#9053

Rose Hill
3.6
Other #9053

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REMEDIAL INVESTIGATION FINAL REPORT

Volume I
Text

Rose Hill Regional Landfill Superfund Site
South Kingstown, Rhode Island

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An Air & Water Technologies Company

ROSE HILL REGIONAL LANDFILL
FINAL REMEDIAL INVESTIGATION REPORT
VOLUME I

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
ATSDR	Agency of Toxic Substances and Disease Registry
bgs	Below Ground Surface
BOD	Biochemical Oxygen Demand
CADD	Computer Aided Drafting and Design
cis-1,2-DCE	*cis*-1,2-Dichloroethene
cc/min	cubic centimeter per minute
cm	Centimeter
cm/hr	Centimeter per Hour
cm/sec	Centimeter per Second
cm^3/sec	Cubic Centimeter per Second
CGI	Combustible Gas Indicator
CLP	Contract Laboratory Program
CH_4	Methane
COCs	Chemicals of Concern
CO_2	Carbon Dioxide
1,1-DCA	1,1-Dichloroethane
DTC	Diversified Technology Corp
DERM	Dermal Exposure Assessment: Principles and Applications
EM	Electromagnetic
EPRB	Emergency Planning and Response Branch
EMSL	Environmental Monitoring Systems Laboratory
EPA	U.S. Environmental Protection Agency
ESD	Environmental Services Division
eV	electron volts
FEMA	Federal Emergency Management Agency
FID	Flame Ionization Detector
FSP	Field Sampling Plan
ft	Feet
ft^3	Cubic Feet ft/dayFeet per Day
ft/ft	Feet per Feet
ft/sec	Feet per Second
ft^2/day	Feet Squared per Day
ft^3/sec	Cubic Feet per Second
GC	Gas Chromatograph
gpm	Gallons per Minute
GRM	General Reciprocal Method
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient

ACRONYMS AND ABBREVIATIONS (Continued)

ID	Inside Diameter
IRIS	Integrated Risk Information System
K	Hydraulic Conductivity
LC_{50}	Concentration which is lethal to 50 percent of test species
LEL	Lower Explosive Limit
L/day	Liter per Day
M&E	Metcalf & Eddy
m^3/day	Cubic Meter per Day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	Milliliter
mm	Millimeter
MCL	Maximum Contaminant Level
MSL	Mean Sea Level
N,N-DMF	*N,N*-Dimethylformamide
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetland Inventory
NX	Rock Coring Method using a three-inch OD Core Barrel
O_2	Oxygen
OD	Outside Diameter
OVA	Organic Vapor Analyzer
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethene
PID	Photoionization Detector
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride (a plastic)
RAGS	Risk Assessment Guidance for Superfund
RAS	Routine Analytical Services
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RME	Reasonable Maximum Exposure
RQD	Rock Quality Designation
SAS	Special Analytical Services
SCS	Soil Conservation Service
SDEF	Standard Default Exposure Factors
SPHEM	Superfund Public Health Evaluation Manual
SRAG	Supplemental Risk Assessment Guidance

ACRONYMS AND ABBREVIATIONS (Continued)

SQL	Sample Quantitation Limit
trans-1,2-DCE	*trans*-1,2-Dichloroethene
TAL	Target Analyte List
TAT	Technical Advisory Team
1,1,1-TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TCL	Target Compound List
TCO	Total Combustible Organics
TOC	Top of Casing
μg/kg	Micrograms per Kilogram
μg/L	Micrograms per Liter
μL	Microliter
URI	University of Rhode Island
U.S. ACOE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDHHS	U.S. Department of Health & Human Services
USDHUD	U.S. Department of Housing & Urban Development
USDOI	U.S. Department of Interior
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VLF	Very Low Frequency
vs.	versus
WET II	Wetland Evaluation Technique, Volume II
WSO	Water Soluble Organics

Executive Summary

EXECUTIVE SUMMARY

A remedial investigation (RI) was conducted by Metcalf & Eddy for EPA Region I at the Rose Hill Regional Landfill Superfund site study area in South Kingstown, Rhode Island. The objectives of the RI were to define the source(s), nature, extent, and distribution of contaminants released; determine and quantify the potential exposure pathways; and assess risks to public health and the environment.

The Rose Hill Regional Landfill Superfund site is located within the town of South Kingstown, Rhode Island, in the village of Peace Dale. The landfill area, which is in part owned by the town and was in part leased from a private owner during the time of disposal operations, is located in an abandoned sand and gravel quarry and encompasses 70 acres. The landfill area comprises three separate inactive disposal areas; solid waste, bulky waste, and sewage sludge disposal areas. An active refuse transfer station is also located in the site study area.

INVESTIGATIVE PROCEDURES

Metcalf & Eddy's field investigation program is described in section 2. The RI field activities were conducted in two phases. The first phase consisted of a site reconnaissance, and the second phase consisted of all other field work. Activities performed as part of the site reconnaissance included a residential well inventory, existing well development, geophysical surveys, landfill gas surveys, ecological resource reconnaissance, and sampling of groundwater, surface water, leachate, and sediment. Field work in the second phase included test boring and monitoring well installation, analytical soil borings, landfill cover material thickness and permeability testing, landfill settlement platform installation, hydrogeological field assessment (surface water elevations, stream velocity measurements, streambed leakage and hydraulic conductivity measurements, groundwater elevation measurements, hydraulic testing, and long-term monitoring), landfill gas investigation, environmental sampling (surface and subsurface soil, groundwater, surface water, sediment, ecological sampling including artificial substrates, quantitative benthic macroinvertebrate, and toxicity testing), site surveying, and site mapping.

SITE CHARACTERISTICS

The data collected during the RI were used to characterize the geology, hydrogeology, and ecology. The site characteristics described in section 3 are summarized below.

Bedrock

Several geologic features that impact the movement of groundwater across the site were identified. The behavior of bedrock groundwater was found to be influenced by bedrock topography, with recharge and discharge occurring at bedrock high and low areas, respectively. The predominant flow of groundwater in bedrock is to the southeast along regional fractures. Weathered and fractured bedrock south and west of the solid waste disposal area appears to facilitate interconnection of the overburden and bedrock flow systems. A bedrock high located in the northern portion of the solid waste area appears to divert groundwater southward and eastward around the high and contribute to localized mounding. This mounding facilitates groundwater transport to the north and west of the solid waste disposal area.

Overburden

The three major constituents of the overburden are ablation till, glacial lacustrine, and glacial outwash sediments. The till and glacial outwash permit unconfined groundwater flow in a south-southeast direction. Lacustrine deposits, encountered in the south-southeastern portion of the site, act as a confining layer between the till and outwash. Infiltration through the cover materials is expected to be high. A combination of the rise in the surface elevation of the bedrock and the presence of thick lacustrine deposits along the Saugatucket River plays a significant role in the increased horizontal gradient and strong upward gradients observed south of the bulky waste area.

Groundwater/Surface Water Interaction

Groundwater interaction with the Saugatucket River and Mitchell Brook plays an important role in the transport of contaminants. The Saugatucket River was observed to gain water from the shallow and deep overburden and the bedrock flow systems along the western side of the river. Mitchell Brook was observed to lose water to groundwater in its upper reaches and gain groundwater in its lower reaches.

Ecological Resources

Significant ecological habitats within the site study area include the Saugatucket River and Mitchell Brook, their associated tributaries and forested wetland, and the adjacent forested and old field upland habitats. Rare plant species known to occur within the site study area include a species of state interest, tickseed sunflower, and species of concern, bloodroot.

As indicated by a single, reconnaissance-level survey, the site study area is utilized by a variety of terrestrial species. Avian species observed were mostly passerines utilizing the old field and edge habitats; relatively few water fowl, raptors, and shorebirds were observed. The extensive running of dogs and hunting on the site have influenced the use of the site by mammalian species. Reptiles and amphibians utilizing the site study area are likely to be confined to largely terrestrial species, as Mitchell Brook does not appear to support large numbers of these organisms or other prey species such as fish. However, the Saugatucket River likely supports a more diverse assemblage of wildlife and aquatic species.

The macroinvertebrate species composition in the sediments of the Saugatucket River appears to be affected by the disposal areas. The species composition (in terms of the relative abundance of dominant organisms) adjacent to the disposal areas appears to be different from the species composition in upstream and downstream locations. Although the area adjacent to the bulky waste area has the most contaminated sediments, pollution-sensitive taxa did occur in relatively high numbers in the sediments compared to the taxa in sediments in upstream and

downstream locations. Organisms in the water column in the Saugatucket River showed a distinct trend in decreasing total densities from upstream to downstream locations. The occurrence of pollution-sensitive taxa in the water column also decreased from upstream to downstream locations. This trend in decreasing densities is associated with an increase in water column contaminants.

In general, the macroinvertebrates in Mitchell Brook sediments and surface waters showed a pattern of decreasing densities from upstream to downstream locations. Additionally, the occurrence of pollution-sensitive species decreased from upstream to downstream locations. This trend in densities may be caused by contamination from the disposal areas.

NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination in the various media are summarized below.

In surface soil, the presence of organic compounds and metal concentrations was related to location. Volatile organics were the most prevalent of organic compounds detected, and chlorinated and aromatic compounds and ketones were detected most frequently and in the highest concentrations. Refuse and landfill gas were the primary sources of volatile organics in surface soil. Elevated iron concentrations were found in samples near leachate seeps, and elevated lead was found throughout the study area.

Soil borings were drilled within the disposal areas to collect subsurface soils. The chemicals detected included typical industrial and municipal wastes: ketones, toluene, PAHs, phthalates, phenols, pesticides, and dichlorobenzenes. These compounds were similar to compounds detected in surface soils and landfill gas. Although several metals were detected, only copper in the sewage sludge area was significantly elevated compared to background soils. Buried waste provides an active source for the release of contaminants to subsurface soils.

As indicated by surface and subsurface soil data, the disposal areas provide a potential source of organic compounds and metals in leachate, since the same types of organic compounds were found at lower concentrations in leachate. Concentrations of several metals were found to be significantly elevated in leachate compared to background groundwater.

Numerous organic compounds were detected in shallow and deep overburden and bedrock groundwater. The types of compounds included volatile organic compounds that were soluble (water-soluble organics) and those less volatile, as well as soluble compounds (semivolatiles, pesticides, and PCBs). Of these compounds, volatile organics, primarily chlorinated and aromatic volatiles, were most frequently and consistently detected. In the three disposal areas, the most elevated concentrations of volatile organic compounds were measured in the solid waste area, and the lowest concentrations were found in the sewage sludge area. Volatile organic contamination extended north and northeast of the solid waste area as a result of localized mounding. Although low concentrations of volatile organics were detected in residential wells east of the Saugatucket River, this contamination does not appear to be related to the site. The predominant metals detected in groundwater were aluminum, iron, basic cations, barium, and manganese. The metals and concentrations detected in shallow and deep overburden were similar; however, the number and concentrations of metals detected were significantly lower in bedrock groundwater. Although variations were observed in the concentrations and number of chemicals detected, seasonal trends were not evident based on the data collected.

A few organic compounds were infrequently detected in low concentrations in the three surface water bodies: Mitchell Brook, the Saugatucket River, and the unnamed brook. Volatile organics, primarily carbon disulfide and chlorinated and aromatic volatiles, were the major contaminants found. A few semivolatiles and pesticides and a water-soluble organic, acrylamide, were also detected. Several surface water locations exhibited high metal concentrations, which coincided with areas adjacent to leachate seeps and downgradient of the solid waste area.

In sediment as in surface water, volatile organic compounds were occasionally detected in low concentrations in Mitchell Brook, the Saugatucket River, and the unnamed brook. In contrast, the less mobile, more adsorptive organic compounds (phthalates, PAHs, and pesticides) were detected more often and in higher concentrations than volatile organics. Metals were elevated in sediments relative to surface water, although the locations with the most elevated metals generally coincided with associated surface water locations.

In the disposal areas, landfill gas was characterized by elevated methane, carbon dioxide, and volatile organic compounds. Hydrogen sulfide was also detected. In the bulky waste area, the volatile organics were primarily comprised of *cis*- and *trans*-1,2-DCE, TCE, and BTEX compounds. In the solid waste area, numerous volatile organic compounds were found in landfill gas; however, vinyl chloride, *cis*-1,2-DCE and toluene were the major components. These compounds were also the major volatile organics in landfill gas north and west of the solid waste area. West of Rose Hill Road, volatile organics were detected on three residential properties. Landfill gas contamination in the sewage sludge area was generally low relative to the other disposal areas.

CONTAMINANT FATE AND TRANSPORT

Predominant transport processes for contaminants identified in the site study area are leachate runoff, landfill gas migration, groundwater flow through overburden and bedrock, and surface water and sediment movement. Landfill gas migration and leachate are the primary contaminant transport mechanisms in the unsaturated zone. Venting of landfill gas was evident where soil/fill cover material was thin or absent; however, movement of gas into surface soil may limit volatilization to the atmosphere. In areas of high landfill gas contamination, groundwater quality was affected.

Highest contaminant concentrations were found in wells adjacent to the disposal areas and decreased with distance from these areas. The predominant groundwater flow direction is south-southeast in the overburden and southeast in the bedrock, although mounding effects in the

northwest of the solid waste area facilitate radial migration of contaminants towards the west, north, and northeast. Mitchell Brook serves to intercept contamination in the shallow and deep overburden, while the Saugatucket River is a receptor for shallow and deep overburden and bedrock contamination. Glacial lacustrine deposits restrict the vertical movement of contaminants from deep to shallow overburden in the southern portion of the site study area. Bedrock fractures provide pathways for contaminant transport from overburden to bedrock groundwater.

Transport of contaminants via leachate impacted surface soil, surface water, and sediment quality near the disposal areas. However, downgradient in the Saugatucket River, surface water and sediment contamination decreased. Likewise, in Mitchell Brook, contamination increased south of the solid waste area but decreased after the confluence with the Saugatucket River. This trend indicates dilution of contaminated surface water by uncontaminated surface water and/or sediment retention of contamination.

PUBLIC HEALTH AND ECOLOGICAL RISK

A baseline risk assessment was conducted to evaluate the potential adverse health effects to human populations. Chemicals of concern were selected from each media. Six media (surface soil, leachate, groundwater, surface water, landfill gas and air) were evaluated quantitatively under various exposure scenarios. Possible human exposure to the chemicals of concern was characterized through exposure pathways for current and future use. Exposure to leachate and surface water is not expected to exceed risk allowable by EPA. Exposure to landfill gas from the solid waste area and ambient and indoor air from residential areas may result in increased carcinogenic risks. Noncarcinogenic risks from ingestion of groundwater from residential wells in the area and from incidental ingestion of surface soils in the bulky waste area exceed a hazard index of one, due to manganese concentrations. In addition, future exposure to site groundwater by ingestion exceeds both the hazard index and carcinogenic risk allowable by EPA. The chemicals responsible for the majority of the risk include manganese (in soils, site groundwater, and residential well groundwater); vinyl chloride (in site groundwater, residential ambient and

indoor air, and solid waste area landfill gas); 1-2 DCE, arsenic, cadmium, antimony, beryllium, zinc, and acrylamide (in site groundwater); and benzene and 1,1,2,2-tetrachloroethane (in residential ambient and indoor air).

An ecological risk assessment was conducted to evaluate potential risk to organisms exposed to contaminated media, including surface water, leachate, sediments, and surface soils. Pathways evaluated included dermal contact, ingestion of contaminated media, and ingestion of contaminated food. The chemicals of ecological concern for aquatic receptors (iron, aluminium, and manganese) pose a risk based on surface water concentrations and toxicity testing. For terrestrial organisms, the chemicals of ecological concern (lead, copper, and manganese) in surface soils were evaluated. Based on a qualitative assessment and comparison to known ecological effects, significant adverse effects are not expected to birds or mammals. Certain aquatic reptiles and amphibians may be adversely impacted due to contact with contaminated surface water. In addition, levels of contaminants exceeding effect levels in soils and leachate were measured in the vicinity of leachate seeps.

CONCLUSIONS

The remedial investigation indicated that 1) contaminants were detected in all media; 2) transport mechanisms were influenced by groundwater flow, geologic features, groundwater/surface water interaction, and leachate and landfill gas migration; and 3) increased human health and ecological risks were evident.

SECTION 1.0
INTRODUCTION

This document is a comprehensive and interpretive report on the remedial investigation portion of the remedial investigation/feasibility study (RI/FS) conducted at the Rose Hill Regional Landfill Superfund site in South Kingstown, Rhode Island, for Region I of the USEPA. This work was conducted by Metcalf & Eddy (M&E) under the Alternate Remedial Contract Services (ARCS) contract. The RI was undertaken to document the nature and extent of contamination observed at the site so that remedial alternatives can be developed and the appropriate response action or actions can be implemented.

1.1 SITE BACKGROUND

This section identifies previous investigations and summarizes information describing the Rose Hill site and its history. Information presented in this section was summarized from USEPA (1990a).

1.1.1 Site Description

The Rose Hill Superfund site is located within the town of South Kingstown, Rhode Island, in the village of Peace Dale (Figure 1-1). It lies about 5 miles inland from Narragansett Bay and 2 miles north of Wakefield, Rhode Island. The site is bordered by Rose Hill Road to the west, the Saugatucket River to the east, and residential private property to the north and south.

The site is located in an abandoned sand and gravel quarry and encompasses approximately 70 acres. As shown in Figure 1-1, the site consists of three separate and inactive disposal areas (landfills): a solid waste area, a bulky waste area, and a sewage sludge area. An active transfer station, south of the disposal areas, is also located on the site (Figure 1-2).

Two primary surface water bodies flow through the site: Saugatucket River and Mitchell Brook. An unnamed brook, west of the site, flows into the Saugatucket River and an unnamed tributary, in the northern portion of the site, flows into Mitchell Brook. The Saugatucket River is classified as a Class B water body that is suitable for fishing and swimming. An open excavated area approximately 400 feet north of the disposal areas is currently used for target and skeet shooting. Approximately 200 feet west of the disposal areas is an active sand and gravel operation. Currently, two companies excavate sand, gravel and loam for resale to the public.

Groundwater is used within a 3-mile radius of the site for the following purposes:

- Private residential supplies (no alternate supply available)
- Municipal public water supply (no alternate supply available)

Residents in South Kingstown obtain water from both public and private wells. Private wells within a 3-mile radius of the site consist of overburden or bedrock wells. Three supply wells for the University of Rhode Island are located 2.7 miles northwest of the site. Two municipal supply wells for the Kingston District are located 2.9 miles northwest of the site. The university and the district utilize each other's systems as back-up because unthreatened alternate systems are not available.

In 1985, the town provided a municipal water line extension to adjacent residences located on Rose Hill Road and those abutting the northern portion of the site. The municipal water line extends as far north as the site owner's driveway. Hookups to the waterline were voluntary. One residence who initially refused the service was subsequently provided municipal water. By 1989, water service was provided to Broad Rock Road. Generally, residences along Rose Hill Road west and south of the site use municipal water. A number of residences on Saugatucket Road and Broad Rock Road are not connected to municipal water and continue to use private wells.

1.1.2 Site History

Prior to 1941, the site was used for agriculture. Sand and gravel excavation operations were conducted at the site from at least 1948 through 1963 (USEPA 1991a). The Rose Hill site began operation as a landfill in 1967 in the area previously used for sand and gravel excavation. The landfill was operated by the town of South Kingstown under state permit from the Rhode Island Department of Environmental Management (RIDEM) which was renewable annually. For approximately 16 years, it received domestic and industrial wastes from residents and industries in South Kingstown and Narragansett. In October 1983, the landfill reached its state-permitted maximum capacity and active landfilling operations were ceased. For the past fifty years, the landfill owner has conducted organized small game hunts, the boarding, breeding, training, and showing of hunting dogs, skeet and target shooting, and stocking and periodic release of small game birds at the site.

1.1.2.1 Facility Operations and Waste Disposal Practices. Table 1-1 provides a chronology of activities affecting the landfill operations.

The three disposal areas (the solid waste, bulky waste, and sewage sludge areas), began operations in 1967, 1978, and 1977, respectively. The solid waste landfill was closed in 1982 and the bulky waste and sewage sludge areas were closed in 1983. During that year, a transfer station for municipal refuse was located south of the bulky waste area. The transfer station is currently active. At the station, refuse is unloaded from collection trucks and transferred to vehicles that transport it off site to the Johnston landfill. Figure 1-1 shows the three disposal areas and the transfer station at the site.

Waste handling procedures for the Rose Hill Regional Landfill were set by state regulations and town ordinance. The waste handling practices conducted at the landfill consisted of the disposal of municipal refuse and industrial refuse including the disposal of industrial wastes. The exact quantity and location(s) of hazardous substances disposed of on the site throughout the landfill's operation are unknown. However, information regarding the total volume of solid waste placed

in the landfill is available through studies conducted for the town of South Kingstown (C.E. Maguire, 1977b)

In 1967, when activity at the landfill officially commenced, a court order prohibited the disposal of combustibles at Rose Hill. In 1978, the order was amended to allow the disposal of combustibles in the bulky waste area. In 1979, the state of Rhode Island ordered cities and towns to establish facilities for the collection of waste oil. It is reported that a waste oil collection facility at the Rose Hill site was established during this time.

A known waste handling problem concerns the disposal of liquid waste from the Peacedale Processing Company, specifically a urethane adhesive. A letter dated January 8, 1970, transmitted from an engineer of the State Division of Solid Waste Management to the South Kingstown director of public works, put into writing an agreement on the disposal method for liquid waste from the Peacedale Processing Company. The two authorities came to an understanding that the drummed waste would be disposed of daily by dumping it onto other wastes that had been deposited each day. The purpose of this was to take advantage of the absorptive characteristics of the waste materials as the urethane adhesive was disposed.

A year later, on March 16, 1971, correspondence sent from the same state office notified the South Kingstown town manager that liquid waste from Peacedale Processing was being improperly disposed of at the Rose Hill solid waste landfill. The communication reiterated that the liquid waste should be spread over the surface of the landfill to allow it to be absorbed by the fill, if acceptance of such waste were to continue.

In 1979, a resident observed and reported to the Rhode Island Department of Environmental Management (RIDEM) the dumping of a number of barrels, with the lids intact, on the solid waste landfill slope within a few feet of Rose Hill Road. The truck transporting these drums on this occasion was reported to be labeled "Peacedale Processing." The resident further reported at least one barrel was labeled "slop glue." The drums were buried intact with the

exception of one. It was further observed that the barrel's contents were at least in part liquid.

On December 6, 1979, the State Division of Solid Waste Management wrote to Kenyon Piece Dyeworks (a subsidiary of Peacedale Processing) to confirm an analysis of the waste adhesive procured from the Peacedale plant on November 19, 1979. The analysis revealed that the sample contained trichloroethylene at 29,000 parts per billion (ppb), toluene at 400 ppb, and tetrachloroethylene at 4 ppb. An analysis of the waste itself revealed that it contained trichloroethylene in the amount of 0.35%. Based upon the analyses, the waste adhesive produced at the plant was deemed not hazardous as defined by Rhode Island regulations and could be disposed of at any licensed solid waste management facility. The state added that the waste adhesive was to be in a solid form when taken to the landfill and exposed to the air at least a week prior to its disposal. Within the same time frame, Kenyon Piece Dyeworks notified the state that the company had suspended shipment of the above-mentioned waste adhesive to the landfill pending further investigation of its environmental reactivity.

Peacedale Processing notified the USEPA, Region I, in 1981 that the company had disposed of laminating adhesive at Rose Hill from 1971 to 1979. Although other volatile organics, inorganics, and phthalate compounds have been detected at the site study area, as yet little is known about the disposal practices associated with these contaminants.

1.1.2.2 Landfill Disposal Areas. The solid waste area operated from 1967 until 1982. The exact depth of deposited solid waste materials is unknown but has been estimated during studies conducted for the town of South Kingstown (C.E. Maguire, 1977b) and was reportedly to bedrock in some places. Refuse was also reportedly deposited in areas above, below, and at the water table. Based on aerial photographs of the disposal area, the sand and gravel pit was filled in with refuse material starting in the southern portion and progressing north (USEPA 1987a, 1991a). By 1988, waste materials were present throughout the pit, and all remnants of the original sand and gravel pit were gone. At this time, waste disposal was also evident again in the southern and central portions of the area. Prior to 1977, the thickness of solid waste deposited throughout the landfill is unknown. However, from 1977 to 1982, it was estimated

that between 10 and 14 feet of solid waste were deposited. Upon closure, the solid waste area was reported to have been covered with 0.5 to 2 feet of sandy soil and subsoil. Recent information indicates that only a portion of this area may have been properly covered. Natural vegetation is observed throughout most of the area.

The sewage sludge area is located in the northeast section of the site, between Mitchell Brook and the Saugatucket River. This area operated from 1977 to 1983. Its predominant use was to receive sludge from the South Kingstown wastewater treatment plant. The sludge was deposited in trenches. Aerial photographs taken in 1981 show that the northern section of a large north-to-south-orientated trench, running the entire length of this area, as well as two smaller trenches in the northern section, already contained sludge material (USEPA 1987a). Three unfilled trenches were also visible at that time. The depth of each excavation and the number of trenches are unknown. Problems with the high moisture content of the sludge prompted the town of South Kingstown to initiate the hauling of the sludge to the Johnston landfill. Vegetative cover in this area is less prevalent than in the solid waste area.

The bulky waste area (used for disposal of large appliances, etc.) is an 11-acre area located east of the solid waste area and southwest of the sewage sludge area (Figure 1-1). This area is approximately 200 feet east of Mitchell Brook and 250 feet west of the Saugatucket River. Disposal of bulky waste began in this area in 1978. Solid waste was also reportedly disposed of in the period between closure of the solid waste area and construction of the transfer station (May 1982 through October 1983). Vegetation, primarily grasses overlying natural fill materials, provide cover for this area.

1.1.2.3 Property Ownership. Edward L. Frisella, Sr., and Pearl F. Frisella are owners of record for the property within which the landfill site is located. The gravel quarry area, located adjacent to the landfill, is owned by Edward L. Frisella, Sr. (recently deceased). In 1967, the town of South Kingstown entered into a lease with Mr. Frisella for the operation of a solid waste landfill. After the establishment of the landfill, in February 1973, the town of Narragansett entered into an agreement with the town of South Kingstown for joint use and operation of the

landfill. In 1977, Edward L. Frisella, Sr., and the town of South Kingstown reached an agreement upon the continued use of the property as a landfill site. This amendment to the lease provided additional land for expansion of the landfill facility (i.e., the sewage sludge and bulky waste areas). In 1982, the town of South Kingstown purchased 15.03 acres from Mr. Frisella for the location of the town's transfer station. The property is currently owned by the estate of Edward L. Frisella, Sr.

1.1.3 Previous Investigations

Several studies have been conducted at the Rose Hill site prior to the initiation of the RI/FS. These studies have generated reports and maps concerning the Rose Hill Landfill site. The studies are documented in the following reports and are summarized in the *Final Work Plan for the RI/FS* (M&E 1991a):

- *Investigation of Groundwater at Landfill, Rose Hill Road, South Kingstown, RI* (Kelly 1975)
- *Phase I, Preliminary Design and Hydrogeological Investigations* (C.E. Maguire 1977a)
- *Phase II Site Evaluation and Operation Plan for Municipal Sanitary Landfill, Rose Hill Road* (C.E. Maguire 1977b)
- *Preliminary Assessment for Rose Hill Landfill, South Kingstown, RI* (USEPA 1982)
- *Assessment of Groundwater Contamination from a Municipal Landfill and Evaluation of Remedial Measures* (Bricknell 1982)
- *Engineering and Hydrogeological Assessment of the Rose Hill Landfill* (York Wastewater Consultants 1984)
- *Site Inspection Report, Rose Hill Regional Landfill, South Kingstown, RI* (NUS 1984)
- *Hazardous Ranking System Report, Rose Hill Landfill, South Kingstown, RI* (NUS 1987)

- *Site Analysis, Rose Hill Landfill, South Kingstown, RI* (USEPA 1987a)
- *Site Analysis, Rose Hill Landfill, South Kingstown, RI* (USEPA 1991a)
- *Ortho Photographic Composite Delineating Physical Features as They Relate to the Topography of the Site and Topographic Map* (EPIC 1989)
- *Expanded Site Investigation, Rose Hill Landfill, South Kingstown, RI* (NUS 1989)
- *Preliminary Health Assessment for Rose Hill Regional Landfill, South Kingstown, RI* (ATSDR 1990)

1.1.4 Identification of Contamination

Historical sampling data for groundwater, landfill leachate, surface water, and sediments within the vicinity of the site has indicated the presence of contaminants periodically and has also indicated potential seasonal variability. The contamination identified is summarized below from the preliminary health assessment (ATSDR 1990a):

- Historical contaminant concentrations in groundwater collected from on-site wells were variable, as summarized in Table 1-2
- Surface water quality data from Mitchell Brook collected in 1982 revealed the presence of 1,1,1-trichloroethane (2 ppb), methylene chloride (1 ppb), 1,2-dichloroethylene (11 ppb), 1,1-dichloroethane (1 ppb), and toluene (2 ppb)
- Off-site residential wells have also intermittently revealed the presence of contaminants reportedly attributable to the site. These contaminants included trans-1,2-dichloroethylene (27 ppb), trichloroethylene (6 ppb), di-n-butyl phthalate (20 ppb), and diethyl phthalate (20 ppb)
- In leachate, primarily from the solid waste landfill, 1,1-dichloroethylene (5 ppb), trans-1,2-dichloroethylene (10 ppb), cis-1,2 dichloroethylene (2,260 ppb), benzene (15 ppb), toluene (385 ppb), ethylbenzene (35 ppb), and m-xylene (50 ppb) were reported.

- Surface water and soil samples collected November 1987 and March 1988 revealed several volatile and extractable organic compounds, however sampling and analytic problems precluded the use of this data.

1.2 SITE STUDY AREA

The area of study evaluated during the RI included not only the Superfund site itself, but also encompassed surrounding areas that may or may not be affected by the Rose Hill site, such as residences west of Rose Hill Road and east of the Saugatucket River. For this reason, the entire study area evaluated during the RI is referred to throughout this report as "the site study area." Figure 1-2 shows the site study area evaluated during the RI.

1.3 REMEDIAL INVESTIGATION OBJECTIVES

The overall goals of the RI/FS are to:

- Complete a field program for collecting data to quantify the extent and magnitude of contamination in different environmental media at the site study area
- Determine the public health and ecological risks associated with existing contamination at the site study area
- Develop and evaluate remedial alternatives, if unacceptable risks are identified

The primary objectives of the RI are to:

- Define source(s) and evaluate nature, extent, and distribution of contaminants detected in the site study area
- Further characterize contaminant transport pathways
- Evaluate and quantify potential exposure pathways
- Assess contaminant risks to public health, ecology, and the environment

1.4 REPORT ORGANIZATION

The field investigation and results of the RI are presented in the following sections of this report:

- Section 2.0, Site Investigation - presents the field investigations performed, the field and laboratory methodologies used, and sampling locations
- Section 3.0, Site Characteristics - presents results of the geologic, hydrogeologic, and ecologic investigations
- Section 4.0, Nature and Extent of Contamination - presents the analytical results for the surface and subsurface soil, leachate, groundwater, surface water, sediment, and landfill gas samples collected
- Section 5.0, Contaminant Fate and Transport - discusses the fate and transport of detected contaminants within the environmental setting of the site study area
- Section 6.0, Human Health Risk Assessment - evaluates the human health risks associated with the site study area
- Section 7.0, Ecological Risk Assessment - evaluates the ecological risks associated with the site study area
- Section 8.0, Summary, Conclusions, and Recommendations - summarizes the report findings and describes conclusions of the investigation

The report is divided into five volumes. Volume One contains the text. Volume Two contains the tables, and Volume Three contains the figures referred to in the text. Volume Four contains Appendices A through C. Volume Five contains Appendices D through G.

SECTION 2.0
SITE INVESTIGATION

2.1 FIELD INVESTIGATION OVERVIEW AND TECHNICAL APPROACH

The purpose of the RI field investigation was to collect data for the characterization of the geology, hydrogeology, hydrology, groundwater, surface water and sediment/soil chemistry, landfill gas emissions, and ecological resources; and to evaluate potential contamination and contaminant migration in the site study area. The RI field investigation was conducted in two phases. A site reconnaissance was conducted as phase 1A in the spring of 1991 to provide a preliminary survey of the site study area. Field work performed during the reconnaissance included evaluating ecological resources; establishing surface water, sediment sampling, and existing and residential well locations; collecting groundwater, leachate, surface water, and sediment samples; monitoring landfill gases; characterizing geologic subsurface conditions; and installing and monitoring staff gauging stations, mini-piezometers, and seepage meters. The results of these activities provided the basis for other field work conducted during the fall and winter of 1991, spring of 1992, and fall of 1993. In particular, the ecological reconnaissance provided information used to locate surface water and sediment sampling locations and to identify and delineate wetlands in the site study area. In addition, data collected during the geophysical and landfill gas survey were used to establish locations for monitoring wells, surface and subsurface soil sampling points, and landfill gas points for laboratory analysis.

Following the site reconnaissance, a series of additional field investigations was conducted as part of phase 1B. During the summer and fall of 1991, soil borings were advanced and monitoring wells were installed. Soil borings were sampled in August 1991. Monitoring wells and surface water were sampled in September/October 1991, January/February 1992, and April 1992. Selected residential wells were samples in September 1993. Sediment samples were collected in September/October 1991. An additional round of biological and chemical sampling at surface water and sediment locations was conducted in May 1992. Surface soil samples were

collected in September/October 1991 and April 1992. Long-term monitoring of groundwater levels was conducted from November 1991 through April 1992.

Analytical data for groundwater, surface water, leachate, sediment, and landfill gas were collected and staff gauging stations, mini-piezometers, seepage meters, and groundwater levels were measured during sampling rounds throughout the study. Field activities were conducted at the site study area from May 15, 1991, to June 1, 1992. Selected residential wells were sampled from September 21 to 23, 1993. A chronology of the RI field investigation is summarized in Table 2-1. The RI field investigation was conducted in accordance with the following project documents:

- *Final Work Plan for RI/FS* (M&E 1991a)
- *Final Field Sampling Plan for RI/FS* (M&E 1991b)
- *Final Quality Assurance Project Plan for RI/FS* (M&E 1991c)
- *Final Health and Safety Plan for RI/FS* (M&E 1991d)
- *Final Quality Assurance and Quality Control Procedures for the RI Ecological Studies* (M&E 1992a)
- *Quality Assurance Summary for SUMMA Canister and Reduced Sulfur Sampling* (M&E 1992b)
- *Draft Statement of Work for the RI/FS at Rose Hill Regional Landfill* (USEPA 1990a)
- *Addendum to the Sampling and Analysis Plan for RI/FS* (M&E 1993b).

Elements of the RI field investigation, including methodologies and site reconnaissance results, are discussed in detail in the following sections.

2.2 FIELD METHODOLOGIES

This section describes the field methodologies followed during the field investigation conducted as part of the RI at the site study area and are based upon the *Final Work Plan* (M&E 1991a) and *Final Field Sampling Plan* (M&E 1991b). The activities discussed in this section include:

- Site reconnaissance
- Test borings and bedrock and overburden monitoring well installation
- Landfill analytical soil borings
- Landfill cover material thickness and permeability testing
- Landfill settlement platform installation
- Geophysical survey

2.2.1 Site Reconnaissance

The RI field investigation began with a reconnaissance of the site study area, which included the following activities:

- Site mobilization
- Residential well inventory
- Existing monitoring well development
- Surface geophysical investigation
- Landfill gas emission sampling
- Ecological resources reconnaissance
- Groundwater and surface water reconnaissance
- Existing on-site and residential well sampling
- Leachate sampling
- Surface water and sediment sampling

Mobilization of the decontamination, support, and drum storage areas began the last week of May and were completed on June 19, 1991. These areas were located in the northern portion of the site study area along a dirt access road along Rose Hill Road as shown on Figure 2-1.

Mobilization activities included the placement of gravel in and the installation of fences around each area; delivery and setup of the storage, office, and decontamination trailers; and provision of telephone service and electrical power to the support/decontamination area.

A 300-gallon tank was rented to store potable water for field equipment decontamination and was connected to a pump and pressure vessel to increase the water pressure. During field activities, the water tank was filled periodically from the hydrant at the corner of the site owner's driveway on Rose Hill Road. Water to the hydrant which is supplied by the Wakefield Water Department, comes from well fields along Tuckertown Road (Wakefield Water Company 1992).

2.2.1.1 Residential Well Inventory. The town of South Kingstown's tax assessor's catalog was reviewed on February 20 and 21, 1991, to identify property owners within 2,000 feet of the disposal areas. The names and addresses, along with plot and lot numbers of the property owners, were recorded. Copies of the plot maps were obtained. The Wakefield Water Company was contacted, and the names and addresses of the residents currently on municipal water were acquired.

On March 4, 1991, M&E and USEPA sent access agreements and questionnaires to approximately 100 property owners east, south, and west of the disposal areas along Rose Hill Road, Saugatucket Road, and Broad Rock Road. Following the mailing of access agreements and questionnaires, a field reconnaissance was conducted from April 12 to April 15, 1991.

The field reconnaissance consisted of contacting property owners along Rose Hill Road, Saugatucket Road, and Broad Rock Road adjacent to the site study boundaries and obtaining mailing addresses and any additional information that would be relevant in determining the extent

of current and past groundwater use in the vicinity of the site study area. Property owners were visited and questioned concerning well installation and groundwater usage.

Information from the questionnaires and visits was compiled and is presented in Appendix A. Results of the well inventory indicated that:

- Residents on Rose Hill Road, south and west of the disposal areas, use municipal water for domestic purposes
- Residents of Saugatucket and Broad Rock Road, east and south of the disposal areas, are currently using private wells, although municipal water is available

Metcalf & Eddy and USEPA reviewed the well inventory data in June 1991 to select residential wells to be included in the sampling program. In selecting the residential wells, preference was given to:

- Wells in close proximity to the disposal areas
- Wells that provided adequate coverage of the site study area
- Bedrock wells
- Wells not currently included in state or town well sampling programs
- In-use rather than abandoned wells
- Deep rather than shallow overburden wells

Ten residential wells were selected for sampling along Rose Hill Road, Saugatucket Road, and Broad Rock Road and within 2,000 feet of the disposal areas. Generally, residential wells were selected south, west, and east of the disposal areas. However, four wells located north of the disposal areas were selected because of their close proximity to potential contamination.

The residential wells were distributed spatially to provide additional information regarding potential contaminant migration beyond the areas selected for the installation of on-site monitoring wells for the RI field investigation. To obtain new information, wells not included

in state or town well sampling programs and wells currently in use by residents for domestic purposes were given preference.

Since only a few on-site bedrock wells would be installed during the RI field investigation, bedrock residential wells were selected to help characterize the bedrock flow zone. In addition, shallow overburden wells were avoided because of potential surface runoff contamination.

The ten residential wells selected for sampling during the field investigation are shown on Figure 2-2. Table 2-2 details the residential well specifications.

2.2.1.2 Existing Well Development. During the weeks of May 20 and May 27, 1991, 12 existing on-site monitoring wells were located, developed, and secured with locking caps as described in the *Final Field Sampling Plan* (M&E 1991b). Table 2-3 summarizes the well information collected during this activity. Three wells (OW-B, OW-C, and RIDEM III) reportedly located near the transfer station were not found and are presumed destroyed. Since many of the residential wells are currently in use, these wells were not developed or secured.

2.2.1.3 Geophysical Surveys. A surface geophysical investigation was conducted by Gartner and Lee between May 21 and June 13 and November 4 and 6, 1991. The objectives of this investigation were to:

- Assist in the characterization of geologic subsurface conditions
- Assist in the evaluation of potential contamination migration from the disposal areas
- Identify optimum monitoring well and landfill gas sampling locations that would provide the best characterization of the extent of contamination

Electromagnetic (EM-34 and EM-31), seismic refraction, and very-low-frequency (VLF) surveys were performed at the site study area. Locations of the surface geophysical surveys are shown in Figures 2-3 and 2-4. The location and elevation of each geophysical line was surveyed by

Diversified Technologies Corporation (DTC), a licensed surveyor in Rhode Island. The report prepared by Gartner and Lee is included in Appendix B. Results from the surveys are discussed further in sections 3 and 4, where appropriate.

Electromagnetic (EM) Terrain Conductivity. The electromagnetic-terrain-conductivity survey method was used to measure the electrical conductivity of the geologic subsurface materials. Variations in the subsurface conductivity may be caused by soil moisture content, groundwater specific conductance, and thickness of soil and rock.

Terrain-conductivity profiling was used to assist in the identification of potential conductive landfill leachate migration. EM profiling was accomplished along the perimeter of the three inactive disposal areas to detect the migration of contaminant plumes. A total of 15,700 linear feet of EM profiling was completed.

EM34-3. EM profiling was completed using a Geonics EM34-3 terrain conductivity meter and a digital data logger. The EM34-3 conductivity meter allowed EM depth sounding using 10- and 20-meter separation between the transmitter and receiver coils. Data were collected at the site study area with the coil's dipole oriented horizontally and vertically and at 10- and 20-meter intercoil separations. Conductivity readings were recorded at 25-foot increments along each line. The depth of investigation with the EM34-3 was dependent upon the coil's dipole orientation and the intercoil spacing. The effective depths of exploration for the survey at the site study area were as follows:

Coil Spacing (meters)	Horizontal dipole mode depth (meters)	Vertical dipole mode depth (meters)
10	7.5	15
20	15	30

A total of 13,700 linear feet of EM34-3 profiling was completed.

EM31-DL. Terrain conductivity data were also collected using the Geonics EM31-DL. The Geonics EM31-DL had a fixed intercoil spacing of 3.67 meters. Data were collected at 2.5-foot intervals with the dipoles oriented vertically along the survey lines. Readings were automatically stored in the digital data logger during the survey.

Both EM34-3 and EM31-DL data were edited by Gartner and Lee using Geonics software package DAT34-3/DAT31Q and LOTUS 123. Conductivity data and the resulting line profiles are presented in Appendix B.

During the EM34-3 survey, a damaged cable caused the 20-meter data on the east side of Mitchell Brook to appear to be 20 to 30 mS/m above the values recorded west of Mitchell Brook. After reviewing M&E drilling results, the geophysical data collected on the east side of Mitchell Brook became suspect. Gartner and Lee collected the data again in the site study area in November 1991. The November survey demonstrated that the 20-meter data were similar on both sides of Mitchell Brook. A total of 2,000 linear feet of EM profiling was completed using the EM31-DL.

Significant anomalies were located on EM lines 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14 and 28 as shown in Figure 2-5. Gartner and Lee has attributed these anomalies to several factors, including fill with buried metal materials, groundwater contamination, and/or near-surface stratigraphic changes. These anomalies aided in locating the monitoring wells and in interpreting the nature and extent of contamination.

Seismic Refraction. Seismic refraction profiling was performed to determine depth to groundwater, thickness of the overburden, and topography of the bedrock surface. Because the depth to bedrock was known to vary throughout the site study area, seismic refraction was used to determine bedrock topography beneath portions of the site study area where little information was available.

The seismic data were acquired using a linear array of 24 geophones spaced 16 feet apart. The seismic energy was generated using a 10-pound sledge hammer and a steel impact plate. The seismic traces from the geophones were amplified and stored on a 24-channel EG&G 2401 digital instantaneous-floating-point seismograph.

Seismic disturbances created by the impact of the sledge hammer generate compressional, shear, and surface seismic waves. These waves propagate through the earth at seismic velocities determined by the bulk density of the subsurface materials. When a compressional wave encounters a boundary between two layers of different seismic velocities, part of the wave energy is reflected back towards the surface, while the remainder is refracted into the underlying layer at some angle.

Data interpretation involved selecting times of the onset of the refracted P wave arrival from the 24 seismic traces. The number and velocities of the subsurface layers are then determined from this data. The general reciprocal method (GRM) of seismic refraction data analysis was used to convert travel time data into measurements of layer thickness. Seismic profiles indicating the number of layers and thickness for each line are included in Appendix A. A total of 7,575 linear feet of seismic refraction was completed. Locations of the seven seismic lines are shown on Figure 2-4.

Very-Low-Frequency Survey. VLF was used in conjunction with seismic profiling, EM profiling, and existing VLF data from the site study area to identify possible water-bearing fracture zones in the bedrock. VLF refers to electromagnetic waves generated for military communications that are transmitted by stations around the world in the 15- to 25-kilohertz band. The VLF method is a walkover technique that uses a portable radio receiver that detects transmissions in the very-low-frequency range.

For identification of buried bedrock fractures, the fractures should trend towards the transmitting station. Because bedrock outcrop fractures in the vicinity of the site study area had predominantly northward-trending fractures, the VLF transmitter used for the survey was located in Cutler, Maine, which transmits at a frequency of 24.0 kilohertz. The VLF survey was performed along three survey lines designated VLF 1, 2 and 3 lines (EM survey line 5, seismic line 4, and EM line 11). Data were collected at 12.5-foot station intervals with an ABEM Wadi VLF instrument. A total of 3,150 linear feet of VLF survey was performed. VLF data is presented in Appendix B.

2.2.1.4 Landfill Gas Survey. During the site reconnaissance, 134 temporary monitoring points in the solid waste area, sewage sludge area, and bulky waste area were sampled for landfill gas. Additionally, 32 permanent landfill gas monitoring points were installed and sampled around the perimeter of the solid waste area. Gas sampling was conducted to determine the presence of landfill gas contaminants, to determine if landfill gas had migrated off the disposal areas, and to identify potential source areas of contamination.

Each location was analyzed for percent levels of methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), and the lower explosive limit (LEL) using hand-held instruments: OVA, carbon dioxide and methane meter, and combustible gas indicator (CGI), respectively. In addition, each point was analyzed for volatile organics with a portable field gas chromatograph (GC). When methane concentrations were below 1%, an OVA with a flame ionization detector (FID) was used to measure and quantitate organic vapors. Landfill gas and analysis procedures are further described in the following sections. Data collected during the landfill gas survey are discussed in detail in section 2.8.

Gas Chromatographic Data Interpretation. To qualitatively identify individual volatile organics, an HNu 311 portable field GC equipped with an 11.7 eV photoionization detector (PID) lamp, 25 meters capillary column, and a 0.5-meter precolumn was used. Tentative identification of volatile organics was made by comparing retention times of chromatographic peaks in sample runs with those in standard runs. For a further discussion of the operation of the PID refer to section 2.4.2.1.

Thirteen target compounds that were routinely used for standardization of the field GC are listed below with their approximate retention times and approximate quantitation limits:

Compound	Retention Time (min:sec)	Quantitation Limit (mg/m^3)
Methylene Chloride	1:43	5
trans-1,2-Dichloroethene *(trans-1,2-DCE)*	1:53	5
1,1-Dichloroethane (1,1-DCA)	1:56	5
cis-1,2-Dichloroethene *(cis-1,2-DCE)*	2:08	2
Chloroform	2:13	5
1,1,1-Trichloroethane (1,1,1-TCA)	2:33	2
Benzene	2:44	1
Trichloroethene (TCE)	3:18	1
Toluene	4:57	1
Tetrachloroethene (PCE)	6:40	2
Ethylbenzene	9:36	2
m-Xylene	10:17	2
o-Xylene	12:07	2

Data that indicated concentrations less than these detection limits were reported as "trace." Trace was also reported when the compound appeared to be present at a low concentration, but because of interferences caused by the matrix resulted in poor chromatography it was not possible to quantitate the concentration.

The detection limits presented above are those which can typically be achieved using the 11.7 eV-lamp. Matrix interferences, sample dilutions, and field conditions all resulted in detection limits, that in many instances, were greater than those listed.

The identification of compounds using the field GC/PID is based on the retention time of these compounds on the GC column. If different compounds have the same or nearly the same retention time, it is not possible to differentiate between them using only a single chromatographic column. Compounds having the same retention time on a GC column are said to coelute.

In practice due to very close retention times, it was not possible to distinguish between *trans*-1,2-DCE and 1,1-DCA, or between *cis*-1,2-DCE and chloroform, because these compounds tend to coelute (are measured by the GC column at approximately the same time). Although values were reported as *trans*-1,2-DCE and *cis*-1,2-DCE, reported values were computed from peaks that may be composed of both or only one of the coeluting compounds. As a result, data reported as *cis*-1,2-DCE may be partially or entirely made up of chloroform. Similarly, data reported as *trans*-1,2-DCE may also contain 1,1-DCA. The decision to report *trans*-1,2-DCE and *cis*-1,2-DCE is supported by the SUMMA canister sample analysis of volatile organics as well as other laboratory data.

The problem of target compounds coeluting with nontarget compounds is similar to the problem of coelution between two target compounds. These interferences are caused by either volatile organic compounds that are not target compounds or other artifacts present in the chromatograms. For example, PCE has a retention time that is very close to that of another

unidentified compounds. Although suspected it was confirmed that this unidentified compound was not PCE by close comparison of the field and the laboratory (SUMMA canister, section 2.5.8) data.

Another problem incurred was a matrix affect of unknown origin which caused a baseline drop near the beginning of the chromatograms. Some compounds with very early retention times fell within this baseline suppression. This suppression resulted in the increased detection limits for vinyl chloride, methylene chloride, 1,1-DCA, *trans*-1,2-DCE, *cis*-1,2-DCE and chloroform. Oxygen is the suspected cause of this artifact.

Concentrated gas standards were prepared from neat (pure solvent) compounds by injecting a known volume of the neat compound into the known volume of a glass sampling bulb. A secondary dilution into another glass bulb was necessary to prepare the working standard. Once the glass sampling bulbs were filled with either prepared standards or sample, multiple analyses of each could be taken from the bulbs before refilling was necessary. For analysis, samples and standards were removed from the glass sampling bulb using a gas-tight syringe and were injected directly onto the head of the precolumn. Fresh standards were prepared each day.

Temporary Landfill Gas Sampling Points. In June and July 1991, M&E sampled landfill gas from 134 locations in the solid waste, bulky waste, and sewage sludge areas. Temporary landfill gas sampling points were installed at each of these points.

A K-V Hefty soil gas sampling system was used to drive a 3/4-inch-OD hollow steel rod into the ground. At the bottom of the steel rods, a slotted section allowed the landfill gas to pass into the hollow steel rods. A diagram of the sampling apparatus is shown in Figure 2-6. The landfill gas was initially purged at a flow rate of 1 liter per minute. The vacuum required to perform the purge was recorded. Approximately 1 liter of landfill gas was drawn through the sampling system and the 125-mL sampling bulb before the bulb was detached and stored until analysis using the field GC. For analysis by the field GC, aliquots of approximately 100 uL

were then removed from the bulb using a gas-tight syringe. Typically the time from sampling until analysis was 15 to 30 minutes.

After collection of the bulb sample, measurements were made (%CH_4, %CO_2, %O_2 and %LEL). If the percent of methane was too low to measure with the carbon dioxide and methane meter (less than 1%), then a Foxborough 128 OVA was used to measure the methane concentration in ppm. In some instances a Photovac Microtip PID was also used to measure total concentrations of organic vapors in the landfill gas for additional information. Not all of these measurements were possible at every point due to weather conditions and time constraints.

Solid Waste Area. M&E sampled 85 temporary points in the solid waste area. These landfill gas sampling points, shown on Figure 2-7, were located on a 100-foot-by-100-foot grid that was determined prior to the beginning of the landfill gas sampling. Once a pattern of contamination was established, some grid points were not analyzed. A sampling depth of 2.5 to 3 feet was measured throughout the solid waste area. When deeper depths were attempted, water was drawn into the sampling apparatus due to the presence of a perched water table. An additional sampling point, designated as SW(05-040), was placed 40 feet east of SW(05+000) because of an apparent anomaly in the SW(05+000) field GC data.

A detailed discussion of the field GC data is included in section 4.2.8. During this survey, the highest organic vapor concentrations measured were found at SW(11+500). The OVA measured organic vapor concentrations of 700 ppm at the surface of the soil at SW(13+200). Approximately 75 to 100 feet northeast of SW(13+200) there is an exposed slope of the disposal area where no cap material or surface vegetation are present, and exposed garbage is visible.

Bulky Waste Area. Twenty-seven temporary monitoring points were sampled on and around the bulky waste area. These points, shown on Figure 2-7, were located on a 100-foot-by-100-foot grid that was determined prior to the beginning of the landfill gas sampling. Once a pattern of contamination was established, some grid points were not analyzed.

A depth profile was performed at one point prior to sampling in the bulky waste area to determine the depth of sample collection. At point BW(02+100), samples were analyzed from three depths: 3 feet, 4.5 feet, and 6 feet. Table 2-4 summarizes these results. Maximum landfill gas concentrations were reached at 4.5 feet, because greater depths did not produce higher contamination. Consequently, a depth of 4.5 feet was used for sampling

where possible. At perimeter locations where less cap material was found, samples were drawn from a depth of 3 feet.

During this survey, the highest levels of volatile organics in the bulky waste area occurred at BW(05+400) and BW(05+500). Due to the possible migration of landfill gas from the bulky waste area at BW(01+000), an additional point was placed 25 feet to the west of BW(01+000) and designated BW(01-025).

Section 4.2.8 provides a detailed discussion of the landfill gas data.

Sewage Sludge Area. Twenty-two points were sampled on the sewage sludge area. These points were located on a 100-foot-by-100-foot grid that was determined prior to the beginning of the landfill gas sampling. The landfill gas sampling points are shown in Figure 2-7. Samples were usually collected from a depth of 3 feet; however, sampling depths of 3 and 6 feet were used at some points to ensure adequate depth coverage in this area because landfill gases were not being detected. Not all of the grid points were analyzed. The number of points analyzed on the sewage sludge area was reduced, since no volatile organics were measured, and the presence of methane and carbon dioxide was limited.

Generally, the landfill gas from the sewage sludge area did not appear to have measurable quantities of volatile organics. In fact, the typical characteristics of landfill gas, high percentages of methane, carbon dioxide, and low oxygen, were generally not present. SS(08+000) exhibited the only high methane concentrations, as well as high carbon dioxide and low oxygen. Other points exhibiting high carbon dioxide and low oxygen were SS(01+100) and SS(04+000). Section 4.2.8 provides a detailed discussion of landfill gas data.

Installation and Monitoring of Permanent Sampling Points. Thirty-two permanent sampling points were installed around three sides of the perimeter of the solid waste area (Figure 2-8) during June and July of 1991. These were spaced at approximately 100-foot intervals at a depth of about 3 feet. Nine points were installed along the site owner's driveway at the northern edge of the solid waste area. Five points were installed at the southern edge of the disposal area along the transfer station road. Eighteen points were installed along the west side of Rose Hill Road.

The permanent monitoring points were installed using a method adapted from Kerfoot and Soderberg (1989) and K-V Hefty soil gas sampling equipment. First, a pilot hole was drilled

to a depth of approximately 3 feet using the K-V Hefty system used for sampling the temporary points. Then a slotted aluminum shield point threaded onto 1/4-inch tubing was inserted to the bottom of the hole. Glass beads or sand was poured into the hole to prevent the shield point slots from becoming clogged. Crushed bentonite pellets were then poured in on top of the sand or glass beads. The bentonite was then hydrated to make a gas-tight seal with the tubing. Finally, a protective PVC casing and locking cap were placed aboveground to protect the point. Figure 2-9 is a diagram of a completed permanent landfill gas monitoring point.

Sampling of these permanent points was performed in a manner identical to the sampling of temporary landfill monitoring points as described in section 2.2.1. Prior to sample collection, permanent points were allowed to equilibrate for a minimum of 24 hours.

2.2.1.5 Ecological Resources Surveys. This section summarizes the methodology used during ecological surveys conducted at the site study area between May and October 1991. Additional surveys conducted after the initial site reconnaissance round (May 1991) are included in this section, because these surveys helped determine the design of subsequent aquatic sampling (described in section 2.5.7) as well as the surface water and sediment sampling programs. Results from the aquatic sampling during the May to October surveys are also summarized in this section, since they served as the basis for the selection of water and sediment sampling locations. Results of the wetland and wildlife investigations can be found in sections 3.4.1 through 3.4.4. Four field surveys were conducted on May 30 to 31, June 6, June 18 to 28, and September 30 to October 7, 1991. The field investigations included a wetland delineation, a habitat description, wildlife observations, aquatic resources reconnaissance, and investigations of ecological resources in nearby and downstream areas that could potentially be affected by migrating contaminants or future remedial actions.

The objectives of the surveys were to:

- Assess the general use by biological resources at the site study area, particularly for mammals, birds, reptiles, amphibians, and stream and river benthos

- Identify any overt effects of contamination and identify potential ecological pathways for site contaminants
- Identify the need for and design of additional quantitative aquatic sampling
- Determine the location and extent of ecological resources on the site study area, such as wetlands and surface water bodies, that could serve as important wildlife habitat or provide other ecological functions
- Identify the characteristics and evaluate the function of wetlands for use in considering potential remediation and site restoration/mitigation decisions

Wildlife Surveys. A wildlife survey of the site was conducted on May 30 and 31, 1991, as part of the initial site reconnaissance. During this survey, a single biologist systematically walked over the site, and all observations of birds, mammals, reptiles, and amphibians, or their sign, were noted. Observations of feeding activity, nesting activity, or the presence of young were also noted.

As part of the wildlife survey, point counts (unlimited distance) were conducted during the early morning hours of May 31 at 14 stations selected the previous day. These sampling stations encompassed all habitat types present on site and included the three disposal areas, the forested areas along Mitchell Brook and the Saugatucket River, the area near the site owner's residence, and the former quarry on the northern portion of the site (Figure 2-10). Point counts were conducted because the thick vegetation in the wooded portions of the site made transect counts impractical.

The census began at first light and lasted approximately three hours. All wildlife (primarily birds) seen or heard were identified to the species level and enumerated during 10-minute count periods by a single observer using 7X50 binoculars. In addition, all wildlife species seen, heard, or observed by sign were noted during transit between stations.

Habitat Mapping. General habitat types were mapped using low-altitude color aerial photographs taken in March of 1988 and field notes on habitat types obtained during the

reconnaissance survey. The resulting habitat map was combined with the wetland site plan (described below), using a geographical information system to determine acreage of individual habitat types. Wetland habitat types followed the classification system of Cowardin et al. (1979), and upland habitat classifications were adapted from Reschke (1987).

Wetland Delineation. Wetland delineation was accomplished using both off-site determination and on-site (intermediate-level) determination methods (FICWD 1989). Additional definitions and delineation methods, in accordance with the State of Rhode Island Freshwater Wetlands Act, were also incorporated (RIDEM 1981); the on-site intermediate-level determination method is an accepted methodology for delineating state-designated wetlands in the state of Rhode Island. On-site wetlands were delineated prior to drilling activities to allow these areas to be avoided during well installation.

Off-site determination methods consisted of a review of available site information including USGS topographic maps, National Wetland Inventory (NWI) maps, state wetland maps, Soil Conservation Service soil surveys, aerial photographs, and other available site-specific data (including information on state and federal threatened and endangered species). From this information, the existence, location, and type of wetlands present on the site study area were determined for subsequent field inspection.

An on-site determination (intermediate-level) of the wetlands on the disposal areas and along Mitchell Brook (between Rose Hill Road and the transfer station road) was conducted during the May 1991 site reconnaissance in accordance with the three-parameter approach (hydrophytes, hydric soils, and hydrology) of the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (FICWD 1989). The upland-wetland boundary was flagged, surveyed, and located on a site plan. The site plan was then transferred onto a geographic information system for subsequent analyses. Information on soils, hydrology, and vegetation was also collected on selected plots using standard M&E wetland delineation data forms (Appendix D). Wetland classifications were in accordance with the classification system of Cowardin et al. (1979).

Since the use of the 1989 manual was disallowed in 1992, the wetland delineation was subsequently reevaluated relative to the guidelines in the *Wetlands Delineation Manual* (USACOE 1987) and was found to be consistent with the 1987 manual. For areas within the site study area south of the transfer station road and adjacent to the Saugatucket River, only an off-site (literature-based) determination was conducted, because extremely dense thickets in these areas severely limited access. Thus, wetland boundaries in these areas were determined based upon existing wetland maps, soil surveys, and aerial photographs. Field observations were conducted in these areas to verify the wetland characteristics identified during the off-site determination.

Wetland Functional Assessment. The on-site (Mitchell Brook) wetlands were evaluated using the U.S. Army Corps of Engineers *Wetland Evaluation Technique Volume II* (WET II) model (Adamus et al. 1987). This technique evaluates various wetland functions and values in terms of social significance, effectiveness, and opportunity (Table 2-5). Social significance is a parameter used to assess the value of a wetland to society based upon its natural features, economic value, official status, and proximity to urban areas. Effectiveness is used to assess the capability of a wetland to perform various functions based upon its physical, chemical, and biological characteristics. Opportunity is used to determine whether the wetland has the opportunity to perform a function to its level of capability.

In evaluating opportunity, one does not consider, specifically, whether the wetland is contaminated with hazardous substances, although the model was used to evaluate the on-site wetlands in their existing condition. Whether a wetland has the opportunity to provide a function or value is determined, to a large degree, by exogenous factors (e.g., nutrient input from upgradient areas) and surrounding land uses. Opportunity is not necessarily diminished by contamination (although effectiveness may be) and, in some cases, may be enhanced by it. For example, a wetland would not have the opportunity to retain toxicants (one of the functions evaluated) if contaminants are not present.

The WET II model utilizes various predictors, which are simple or integrated variables that directly or indirectly measure physical, chemical, and biological attributes of a wetland, to characterize the functions and values of a wetland. Values for predictor variables are determined based upon the responses to a series of questions relating to site attributes. A series of interpretation keys is then used to define the relationship between predictors and wetland functions and values, resulting in the assignment of qualitative probability ratings of high, moderate, low, or uncertain in terms of social significance, effectiveness, and opportunity. These ratings are not meant to be direct estimates of the magnitude of a wetland function or value. Rather, they are estimates of the probability that a function or value will occur in the wetland to an unspecified magnitude.

The WET II model requires that a number of evaluation areas be delineated or defined. These include the assessment area, input zone, watershed, service area(s), locality, and region. These terms are defined below, and the assessment area, input zone, service area, and watershed are shown on Figure 2-11.

The assessment area is the area evaluated by the model for functions and values. For this analysis, the assessment area is defined as the wetlands associated with Mitchell Brook between Rose Hill Road and the transfer station road. Wetlands associated with the Saugatucket River were not included in the initial work plan and were not formally assessed for functions and values. However, since potential effects were occurring to aquatic biota in the Saugatucket River (see the next section), a qualitative assessment of functions and values was subsequently done for the Saugatucket River wetlands. Areas influencing the assessment area (i.e., the input zone and watershed) and areas influenced by the assessment area (i.e., the service area) are also important to the analysis since they determine, to a large degree, the wetland's capability for providing functions and values. A wetland's value must also be evaluated within a broader geographical context (i.e., locality and region) to estimate its value relative to surrounding land uses.

The input zone includes an area 300 feet upgradient of the boundary of the assessment area and may have a significant impact on the assessment area in terms of sediment, nutrient, or contaminant input. The watershed of the assessment area is the upgradient area from which surface water enters the assessment area at least seasonally. Service areas are areas to which wetland services are delivered. A service is defined as a wetland function or value that has a well defined, off-site delivery point. Saugatucket Pond best meets this definition and is used as the service area for this evaluation. Locality is defined as a relatively small political or hydrologic area. For this analysis, locality was defined as the watershed of the Mitchell Brook wetlands. Region is defined as a larger political, ecological, hydrologic, or jurisdictional area that is relatively uniform in terms of topography and drainage. Southern Rhode Island is considered the region for this evaluation.

The results of the wetland functional assessment are described in section 3.4.4.3.

Benthic Reconnaissance Sampling. The methodology used and the results of benthic reconnaissance surveys conducted in Mitchell Brook and the Saugatucket River are described below. This information was used to determine the design for additional aquatic investigations (see section 2.5.7) and to support the ecological risk assessment (section 7).

Benthic reconnaissance surveys were conducted in Mitchell Brook and the Saugatucket River in June 1991 and during sediment and surface water sampling in October 1991. The purpose of the surveys was to qualitatively determine the characteristics of the benthic communities in Mitchell Brook, the Saugatucket River, and two unnamed tributaries and to determine sampling locations for additional quantitative benthic, surface water, and sediment sampling. Objectives for selection of sampling locations included uniformity of substrate among stations, ability of the substrate to adsorb contaminants (i.e., presence of fine material), and a geographic range of locations upstream, adjacent to, and downstream of the disposal areas. The rationale for the selection of surface water and sediment sampling locations is discussed below, and the locations are identified on Figure 2-12. The procedures used to collect benthic, surface water, and sediment samples are described in sections 2.5.5 to 2.5.7.

The sediments and benthic communities within Mitchell Brook were qualitatively sampled from the west side of Rose Hill Road to the intersection with the Saugatucket River. Sediments and benthic community sampling in the Saugatucket River was conducted just north of the sewage sludge area near SW/SD-02. Sediments were also sampled in an unnamed brook (SW/SD-10) that flows from the west side of Rose Hill Road into Mitchell Brook and in an unnamed tributary (SW/SD-01) that flows from an unnamed pond into Mitchell Brook. Sampling was conducted with a kick net by agitating the surface of the sediments. Organisms in each sample were identified in the field to the lowest practical taxon (family or order), and relative abundance was estimated. Each sediment sample was examined to determine whether the approximate grain size and organic content were appropriate for quantitative benthic sampling and were comparable to other sampling locations.

Mitchell Brook. A sediment sample in Mitchell Brook west of Rose Hill Road and directly across from the site owner's driveway contained beetle larvae (*Coleoptera*) and mayfly larva (*Ephemeroptera*). Farther downstream in this vicinity, designated as SW/SD-13, the sediments were of fine grain size, and a high density of isopods was found. During sediment and surface water sampling in October 1991, *Dipteran* larvae, adult beetles, and a snail (*Gastropoda*, possibly *Lymnaeidae*) were identified at SW/SD-13.

Mitchell Brook north of the site owner's driveway was sampled in several places. The water in this portion of the brook was clear and the grain size was coarse. The samples taken in the portion of the brook that runs almost parallel to the site owner's driveway contained many larval fish, a juvenile fish (possibly a esocidae), many midges (*Chironomidae*), isopods (*Isopoda*), and many beetle larvae. Slightly farther upstream, near a dam, the sediments contained damselfly larva (*Odonata*), beetle larvae, blackfly larvae (*Simuliidae*), isopods, and many midges. Downstream of the dam, a quiescent pool containing fine sediment was designated as SW/SD-14. In October 1991, juvenile *Dytiscid* beetles, *Dipteran* larvae (true flies), and some isopods were identified at this location.

Approximately 150 feet south of the site owner's driveway, benthic sampling revealed a tadpole (species unidentified), beetle larvae, and a *Dipteran* larva (true fly). SW/SD-15 was sampled on the east side of the brook where the sediment is of a finer grain size. During October sampling, a *Dipteran* larva (true fly), some *Dytiscid* beetle larvae, some juvenile beetles, and several bivalves (*Sphaeridae*) were observed.

Approximately 300 feet south of a dirt road connecting the sewage sludge area to the solid waste area, another area of soft sediment was identified. Sampling in this area revealed a salamander (*Caudata*), an isopod, and a beetle larva. A few feet south, along the brook,

a caddisfly larva (*Trichoptera*) was also observed. This area was designated as SW/SD-09. During October sampling at this location, a stonefly larva (*Plecoptera*), a *Dipteran* larva (true fly), and some midges were identified. This location was selected for future quantitative sampling because of its fine grain sediment and its upstream location.

The sediment in Mitchell Brook south of the transfer station road to the intersection with the Saugatucket River was sampled at approximately 15 locations. The sediment in this portion of the brook was distinguished by a deep orange color (possibly due to the presence of iron). A flocculent orange layer covered the sediments and the rocks in the brook. A few adult *Dytiscid* beetles were found on the water surface, but no organisms were found in the sediments in any of the samples in this portion of Mitchell Brook. Most of the streambed was composed of a medium gravel with very little or no organic deposition. Two locations that had similar substrate and appeared to have the highest percent of fine material in this portion of the brook were identified for future sampling and were designated as SW/SD-07 and SW/SD-12. During sediment and surface water sampling in September and October 1991, few organisms were found at either of these two locations. A few bivalves were identified at SW/SD-07. A midge larva, tube-dwelling larva (probably a caddisfly) and an unidentified egg mass (gold, 0.5-inch diameter) were found at SW/SD-12 during October sampling.

Sediment in an unnamed brook that flows from the west of Rose Hill Road into Mitchell Brook was sampled at a point west of Rose Hill Road and south of the transfer station road. The brook, south of the transfer station road, is siltier than Mitchell Brook and has a very deep orange color and floc layer (again, possibly due to iron). Benthic reconnaissance revealed beetle larvae and amphipods (*Amphipoda*). This area was designated SW/SD-10. October sampling revealed isopods at this location. Farther downstream, this brook flows into an impounded open-water wetland area on the west side of Rose Hill Road. Sediments in this pond contained caddisfly larvae, a water bug (*Corixidae*) larva, and isopods. Sediments in this area on both sides of Rose Hill Road contained beetle larvae, but grain size was more coarse and was not consistent with other reaches of the stream. Consequently, no sampling locations were designated in this area.

A pond that forms the headwaters of an unnamed tributary to Mitchell Brook was designated as SW/SD-01. The sediment at this location was silty. In October, this tributary was dry. The sediment in the pond was sampled instead. A tadpole (species unidentified), an adult *Dytiscid* beetle, and several midge larvae were found.

Saugatucket River. Qualitative benthic sampling was conducted in the river just north of the sewage sludge area just downstream of SW/SD-02. Benthic organisms found here included damselfly larvae, many amphipods and isopods, and an unidentified egg mass (gold mass, 0.5-inch diameter). Approximately 150 feet upstream, the substrate becomes siltier. Many mayflies were seen. Upstream (300 feet from SW/SD-02), the substrate becomes sandy and the following benthic organisms were found: several mayfly larvae (*Heptageneidae* and *Bateidae*), many *Dipteran* larvae (true flies), an amphipod, and a

blackfly larva. About 100 feet downstream from SW/SD-02, the substrate is very sandy and contained caddisfly larvae, dragonfly larvae (*Odonata*), *Chironomidae,* and many *Dipteran* larvae (true flies).

A location SW/SD-02, the substrate was consistent with Mitchell Brook. During October sampling, isopods and *Dytiscid* beetle larvae were identified at this location. This location was selected for future quantitative sampling because of its relatively fine grain sediment and its upstream location.

SW/SD-03 was established in a wide section of the river near the bulky waste area. There is a leachate seep approximately 250 feet downstream of this area. SW/SD-03 is in an area primarily consisting of terrestrial detritus. A benthic sample in the silt contained a mayfly larva and a horsefly (*Tibanidae*) larva. Many stoneflies were noted between SW/SD-03 and SW/SD-04. During October sampling, many isopods, many adult beetles, and a stonefly larva were identified at SW/SD-03.

SW/SD-04 was established in the river in a pool adjacent to the bulky waste area in which the sediments contained caddisfly larvae, amphipods, and many mayfly larvae. Fish were observed jumping in this pool. A sample upstream of the pool, in a very rocky, fast-moving area, revealed a *Hydropsychidae* larva and stonefly larvae. SW/SD-04 was located approximately 40 feet downstream of SG-05 between a silty area and a sandy area. During October sampling, a beetle larva (*Hydrophilidae*), many adult beetles, a *Dipteran* larva (true fly), many isopods, and a hellgrammite larva (*Megaloptera*) were identified at this location. This location was selected for future quantitative sampling based on the substrate type and the relative health of the benthic community.

The river south of the bulky waste area contained a large amount of orange floc (possibly iron). Relatively more floc was noted here than in Mitchell Brook south of the transfer station road. Submerged rocks and logs were coated with a layer of orange-brown floc that was up to 0.5 inches thick. The substrate in the area is coarse and isopods and leeches (*Hirudinae*) were found. Reconnaissance conducted upstream to find the source of the floc revealed a 40-foot-wide leachate seep approximately 100 feet downstream of the pool at location SW/SD-04, as well as several seeps downstream of that location. SW/SD-05 was located just downstream of this 40-foot seep to determine the effect of the leachate on the river water. SW/SD-05 was located 200 feet downstream of the leachate seep where the sediment was comparable to other sampling locations and was selected for future quantitative sampling. During October sampling, adult beetles and bivalves were identified. In addition, a high density of vertical tubes was noted in the sediment close to the bank (possibly *Tubificidae*).

Isopods and beetle larvae were found in the sediments approximately 150 feet downstream of the intersection of Mitchell Brook and the Saugatucket River. This location was designated as SW/SD-06. During October sampling, limited benthos were identified at this location. Some adult beetles and a caddisfly larva were identified. This location was

selected for future quantitative sampling because of the similarity of its substrate type to the other selected stations.

A tributary seen on the USGS map was investigated as a potential benthic reconnaissance station (SW/SD-11) during the June reconnaissance; however, the tributary could not be located and no sample was collected in this area. In October, SW/SD-11 was added in the Saugatucket River, 100 feet upstream of Saugatucket Road. Benthic sampling at this location revealed adult beetles, a *Dytiscid* beetle larva, and a tadpole (species unidentified). This location was selected for future quantitative sampling based on the substrate type and downstream location. A sample in the Saugatucket River downstream of Saugatucket Road contained isopods, beetle larvae, and a midge larva; this location was designated as SW/SD-08.

Summary. There appears to be degradation of the aquatic community downstream of the disposal areas in both Mitchell Brook and the Saugatucket River. The water in Mitchell Brook, north of the site owner's driveway, is clear and rich with aquatic biota. Downstream of the disposal areas, aquatic diversity decreases (Figure 2-13). Fish, mayfly larvae, damselfly larvae, and isopods were identified in the brook upstream of the disposal areas (Table 2-6). Between the site owner's driveway and the transfer station road, tadpoles, salamanders, blackfly larvae, caddisfly larvae, and isopods were identified. Downstream of the transfer station road, however, the brook contains a large amount of orange floc, and benthic and aquatic life are absent with the exception of surface beetles and a few beetle larvae. Locations SW/SD-09, SW/SD-07, and SW/SD-12 were selected for future sampling in Mitchell Brook.

The Saugatucket River shows a similar pattern (Figure 2-14). Upstream of the disposal areas, the water was clear, and damselfly larvae, amphipods, isopods, mayfly larvae, blackfly larvae, caddisfly larvae, and dragonfly larvae were abundant (Table 2-7). Adjacent to the bulky waste area, fish, caddisfly larvae, stonefly larvae, and mayfly larvae were identified. Just 200 feet downstream of SW/SD-04, the river water becomes cloudy and orange, apparently due to a 40-foot-wide leachate seep that enters the river at this point. Downstream of the leachate seep and upstream of Saugatucket Road, the only benthos identified were beetle larvae, a leech, and isopods. Locations SW/SD-02, SW/SD-04, SW/SD-05, SW/SD-06, and SW/SD-11 were selected for future sampling.

2.2.1.6 Sampling of Environmental Media. During the site reconnaissance, environmental samples were collected during June 1991 to provide a characterization of groundwater, surface water, sediment, and leachate in the site study area (Figure 2-15). Environmental samples were collected in accordance with the *Final Field Sampling Plan* (M&E 1991b) and the (final quality assurance project plans (M&E 1991c, 1992a) and were submitted for chemical analysis. Section 2.5 provides a more detailed discussion of the field sampling procedures and the chemical analyses performed.

Groundwater was collected from eight existing monitoring wells to evaluate reported contamination and to identify wells that should be excluded or included in further sampling rounds. Groundwater was also collected from nine residential wells. The residential wells were chosen for sampling based on the criteria discussed in section 2.2.1.1. The 14 surface water and sediment locations that were sampled were selected during the ecological reconnaissance as discussed in section 2.2.1.5. A sample was not collected for SW/SD-11, since the location was dry. The six leachate locations that were sampled were selected in areas of leachate seeps including one on Mitchell Brook, and five in areas of leachate outbreaks west of the Saugatucket River.

2.2.2 Test Boring and Monitoring Well Installation

The RI field investigation included the drilling and installation of 22 overburden and 6 bedrock monitoring wells at the site study area. Monitoring wells were installed from July 21 to September 9, 1991. The wells were installed at 14 locations as shown on Figure 2-16.

2.2.2.1 Rationale for Well Locations and Construction. Monitoring wells were installed to obtain water quality data and groundwater hydraulic flow parameters for the uppermost overburden, the lowermost overburden, and the upper bedrock (near the bedrock-overburden interface). The locations, depths, and configuration of well clusters initially identified during the development of the *Final Work Plan* (M&E 1991a) and the *Final Field Sampling Plan* (M&E 1991b) for the site study area were modified following site reconnaissance activities.

Modifications were also made as a result of field observations during drilling activities. The modifications were based on the following field activities:

Site Reconnaissance Findings

- Preliminary geophysical survey results
- Groundwater analytical results
- Drill rig accessibility

Drilling Activities

- Detection of organic vapors in the headspace of soil samples collected from the test borings using a PID
- Thickness of the saturated overburden
- Differences in the geology between the shallow and deep overburden
- The connection between the overburden and the shallow fractured bedrock

Table 2-8 summarizes the rationale for each monitoring well location and subsequent modifications made during the monitoring well installations.

2.2.2.2 Test Borings. A test boring was advanced at each monitoring well location prior to installation of the monitoring wells. The test borings were used to collect stratigraphic information and to help determine the number of wells and well construction specifications required at each location. Each test boring was completed as either an overburden or bedrock monitoring well. The specifications of the test borings are summarized in Table 2-9.

The test borings were advanced through the overburden using one or more of the following techniques:

- 4 1/4-inch-inner-diameter (ID) hollow-stem auger
- 6 5/8-inch-ID hollow-stem auger

- 3-inch-ID spin casing and wash with a 2 7/8-inch-diameter tungsten-carbide or steel tricone roller bit

- 4-inch-ID spin casing and wash with a 3 5/8-inch to 3 7/8-inch tungsten-carbide or steel tricone roller bit

- Air rotary with a 8 1/2-inch tungsten-carbide pneumatic hammer and drive 6 1/4-inch-diameter temporary steel casing

Test borings were sampled continuously until refusal using a 2-inch-outer-diameter (OD) split-spoon soil sampler. The contents of the split spoon were field screened for the presence of organic vapors using a PID. Soil samples (Table 2-9) were selected to represent each strata classification and were submitted for total combustible organics (TCO) and grain size analysis to Morrison Geotechnical Laboratory. Analytical samples were not collected from test borings.

Refusal was defined as the rate of advance of less than 12 inches per 120 blows or 1 inch per 50 blows when the split-spoon samples were driven with a 140-pound hammer free falling 30 inches. A minimum of 5 feet of NX coring was completed in each boring to confirm bedrock.

The rock obtained by the coring method was classified, analyzed for rock integrity, and screened for organic vapors. The rock quality designator (RQD; Deere 1971) value was calculated for each core run. The RQD was computed by summing the lengths of all pieces of core equal to or longer than 4 inches and dividing by the percent recovery. The result was multiplied by 100 to yield the RQD in a percentage form that could be recorded to the nearest 5 percent.

$$RQD = \frac{\textit{Sum of Length} > 4 \textit{ inches}}{\textit{Total Length of Core}} \times 100$$

This value provided an estimate of the extent of natural fractures occurring in the core and provides guidance in determining the most permeable or water-bearing zones of the bedrock.

The RQD values are listed on the geologic logs, which were completed for each test boring and are provided in Appendix B.

2.2.2.3 Monitoring Well Installation Procedures. Table 2-10 summarizes the specifications of the overburden and bedrock monitoring wells installed by M&E at the site study area. Construction details for each monitoring well are provided in Appendix B.

Overburden Monitoring Wells. Twenty-two overburden monitoring wells were installed in 14 well clusters at the site study area shown on Figure 2-16. Each overburden monitoring well was constructed using a 2-inch-diameter Schedule 40 PVC riser pipe and a 10-slot (0.10-inch) well screen. A 10- to 15-foot-long well screen was positioned in the overburden based upon the depth to groundwater. If the thickness of the saturated overburden was significantly greater than 20 feet and/or the lower overburden was identified as a separate potential groundwater flow zone, a second overburden monitoring well was installed at that location.

After the borehole was advanced to the required depth, the following procedures were used for the installation of the overburden monitoring wells:

- The borehole depth was verified by measuring with a weighted tape through the auger flights or casing.
- Bentonite chips were tremied into the well to raise the bottom of the borehole to the required depth for the placement of the well screen.
- Monitoring well riser and screen consisted of new, 2-inch-diameter, flush-threaded Schedule 40 PVC pipe. Screens with 0.10-inch openings (10-slot) were installed in the monitoring wells. The screen slot size was chosen to retain at least 90 percent of the sand pack. Individual screen lengths did not exceed 15 feet.
- PVC riser pipe and screen were suspended inside the augers/casings, and well-rounded Ottawa No. 00 silica sand was tremied into the annular space as the auger flights and casings were removed. Estimates of the volume of sand needed to raise the sand pack to 2 feet above the top of the screen and frequent tape checks were made to avoid bridging and to ensure proper sand placement.

- Bentonite chips were tremied into the annular space after the sand pack had been emplaced. The bentonite seal formed a barrier to keep the bentonite/cement grout from penetrating the sand pack. The seal was manually checked with a weighted tape to ensure that a minimum of 2-feet existed. If the seal was above the water table, clean potable water was added to allow proper hydration of the bentonite grout. The seal was allowed to hydrate for at least one hour. (The bentonite/cement grout consisted of Portland Type I or II cement mixed with clean potable water and 2 to 5 percent by weight powdered bentonite. The grout mixture was tremied into the borehole and allowed to set for a minimum of 48 hours before development.)

- Wells were vented through a ¼-inch hole drilled into the PVC expansion caps.

- A locking steel protective casing was installed over the well immediately after well installation. A small hole was drilled through the steel protective casing below the level of the top of the PVC pipe. The hole was drilled to allow any accumulated water in the above annular space to drain.

- A concrete pad was constructed around each protective casing so that rain water would drain away from the well.

- Well identification was clearly engraved on the outside protective casing, and a brass metal identification tag was secured on the inside of the well casing.

- The drilling rig and associated drilling and sampling equipment were decontaminated by steam cleaning prior to beginning each test boring monitoring well.

Bedrock Monitoring Wells. Six bedrock monitoring wells were installed at the site study area. The locations of the bedrock monitoring wells are shown on Figure 2-16, and their specifications are presented in Table 2-10. Construction details for each bedrock monitoring well are provided in Appendix B.

Wells MW-01-03, MW-03-03, and MW-04-03 were constructed as 6-inch open borehole wells with depths ranging from 50 to 100 feet into the bedrock. Wells MW-07-02 and MW-11-03 were constructed using 4-inch PVC well screens and risers, due to the extremely fractured nature of the bedrock at these locations. These wells were screened in the upper 40 feet of bedrock. Well MW-08-02 was constructed with 2-inch PVC screen and riser pipe and installed using the overburden well installation procedures. The purpose for installation of this bedrock well was to allow hydraulic and water quality information to be collected close to the bedrock-overburden

interface, since it is believed that the overburden and bedrock groundwater is interconnected at this location.

The construction procedures followed for specific bedrock wells are described below:

MW-01-03, MW-03-03, and MW-04-03:

- 6 1/4-inch-ID steel casing was grouted into an approximately 8 1/2-inch-diameter, 5- to 7-foot-deep socket in the top of bedrock.
- A nominal 6-inch-diameter hole was then advanced to the desired depth in the bedrock as outlined in the *Final Work Plan* (M&E 1991a).
- The borehole depth was verified by measuring with a weighted fiberglass tape through the auger flights or casing.
- Holes bored in competent rock were left as open holes.

MW-11-03 and MW-07-02:

- Flush-threaded 4-inch-diameter Schedule 40 PVC screens and risers were installed into holes drilled in fractured rock to prevent bedrock material from caving into the hole. Ten-slot (0.10-inch openings) screens were used to retain at least 90 percent of the sand pack.

MW-08-02:

- Flush-threaded 2-inch-diameter Schedule 40 PVC screen and riser was installed into upper bedrock surface.
- PVC riser and screen were suspended inside the casing and clean, well-rounded Ottawa No. 00 silica sand was tremied into the annular space. Estimates of the volume of sand needed to raise the sand pack to 2 feet above the top of the screen were made, and measuring tape was checked frequently to avoid bridging and to ensure proper sand placement.
- Bentonite chips were tremied into the annular space after the sand pack had been emplaced. The bentonite seal formed a barrier to keep the bentonite/cement grout from penetrating the sand pack. The seal was manually checked with a weighted tape to ensure that a minimum of 2 feet existed. If the bentonite chip seal was above the

existing water table, clean potable water was added to allow proper hydration. The chip seal was allowed to hydrate for at least one hour.

- The bentonite/cement grout mixture consisted of Portland Type I or II cement mixed with clean potable water and 2 to 5 percent by weight powdered bentonite. The grout mixture was tremied into the hole and was allowed to set for a minimum of 48 hours before development to effectively seal the well.

The following construction procedures were used for bedrock wells:

- Casings were vented with an approximately 1/4-inch hole drilled in the PVC expansion caps.

- A locking steel cap was welded to the top of the permanent casing.

- In bedrock wells completed with PVC, a hole approximately 1/8 inch in diameter was drilled through the steel protective casing below the level of the top of the PVC. The hole was drilled to allow any accumulated water in the aboveground annular space to drain.

- A concrete pad was constructed around each bedrock well so that rain runoff would drain away from the well.

- Well identification was clearly engraved on the outside of the well casing.

- The drilling rig and associated drilling and sampling equipment were decontaminated by steam cleaning prior to beginning each monitoring well.

2.2.2.4 Monitoring Well Development. All of the new monitoring wells were developed following installation. The grout seals in all of the wells were allowed to set for at least 48 hours prior to development. Development procedures were as follows:

- Static water and well depth were measured, and the total well volume was calculated.

- The wells were pumped with either a BRAINARD KILMAN pump, a centrifugal pump, or a submersible pump. Submersible pumps used in the bedrock wells were regulated to a rate of approximately 0.5 gpm.

- Approximately 3 to 5 well volumes were removed from each well. The criteria used to determine the total volume of water removed consisted of:

- Three stable pH, temperature, and conductivity readings (within approximately 10 percent of each other)

- Visual clarity of the water

- Removal of at least 50 to 100 gallons of water in overburden wells

- Development was continued until the readings had stabilized and the water was clear. From 50 to 100 gallons were removed from each overburden well, even if stable readings were not obtained. The standing water level in the bedrock wells was not allowed to drop below 20 feet. In cases where the water level dropped to 20 feet of standing water, pumping was halted and the well was allowed to recharge prior to the continuation of pumping.

- All well development information was recorded on log sheets and in field notebooks.

- All development water was allowed to drain back onto the ground surface because PID readings of the water did not exceed 10 ppm.

Well development log sheets are included in Appendix B.

2.2.3 Landfill Analytical Soil Borings

Ten soil borings were originally proposed to investigate the areal and vertical extent of contamination and to characterize soil contamination in the sewage sludge area. Based on findings during site reconnaissance activities, three soil borings were eliminated and three locations were moved from the sewage sludge area.

The soil borings were drilled from August 20 to August 26, 1991. The locations of these borings are shown on Figure 2-17. Boring specifications are summarized in Table 2-9. Geologic boring logs were completed for each soil boring and are provided in Appendix B.

To characterize soil contamination, six soil borings were advanced within the upper 20 feet of the sewage sludge, bulky waste, and solid waste areas. A 20-foot background boring was also drilled. Three of the soil boring locations (BH-01, BH-03, and BH-04) were chosen to

investigate minor landfill gas levels measured in the sewage sludge area. Soil boring BH-02 was located in the sewage sludge area to provide additional information on the spatial extent of soil contamination. Soil boring BH-06 was drilled at the edge of the bulky waste disposal area to evaluate landfill gas readings in that location. A soil boring (BH-07) was located at the southern edge of the solid waste area near an area where landfill gas was detected. After soil boring BH-07 was drilled, it was completed as an overburden monitoring well, MW-14. The background soil boring, BH-05, was advanced northwest of the sewage sludge area, in an area with no known landfill activity.

The soil borings were advanced by a Mobil B-47 bombardier drilling rig to a maximum depth of 20 feet below the ground surface using 4-inch-ID hollow stem augers. Soil samples were continuously retrieved with a 3-inch-OD California-modified split-spoon sampler lined with four, 6-inch-long stainless steel tubes. Upon removal from the split-spoon sampler, the contents of the liners were screened for organic vapors using a PID and an OVA. The stainless steel liners from each spoon were then wrapped in aluminum foil and labelled. At the completion of drilling activities at each soil boring location, two samples were selected for geotechnical analysis. Samples were generally selected for further analysis based on the highest PID readings encountered during screening. Specific soil boring sampling procedures are described in section 2.5.2.

At the completion of each soil boring, the borehole was grouted to the ground surface using a bentonite/cement grout. The drilling rig and associated drilling and sampling equipment were decontaminated prior to beginning each soil boring.

2.2.4 Landfill Cover Material Thickness and Permeability Testing

Cover material from the solid waste and bulky waste areas was collected to evaluate the infiltration of runoff water through the cover materials placed on these disposal areas. Soil samples of the cover material were collected for permeability testing on August 27, 1991, from the five locations shown on Figure 2-17.

Permeability test locations were drilled to a depth of 4 feet below the ground surface with a Mobil B-47 bombardier drilling rig using a 3-inch-OD California-modified split-spoon sampler lined with four 6-inch-long stainless steel tubes. An intact section of soil recovered in the split-spoon sampler was submitted for permeability analysis to Morrison Geotechnical Laboratory. At the completion of each permeability test, the borehole was grouted to the ground surface.

2.2.5 Landfill Settlement Platform Installation

From September 3 to 5, 1991, nine settlement platforms were installed at the site study area to determine if either the solid waste or bulky waste areas are settling and to monitor the rate of settlement. Six platforms were installed in the solid waste area and three in the bulky waste area as shown on Figure 2-17. The locations of the platforms were selected to provide the best areal coverage of the elevated portions of the solid waste and bulky waste areas. The construction of the settlement platforms is shown in Figure 2-18.

Settlement platforms were installed by excavating pits to a minimum of 5 feet below the existing ground surface. The following procedure was used to install the settlement platforms:

- A 2-foot-by-2-foot wooden form was placed in the pit to set the concrete pad; concrete was then poured into the form to a thickness of at least 1 foot. The concrete was leveled to 4 feet below the ground surface and allowed to harden.

- A 1/4-inch by 24-inch-by-24-inch steel plate fitted with a 1 1/4-inch coupling was placed directly on top of the hardened concrete pad. A 5-foot length of 1 1/4-inch-diameter steel pipe (Schedule 80) was secured to the steel plate.

- A 5-foot length of 4-inch-ID PVC casting pipe and a cap were installed over each piece of standup pipe to approximately 1 foot above grade. Space between the casing and the riser was not filled.

- Each pit was then backfilled with 6 to 12 inches of fill and topped off with excavated material.

The platforms were initially surveyed on September 9, 1991, after installation in September 1991 and were surveyed again on April 15, and November 9, 1992.

2.3 HYDROGEOLOGIC FIELD ASSESSMENT

The hydrogeologic field investigation included groundwater and surface water elevation measurements, streambed hydraulic conductivity measurements, and well slug testing. These field activities are discussed in the following sections. All monitoring wells and surface water monitoring stations used during the hydrogeologic field investigation are shown in Figure 2-19.

2.3.1 Surface Water Elevations

Twelve surface water monitoring (staff gauge) stations were established in June 1991 in the site study area as shown on Figure 2-19. These stations were installed to monitor seasonal changes in surface water elevations along the Saugatucket River, Mitchell Brook, and the unnamed brook. Elevation measurements were collected during late spring (June 18, 1991) and early fall (September 30, 1991), winter (January 27, 1992), and spring (April 6, 1992).

2.3.2 Stream Velocity Measurements

Stream-flow velocity measurements were made at or near each staff gauge using either a Pygmy or a MARSH-MCBIRNEY current meter. Drogue measurements were made if either the velocity or the depth of the water was not sufficient to measure with the current meters. Buoyant materials were used to conduct drogue velocity measurements. Velocity measurements coincided with surface water elevation measurements made on June 18 and September 30, 1991, and January 27 and April 6, 1992.

At each surface water monitoring station, velocities were measured at several points across the stream to calculate the average velocity for the stream at that station. The number of points used was determined by dividing the stream at each station into vertical sections such that each

section contained less than approximately 10 percent of the total cross-sectional flow. Due to field limitations and small cross-sectional distances, the vertical sections sometimes represented greater than 10 percent of the cross-sectional flow. Velocity measurements were made at each vertical section at two-tenths of the stream depth and eight-tenths of the stream depth below the water surface (Chow 1959) to obtain the mean velocity in each vertical section.

Cross-sectional velocities at a given station were determined from the average of vertical section mean velocities. Stream-flow volumetric rates were calculated by multiplying cross-sectional velocities by cross-sectional areas. Volumetric flow rates from the 12 stations were compared and a surface water budget analysis was developed for the site study area. Velocity calculations and the surface water budget analysis are included in Appendix B. The results of the surface water budget analysis are discussed in sections 3.3.2 and 3.3.5.

2.3.3 Streambed Leakage and Hydraulic Conductivity Measurements

Eight mini-piezometers and three seepage meters were installed at selected surface water monitoring stations, as shown on Figure 2-19, to provide estimates of the hydraulic conductivity and volumetric seepage rates through the streambed sediments. Mini-piezometers and seepage meters were installed between June 5 and 18, 1991. The hydraulic conductivity and seepage rate data were used to evaluate any interaction between groundwater and surface water and to determine where groundwater was discharged to surface water or where surface water was discharged to groundwater. The construction of the mini-piezometers and seepage meters is illustrated in Figure 2-20.

2.3.3.1 Mini-Piezometers. Mini-piezometers were installed at SG-03, SG-08, SG-09, SG-10, SG-11, and SG-12. Mini-piezometers were also installed at SG-01 and SG-07 for comparison with seepage meter results. The mini-piezometers were constructed of PARFLEX tubing (1/8-inch ID, 3/16-inch OD) attached to an aluminum-slotted-screen well point, as shown on Figure 2-20. The mini-piezometers were installed by threading the PARFLEX tubing up through a hollow steel drive pipe until the mini-piezometer basal drive point was flush with the bottom

of the steel drive pipe. The mini-piezometers were then driven down 1 to 2 feet into the streambed. After reaching the desired depth, the steel drive pipe was carefully withdrawn, leaving the mini-piezometer permanently installed in the streambed.

During each sampling round, plastic sampling bags with valves were filled with a 60-mL syringe with varying volumes of water: 600, 1,000, or 1,500 mLs. The sampling bags used for the mini-piezometers had a 1-foot-long piece of Tygon tubing attached to the bag valve. After the last injection of water, the tube was clamped to prevent the passage of air into the system. Next, the mini-piezometer was purged underwater using a syringe so that, again, no air would be in the piezometer. Approximately 20 to 60 mLs of water were removed. The bag was attached by its tubing to the mini-piezometer and the clamp was removed. The bags were left to fill or empty for varying times: 10 minutes, a few hours, or overnight. The initial bag volumes used and sampling time period were determined based on previous results of the rate at which groundwater discharged water to or received water from the stream in June 1991.

2.3.3.2 Seepage Meters. Seepage meters were installed at SG-01, SG-05, and SG-07, where water depths were sufficient to submerge the seepage meter below the water surface. The seepage meters were constructed with end sections from a 55-gallon metal drum as shown in Figure 2-20. The drums were placed approximately 6 inches into the streambed.

A similar measurement procedure was used for the seepage meters. A plastic sampling bag was directly attached to a seepage meter by a valve located on the bag. The valve was closed during the underwater attachment process to prevent stream water from entering the bag. Upon secure attachment to the seepage meter, the bag was opened.

When the sampling bags were collected, the water volumes inside the bag were measured by pouring the contents into a 250-mL graduated cylinder. As the volume of water decreased, smaller cylinders of 100, 50, and 10 mLs were used to measure the volume of water. After measuring the bag volume, depth to surface water and depth to water inside the piezometers and seepage meters were measured again.

2.3.3.3 Calculations. The distribution of surface water velocities across the site study area as well as streambed leakage values and groundwater/surface water gradients were used to classify surface water areas as potential groundwater recharge, potential groundwater discharge, or low-gradient (stagnation) points. This information is discussed in section 3.3.4.

Streambed leakage volumes and groundwater/surface water gradients were used to estimate streambed hydraulic conductivities. Streambed hydraulic conductivity for mini-piezometers was calculated by applying Hvorslev's equation (Hvorslev 1951):

$$K = Q \ln (L/D + [1 + (L/D)^2]^{1/2}) \, [2\pi \, L \, h]^{-1}$$

where: K = Hydraulic conductivity (cm/sec)

Q = Discharge from the piezometer (cm^3/sec)

L = Length of the screened interval (cm)

D = Diameter of the screen (cm)

h = The change in head between the piezometer water level and the surface water (cm)

Streambed hydraulic conductivity for seepage meters was calculated from Darcy's Law:

$$K = \frac{Q}{iA}$$

where: Q = Discharge from seepage meter (cm^3/sec)

i = Hydraulic gradient = $\frac{\nabla H \text{ (depth of seepage meter below streambed)}}{\text{6 inches}}$

A = Open area of seepage meter

∇H = Surface water level - groundwater level

Streambed hydraulic conductivity calculations are included in Appendix B. The results are discussed in section 3.3.3.

2.3.4 Groundwater Elevation Measurements

Static water levels were measured in the newly installed monitoring wells and selected existing and residential wells. Static water levels, the measurement of surface water elevations and velocities, and seepage meter and mini-piezometer readings were collected simultaneously and preceded sampling activities for September/October 1991. Additional measurements were collected during January/February 1992 and April 1992. The static water levels were used to calculate groundwater elevations and gradients. Groundwater occurrence and movement based on these measurements are discussed in section 3.3.4.

2.3.5 Hydraulic Testing of Geologic Strata

In October/November 1991, slug testing of the 28 shallow overburden, deep overburden, and bedrock monitoring wells installed by M&E was performed to evaluate the hydraulic conductivities of saturated soils and bedrock. Slug testing was performed using the following procedures:

- The static water level was measured.
- A data logger and 10-psi downhole pressure transducer were set up at each well after the static water level was measured.
- A solid slug of known volume was introduced into each well. The slugs were made of PVC. A 3-foot-by-1-1/4-inch slug was used in the overburden wells and a 3-foot-by-3-inch slug was used in the bedrock wells. The data logger was then programmed, and the transducer was positioned at the appropriate depth in each well. The data logger was activated with the introduction of the slug, and the falling water levels were measured until the static water level was reestablished.
- After the static water level was attained, the data logger was reprogrammed and reactivated with the removal of the slug to measure rising water levels.

- The rising water test was continued until the static water level was attained.
- Slug tests for rising and falling water level were duplicated in several wells for quality control.

The data were downloaded and then plotted as semi-logarithmic curves and analyzed using either the Bouwer and Rice (1976 and 1989) method; the Cooper et al. (1967) and Papadopalos et al. (1973) method; or the Hvorslev (1951) method. The results of the in situ tests were analyzed using the Bouwer and Rice (1976 and 1989) method. This method uses a straight line fit of early linear data, graphed as log-drawdown versus linear time. The slug test data of the six bedrock wells were also analyzed using the Cooper et al. (1967) method to obtain transmissivity values for the bedrock. Slug test plots and calculations are included in Appendix B. The results are discussed in section 3.3.3.

2.3.6 Long-Term Monitoring

A groundwater and surface water long-term monitoring program was performed at the site study area. The purpose of the program was to study the effects of rainfall on surface water and deep, shallow, and bedrock wells and to evaluate, on a seasonal basis, the relationship between groundwater and surface water.

The water levels at the following groundwater monitoring wells and surface water points were monitored for six months:

Monitoring Point	Relative Depth of Surface Water Body
MW-12-01	Shallow Overburden Well
MW-02-02	Deep Overburden Well
MW-08-02	Shallow Bedrock Well
MW-03-03	Deep Bedrock Well
SG-03	Mitchell Brook
SG-05	Saugatucket River

On November 21 and 22, 1991, In-Situ and Thor data logging systems were set up at the selected groundwater monitoring wells and surface water monitoring stations. In-Situ 10-psi transducers were installed in the wells and connected to data loggers. At the surface water locations, Thor 10-psi transducers were installed in slotted PVC pipes that were partially driven into the streambed sediments and connected to data loggers. The In-Situ data loggers were programmed to collect water levels every hour on the hour in each of the monitoring wells. The Thor data loggers were programmed to collect surface water levels every 15 minutes. All of the data loggers were programmed to start data collection at the same time. To decrease the risk of vandalism, the exposed portions of cables outside of the wells and surface water points were buried beneath several inches of soil, and the data loggers were hidden underground in locked drums.

Water level data were collected continuously at the programmed interval times until May 14, 1992. To minimize the loss of data due to potential vandalism and battery power depletion, the In-Situ and Thor data loggers were downloaded in the field using a portable Compaq personal computer on the following dates: December 17, 1991, January 29, 1992, March 16 and 17, 1992, April 16, 1992, and May 14, 1992 (the In-Situ data loggers were downloaded at the M&E office in Wakefield, Massachusetts).

Some data collected at MW-02-02, MW-12-01, and SG-03 were lost despite the precautions taken to prevent this from occurring. The data recorded at MW-02-02 between 09:00 hours on January 29, 1992, and 08:00 hours on March 16, 1992, was lost because of a faulty downloading cable, necessary for the downloading of data to the portable Compaq personal computer. The faulty cable prevented the neutralization of static electrical charges that had built up in the In-Situ loggers between downloading dates. The static electric charge encased the data stored in the data logger, when attempts were made to download the data to the portable Compaq personal computer.

The In-Situ system established in well MW-12-01 was vandalized in February 1992. The cable leading to the transducer in the well was ripped out of the well and in the process severed from

the transducer some time between 16:00 and 17:00 hours on February 3, 1992. As a result, data collected from MW-12-01 between February 3, 1992 and April 6, 1992 were considered unreliable and therefore unusable. Also, the data collected by the Thor data logger at SG-03 between 14:15 hours on January 29, 1992, and March 17, 1992, was lost because of a loss of battery power.

2.4 LANDFILL GAS INVESTIGATION

Landfill gas samples were collected from each of the three disposal areas and from off-site permanent monitoring points. Sampling from the landfill areas and the initial installation of permanent monitoring points occurred during the site reconnaissance in June and July 1991 and is described in section 2.2.1.4.

Further off-site work to delineate the extent of landfill gas migration and the proximity of landfill gas to near-by houses is discussed in section 2.4.1. Additional on-site landfill gas sampling was conducted in May 1992 to collect samples for laboratory analysis. This sampling is described in section 2.5.8.

2.4.1 Additional Installation and Monitoring of Permanent Points

The permanent sampling points installed in June and July 1991 were described in section 2.2.1.4. The permanent points were monitored in July and September of 1991. One of the points, LFGF-06, was no longer present when M&E returned to sample in September. Two other points, LFGR-12 and LFGT-04, were not sampled in September because water was drawn into the sampling apparatus during purging.

In December 1991, 16 additional permanent points were installed in response to the migration of landfill gas near several residences. Eight points were installed adjacent to houses along Rose Hill Road in proximity to the solid waste area. Eight locations were installed at points determined during the delineation of the off-site landfill gas plume (described in section 2.4.2).

These points were placed at the leading edge of the contaminant plume so that expansion of the plume area could be easily monitored, as is discussed further in section 2.4.2. All of the permanent sampling points are shown on Figure 2-8.

Monthly sampling of the permanent sampling points was conducted in December 1991 and January, February, March, and April of 1992. For the first three months, the 16 points installed in December as well as eight of the permanent points installed in June and July 1991 were sampled each month. The eight older points selected for sampling were chosen based on the previous history of contamination, field conditions, and the proximity to residential buildings. A different set of eight points was selected for each of the monthly monitoring rounds. The field GC was used on only 25 to 33% of the monthly monitoring samples.

During the April 1991 monitoring, an attempt was made to sample the 48 permanent sampling points. Several of these were not sampled because water was drawn into the sampling system. The field GC was used to analyze all of the points sampled in April 1992.

2.4.2 Delineation of Off-Site Landfill Gas Plume

In December of 1991, M&E conducted additional off-site landfill gas monitoring to further delineate the migration of landfill gas from the site study area. Twenty-six temporary points were analyzed at various depths. Hand-held instruments, including an OVA, PID, carbon dioxide and methane meter, and CGI were used at these points. The field GC was used to analyze approximately 25 to 33% of the samples.

Based on the June/July and September sampling, four areas of concern were defined prior to the December 1991 landfill gas sampling. These included areas:

- North of the solid waste area near LFGF-03
- Northeast of the solid waste area near LFGF-08
- West of Rose Hill Road, between LFGR-07 and LFGR-14

- South of the solid waste area and the Transfer Station Road

Each of these areas of concern and the points sampled to delineate the off-site plume are indicated on Figure 2-21.

The locations of sampling points were chosen in the field to provide the following information:

- The furthest extent of the landfill gas plume in each of the areas of concern
- The width of the contamination plume
- The proximity of the plume to residences near the solid waste area

Many of the points sampled were sampled at more than one depth to determine if the landfill gas may be migrating preferentially at deeper depths. Table 2-11 shows the sampling depths of each of the off-site points.

2.4.2.1 Modifications to Field GC Methodology. Photoionization detectors employ ultraviolet light to operate on the principle of ionization or electrical charge impartation on the compound being detected. Once the compound is ionized, it changes the electrical conductivity between two very sensitive electrodes within the detector. These electrodes send this signal to the plotter which produces a chromatographic peak that is proportional in area or height to the concentration of the compound detected. The "strength" or ability of a PID lamp to ionize individual compounds can be determined from the energy rating of the lamp given in electron volts (eV). The photoionization lamp is able to ionize or detect all compounds with ionization potentials below the lamp rating and even some compounds with ionization potentials just above the rated value of the lamp. Modifications to the field GC methodology were made in February 1992 to include the use of a 102-eV-PID lamp. Due to the deterioration of the 11.7-eV lamp that was in use, a 10.2-eV lamp was used to confirm the results from the 11.7-eV lamp. Another modification made in April 1992 included the addition of vinyl chloride to the field GC target compound list. Vinyl chloride became a concern when early eluting compounds

were detected with the 10.2-eV lamp. The approximate quantitation limit for vinyl chloride was 40 mg/m^3.

The 10.2-eV lamp is unable to detect the four saturated compounds (methylene chloride, 1,1-DCA, chloroform, and 1,1,1-TCA) because their ionization potentials are 11.0-eV and above. Although the 11.7-eV lamp is able to detect the four saturated compounds, it is less durable than the 10.2-eV lamp and exhibited considerable loss of sensitivity over time. The 10.2-eV lamp was used in April 1992, because it is much more sensitive than the 11.7-eV lamp to vinyl chloride. This is important since the detection of vinyl chloride is of particular concern near residential homes.

2.5 ENVIRONMENTAL SAMPLING

Environmental samples were collected from the site study area from June 1991 to September 1993. During this study period, the following media were investigated:

- Groundwater:

  Residential wells
  Overburden monitoring wells
  Bedrock monitoring wells

- Surface and Subsurface Soils:

  Soil borings
  Surface soils

- Surface water
- Sediments
- Leachate
- Landfill gas emissions

A detailed description of field sampling procedures and activities and laboratory analyses, methods, and protocols are provided, respectively, in the *Final Field Sampling Plan* (M&E 1991b) and the final quality assurance project plans (M&E 1991c, 1992a).

The results of the landfill gas sampling activities, conducted as part of the RI in the spring of 1991, were reported to the EPA RPM for an initial evaluation. The information prompted the EPA RPM to obtain assistance from the EPA Emergency Planning and Response Branch (EPRB) concerning the potential for lateral migration of landfill gases in proximity to and into residential structures. From November 1991 through March 1992, under the direction of EPRB, the Roy F. Weston Technical Assistance Team (TAT), conducted monthly monitoring of twelve residential basements using a flame ionization detector and a combustible gas indicator/oxygen meter. From July 1992 through May 1993, EPRB and TAT conducted bi-weekly monitoring visits and also monitored permanent soil gas wells installed by M&E.

Based on the ongoing monitoring results, EPRB initiated a removal action, on October 9, 1992, in response to the threat of exposures posed by migrating landfill gas. This response conducted by EPRB, allows for short-term actions which are independent of, but are consistent with and parallel the RI/FS process. The response included the involvement from the town of South Kingstown in vacating and razing one structure, and providing continuing monitoring of two other residential dwellings. EPRB contracted M&E in the January of 1993 to prepare a report to evaluate three landfill gas migration barrier systems under a removal action conducted at the site (M&E 1993a). The results of this evaluation will be incorporated into the Feasibility Study. Additionally, in late winter and spring, air sampling was conducted in two phases by EPRB. Phase I occurred in February and March 1993 and consisted primarily of indoor air sampling. Phase II was conducted in May 1993 and consisted primarily of outdoor air sampling. The Phase II sampling was conducted under the direction of EPA Environmental Response Team (ERT). The results of these studies will be considered in the evaluation of remedial alternatives.

Detailed information regarding EPRB, ERT, and Weston (TAT) field sampling procedures and activities, field and laboratory analyses, and methods and protocols have not been included in the RI report. These independent studies are on file with EPA. However, results of the air sampling conducted by EPRB have been incorporated into the human health risk assessment (section 6). In addition, documents generated by EPRB, ERT, or Weston pertaining to the removal action and landfill gas and air sampling are listed in section 9. The majority of the supporting documents, reports, and correspondence associated with the removal response are a matter of public record and can be viewed, by appointment at the EPA offices in Lexington or Boston, Massachusetts.

2.5.1 Chemical Analysis

Environmental samples collected by M&E during the RI field investigation were submitted to laboratories for analysis under the USEPA Contract Laboratory Program (CLP). In addition, soil boring and sediment samples were submitted to a subcontracted laboratory, Morrison Geotechnical Laboratory, for geotechnical analysis. Laboratory analyses performed through the CLP system consisted of both routine analytical services (RAS) and special analytical services (SAS). The RAS analyses included:

- Target Compound List (TCL) volatile organics
- TCL semivolatile organics
- TCL pesticides/PCBs
- TAL metals (total and dissolved)
- TAL cyanide

The SAS analyses included:

- Volatile organics (Method 524.2)
- Biochemical oxygen demand (BOD)
- Sulfide
- Total organic carbon (TOC)
- Water-soluble organics (WSO)
- Ammonia
- TO14 - Volatile organic analysis of landfill gas using SUMMA canister sampling

Analyses performed by Morrison Geotechnical Laboratory consisted of:

- Grain size
- Permeability
- Atterberg limits
- Total combustible organics (TCOs)

The analyses performed using the CLP are further described in the final quality assurance project plans (M&E 1991c, 1992a). A list of sample quantities and analyses conducted during the RI field investigation is presented in Tables 2-12 to 2-17.

Groundwater samples from residential wells were analyzed for volatile organics using USEPA drinking water Method 524.2 to obtain lower detection limits. Groundwater and surface water samples were analyzed for water-soluble organics because *N,N*-dimethylformamide (*N,N*-DMF) is suspected to have been landfilled within the disposal area. Since this compound and other water-soluble organics are more soluble than most volatiles, a SAS method was developed to account for this factor. TO-14 analysis of landfill gas SUMMA canister samples was performed to: provide positive identification of volatile organic compounds detected during the field GC analysis of landfill gas samples and; provide better sample quantitations that could be used

during the risk assessment. Other SAS analyses (BOD, TOC, sulfide, and ammonia) are typical water quality characteristics.

2.5.2 Soil Sampling and Analysis

Soil samples were collected from landfill analytical soil borings, permeability test borings, and surface soils during the RI field investigation. Landfill analytical soil borings and permeability test borings were conducted between August 20 and August 27, 1991. Landfill analytical soil borings were advanced to a maximum depth of 20 feet below the ground surface and were submitted for chemical and geotechnical analysis to characterize soil contamination. Permeability test borings were advanced to a depth of 4 feet and submitted for geotechnical analysis to evaluate the infiltration of runoff water through the cover materials placed on the disposal areas. Surface soils were collected in September/October 1991 and April 1992.

2.5.2.1 Landfill Analytical Soil Borings. Six soil borings were advanced in the sewage sludge, bulky waste, and solid waste areas to characterize soil contamination in August 1991. A 20-foot background boring was also drilled. The locations of these borings are shown on Figure 2-22. Section 2.2.3 describes the rationale for selection of the boring locations and the drilling methods used. Specifications for the soil borings are shown in Table 2-9.

Soil borings were advanced to a maximum depth of 20 feet below the ground surface. During drilling activities, soil samples were continuously retrieved with a 2-foot-by-3-inch-OD California-modified split-spoon sampler lined with four 6-inch-long stainless steel tubes. Upon removal from the split-spoon sampler, the contents of the liners were screened for organic vapors using a PID and an OVA. The contents were also visually inspected for staining and other apparent signs of contamination.

Immediately after the contents of the split spoon were screened for presence of organic vapors, a single 6-inch stainless steel liner was selected for potential laboratory volatile organic analysis. In an effort to minimize potential volatilization during storage, this liner was immediately

covered on both ends with 4-inch Teflon tape and plastic end caps secured with rubber bands, labeled, and placed on ice. Generally, the liner from the 12- to 18-inch interval in the split-spoon liner was selected for potential volatile organic analysis. A small aliquot of soil was then taken from the two split-spoon liners adjacent to the liner removed for potential volatile organic analysis. This aliquot was placed into a glass jar, labeled with the appropriate depth interval, covered with aluminum foil, and capped with a lid. The remaining stainless steel liners from each split spoon were wrapped together in aluminum foil and labeled.

Upon completion of the borehole, two samples were selected for further chemical analysis. The samples were selected by screening each jar of soil that was set aside earlier for organic vapors by shaking the jar vigorously and screening with the PID. If organic vapors were not detected on the PID, the soil was screened using an OVA. Sample screening allowed the field team to be selective in deciding which samples would be sent for analysis. The samples were generally selected based on the highest PID readings detected during screening. If no instrument readings were detected, odor, visual appearance, and professional judgement were used in sample selection.

At the completion of drilling activities at each soil boring location, two sample depth intervals were selected for submission to CLP laboratories for chemical analysis and to Morrison Geotechnical Laboratory for geotechnical analysis. The remaining split-spoon liners from the depths selected for analysis were homogenized using a stainless steel bowl and trowel. The homogenized soil was then transferred to the appropriate sample containers. In instances where soil volume was low, more than one split-spoon interval was composited together. Specific soil boring sampling procedures are provided in the *Final Field Sampling Plan* (M&E 1991b).

The two samples selected from each soil boring were submitted for the analysis of volatile organics, semivolatile organics, and pesticides/PCBs; metals and cyanide; total combustible organics; permeability; and grain-size distribution. Samples submitted for analysis are presented in Table 2-18. The results of the soil boring sampling are discussed in section 4.2.3.

2.5.2.2 Permeability Test Borings. Cover material from the solid waste and bulky waste areas was collected to evaluate the infiltration of runoff water through the cover materials placed on these disposal areas. Five soil samples of the cover material were collected for permeability testing on August 27, 1991 (Figure 2-22). Permeability test locations were drilled to a depth of 4 feet below the ground surface using a 2-foot-by-3-inch-OD California-modified split-spoon sampler lined with four 6-inch-long stainless steel tubes. An intact section of soil recovered in one of the stainless steel liners was submitted for permeability analysis to the Morrison Geotechnical Laboratory for each permeability test boring location. At the completion of each permeability test boring, the borehole was grouted to the ground surface. The results of the soil permeability testing are included in section 3.3.3.

2.5.2.3 Surface Soils. A total of 24 surface soil locations were sampled during the RI field investigation. Surface soils were collected from September/October 1991 and April 1992. Thirteen surface soil samples were collected in September/October 1991. Eleven additional surface soil samples were collected in April 1992. Surface soil locations are shown on Figure 2-23. Surface soil samples collected are listed in Table 2-19. The rationale for selection of the sampling locations is presented in Table 2-20. Samples collected during September/October 1991 were taken from depths of 0 to 6 inches, as outlined in the *Final Field Sampling Plan* (M&E 1991b). April 1992 samples were collected from depths of 0 to 12 inches, at USEPA's request.

Surface soil samples were collected using a stainless steel hand auger. Immediately upon removing the auger, the extracted soil and the hole were screened for organic vapors using a PID.

Prior to collecting the sample for volatile organic analysis, disturbance of the soil was minimized by immediately sampling soil from the first auger of 0 to 6 inches. Soil was taken from the bottom portion of the auger and immediately transferred to sample containers.

After the volatile organic containers were filled, the remaining soil was transferred to a stainless steel bowl. To obtain sufficient sample volume, the auger was advanced, if necessary, additional times within a 2-foot area of the original auger location until sufficient soil volume was acquired. The soil was homogenized in the bowl using a hand trowel and then transferred to the appropriate sample containers. Specific surface soil sampling procedures are provided in the *Final Field Sampling Plan* (M&E 1991b).

Samples were submitted for the analysis of volatile organics, semivolatile organics, pesticides/PCBs, metals, and cyanide. In addition, samples collected in September/October 1991 were submitted for analysis of total combustible organics (Table 2-13). The results of the surface soil sampling are discussed in section 4.2.2.

2.5.3 Groundwater Sampling and Analysis

Groundwater samples were collected from on-site monitoring wells screened in either overburden or bedrock and from residential wells within the site study area. Groundwater sampling for on-site monitoring wells occurred during four sampling rounds: June 1991, September/October 1991, January/February 1992, and April 1992. Selected residential wells were sampled during June 1991, September/October 1991, January/February 1992, and September 1993. Figure 2-24 shows all of the wells sampled during the RI field investigation.

2.5.3.1 Residential Wells. The properties from which residential groundwater samples were collected are listed in Table 2-21 and are shown in Figure 2-24. M&E sampled nine residential wells during June and September/October 1991. During the January/February 1992 sampling, only two residential wells were selected for sampling based on analytical results from the June and September/October 1991 sampling events. In addition, a third residential well, residential well #10, was sampled during January 1992 for the first time. In September 1993, seven wells were sampled to verify the presence of antimony, and trace amounts of water-soluble organics, and volatile organics detected in residential wells during previous rounds. Based on groundwater flow patterns an eleventh well, residential well #11, was selected for sampling. The sampling

and analysis procedures and protocols were in accordance with the *Addendum to the Sampling and Analysis Plan for RI/FS* (M&E 1993b). The wells sampled during September 1993 included those currently in use for drinking water purposes (residential wells #5, #6, #7, #8, #9, #10 and #11). By September 1993, residential well #1 was no longer in use and therefore was not sampled.

Purging and sampling techniques varied for residential wells because of different well types and limited access. Table 2-22 summarizes purging and sampling techniques used for each well. With the exception of residential well #3, all residential wells were purged at a rate of approximately 3 gpm for approximately 15 minutes. Prior to sample collection during June 1991, wells purged in this manner were being used for drinking water purposes at the time of sampling. Because residential well #3 was not being used by the residents, three well volumes were purged using a BRAINARD KILMAN pump prior to sampling. The sample was collected using a Teflon bailer. For residents using filtration systems, water samples during September 1993 were collected after filtration. During the September 1993 sampling round, all samples were collected from spigots.

After the June 1991 sampling round, residential well #2 was no longer used by the residents. Therefore, it was necessary to pump three well volumes from both residential wells #2 and #3 during September/October 1991. The BRAINARD KILMAN pump was used to purge the wells prior to sampling. Samples were collected using a Teflon bailer.

Conductivity, temperature, and pH were measured during purging of each of the wells and again upon completion of sample collection. The final measurements are presented along with the analytical results in Appendix D.

During sample collection, containers for volatile organic analysis were filled first. Each container was preserved and checked for the presence of air bubbles. The remaining sample containers were then filled and preserved accordingly. Groundwater samples to be tested for dissolved metals were field filtered through a 0.45-micron filter prior to filling the sample

container. Specific groundwater sampling procedures are provided in the *Final Field Sampling Plan* (M&E 1991b).

Groundwater samples from residential wells were submitted for analysis of volatile organics (Method 524.2), semivolatile organics, pesticides/PCBs, total and dissolved metals, cyanide, total organic carbon, and BOD (Table 2-14). Samples were also submitted for analysis of sulfides in June 1991, September/October 1991, and January/February 1992; water-soluble organics in September/October 1991; and January/February 1992. In September 1993, all samples were submitted for total and dissolved antimony and metals and selected samples were submitted for volatile organics (Method 524.2), semivolatile organics, water-soluble organics, cyanide, and pesticides/PCBS.

2.5.3.2 Monitoring Wells. The 28 newly installed monitoring wells and the 8 existing monitoring wells were sampled during the study period. Groundwater samples were collected from monitoring wells during June 1991, September/October 1991, January 1991, and April 1992. Monitoring well sampling locations and sample collection dates are shown in Figure 2-25 and are listed in Table 2-23.

Because of differences in each well (i.e., well diameter, well depths, depth to water), purging and sampling techniques varied. Table 2-24 lists the purging and sampling techniques used at each monitoring well. Equipment used to purge wells included Teflon bailers, a Wattera pump, a submersible pump, and the BRAINARD KILMAN pump. Each well was purged for a minimum of three well volumes prior to sample collection. Conductivity, temperature, and pH were measured after each well volume was removed, to ensure that well conditions had stabilized, and again after sampling was completed. The final measurements along with the analytical results are presented in Appendix D.

During sample collection, containers for volatile organic analysis were filled first using a Teflon bailer to retrieve sample aliquots from each well. Each container for volatile organic analysis was preserved and checked for air bubbles. The remaining sample containers were then filled

and preserved accordingly. With the exception of monitoring wells with diameters of 1 1/2 inches, Teflon bailers were used to collect samples for the remaining sample containers. Wells with 1 1/2-inch diameters were sampled with the Wattera pump. Groundwater samples to be tested for dissolved metals were field filtered through a 0.45-micron filter prior to filling the container. Specific groundwater sampling procedures are provided in the *Final Field Sampling Plan* (M&E 1991b).

All groundwater samples collected were submitted for the analysis of volatile organics, semivolatile organics, pesticides/PCBs, total and dissolved metals and cyanide, BOD, and total organic carbon. Groundwater samples collected during September/October 1991 and January/February 1992 were also submitted for analysis of water-soluble organics and sulfides, while samples collected in April 1992 were also submitted for analysis of water-soluble organics and ammonia (Table 2-14).

2.5.4 Leachate Sampling and Analysis

M&E sampled leachate seepage at the site study area during June 1991 and April 1992. The six leachate locations sampled are shown in Figure 2-26 and are listed in Table 2-25. The rationale used to select the sampling locations was discussed in section 2.2.1. Each of the six leachate locations was sampled during June 1991. In addition, three samples were collected from LE-05 during April 1992 to supplement ecological toxicity tests, as discussed in section 2.5.7, being conducted at the same time.

Different sampling methods were used to collect leachate during June 1991 and April 1992. If flow was sufficient in June 1991, leachate samples were collected directly from water seeping from the ground. In most cases it was necessary to dig a shallow hole, allow the hole to fill with leachate, and then immerse the sample containers into the leachate. During sample collection, containers used for volatile organic analysis were filled first to reduce the loss of volatiles because of disturbance. Each volatile container was preserved and checked for the presence of air bubbles. The remaining sample containers were then filled and preserved

accordingly. Leachate samples to be tested for dissolved metals were field filtered through a 0.45-micron filter prior to filling the sample container. Conductivity, pH, and temperature were recorded at each leachate location prior to sample collection. Specific leachate sampling procedures are provided in the *Final Field Sampling Plan* (M&E 1991b).

In April 1992, 10 gallons of leachate were collected from LE-05 on three consecutive days. The collection method consisted of immersing a sample container directly into the flowing leachate outbreak and compositing the volume retrieved into a decontaminated cooler. Prior to this, the containers used for volatile organic analysis were filled directly from the leachate outbreak, to minimize the loss of volatiles. The composited sample that remained was poured into two decontaminated 2.5-gallon polyethylene carboys. The sample in the carboys was used to perform toxicity tests as described in section 2.5.7.

All leachate samples collected were submitted for the analysis of volatile organics, semivolatile organics, pesticides/PCBs, total and dissolved metals, cyanide, BOD, and total organic carbon. Samples collected in April 1992 were also submitted for analysis of water-soluble organics and ammonia (Table 2-15).

2.5.5 Surface Water Sampling and Analysis

Eighteen locations were chosen for surface water sampling during the RI field investigation as shown in Figure 2-27. Locations for surface water sampling were chosen in the field during the ecological investigation. The rationale for the selection of locations for SW-01 through SW-15 was discussed in section 2.2.1. The selection rationale for SW-16, SW-17, and SW-18 is provided in section 2.5.7. Nine surface water sampling points are located in the Saugatucket River, seven in Mitchell Brook, one in the unnamed brook, and one in the unnamed tributary to Mitchell Brook. Surface water samples were collected in June 1991, September/October 1991, January/February 1992, April 1992, and May 1992 at selected locations (Table 2-26).

The surface water samples were collected by immersing a sample container in the standing water and allowing it to fill. Containers used for volatile organic analysis were filled first to reduce loss of volatiles caused by disturbance of the standing water. Each container was preserved and checked for air bubbles. The remaining containers were then filled and preservative was added accordingly. Surface water samples to be tested for dissolved metals were field filtered through a 0.45-micron filter and preserved prior to filling the sampling container. Specific sampling procedures are provided in the *Final Field Sampling Plan* (M&E 1991b).

All surface water samples were submitted for the analysis of volatile organics, semivolatile organics, pesticides/PCBs, total and dissolved metals, cyanide, BOD, and total organic carbon. In addition, samples were submitted for the analysis of sulfides in June 1991, September/October 1991, and January/February 1992; water-soluble organics in September/October 1991, January/February 1992, and April 1992; and ammonia in May 1992 (Table 2-16).

2.5.6 Sediment Sampling and Analysis

Sediment samples were collected at the same locations as surface water samples, as shown in Figure 2-27. Sediment and surface water sample collection coincided during June 1991, September/October 1991, and May 1992 (Table 2-27). Sediments were not sampled in January/February or April 1992.

Two different sampling methods were used to retrieve sediments. A hand auger was used to collect sediment samples during June 1991 and September/October 1991. The auger was advanced to a depth of approximately 6 inches below the top of the bottom sediment. Upon removal, sediment was transferred from the auger into a bowl. Because sediments collected in May 1992 were used to evaluate quantitative benthic data, the sediment sampling technique for this round deviated from that used previously. The petite ponar dredge was originally intended to be used, although the coarse substrate prevented the petite ponar from fully closing, causing the sediment to be lost or disturbed. A small scoop or shovel was used as an alternate collection method. This technique was much more effective in terms of volume retrieved.

For both techniques, as much water as possible was decanted from the sediment. Disturbance of the sediment prior to collection of samples for volatile organic analysis was minimized. Containers used for volatile organic analysis were filled first. The remaining contents of the bowl were composited, and the other sample containers were filled. Specific sediment sampling procedures are described in the *Final Field Sampling Plan* (M&E 1991b).

Sediment samples collected were submitted for the analysis of volatile organics, semivolatile organics, pesticides/PCBs, metals, cyanide, grain size, and total combustible organics (Table 2-17). Samples were also submitted for sulfides analysis in June 1991 and September/October 1991.

Sediment samples collected during the May 1992 sampling were also submitted for ammonia analysis. Prior to sample submittal, sediments were extracted in the field using a 2N potassium chloride solution. Twenty grams of sediment were extracted using 200 mL of potassium chloride solution and then filtered using a 0.45-micron filter. This extraction procedure was repeated again using another 200 mL of potassium chloride. The extracts were then composited together and submitted to the laboratory. The barrel filter unit was used as the extraction vessel. In addition, an aliquot of sediment from each location was submitted along with the extract for determining the percent moisture of the ammonia analysis.

2.5.7 Additional Ecological Sampling and Analysis

Based on sampling data and the results of benthic reconnaissance surveys in 1991, it appeared that the benthic community was stressed, as indicated by low diversity in Mitchell Brook, the Saugatucket River, and the unnamed brook west of Rose Hill Road. Several areas appeared abiotic. Such an effect may be caused by contaminants in the sediment and/or water column, which may result in acute or chronic effects such as reproductive impairment. Additional sampling and chemical and benthic community analyses were conducted to verify the stressed conditions qualitatively observed in June 1991. Four types of analysis were conducted to assess the benthic community structure and the potential toxicity of water and sediment to aquatic biota:

- Artificial substrate surveys
- Quantitative benthic macroinvertebrate surveys
- Sediment toxicity testing
- Leachate toxicity testing

Sediment sampling for the four analyses was conducted at eight locations selected to represent a potential contaminant gradient in the Saugatucket River (SW/SD-02, SW/SD-04, SW/SD-05, SW/SD-06, and SW/SD-11) and Mitchell Brook (SW/SD-09, SW/SD-07, and SW/SD-12). These eight locations include areas upstream of the disposal areas (reference areas) and areas downstream of the disposal areas. Surface water was also sampled at each of these locations. In addition, sediment and surface water were collected at three additional locations (SW/SD-16, SW/SD-17, and SW/SD-18) adjacent to the disposal areas (Figure 2-27) to better characterize contaminant gradients within Mitchell Brook and the Saugatucket River.

2.5.7.1 Artificial Substrates. Artificial substrates were placed in triplicate at the eight locations situated upstream and downstream of the disposal areas. The locations of the artificial substrate samples are the same as those on Figure 2-27 for SW/SD locations. To distinguish substrate data from other data, the artificial substrate samples are designated as: AS-02, AS-04, AS-05, AS-06, AS-11, AS-09, AS-07, and AS-12. HESTER-DENDY samplers (1-square-foot surface area) were attached by nylon cord to steel rebar and driven into the streambed at the eight locations. The substrates were located a few inches above the streambed and were completely submerged. After six weeks, the substrates were retrieved by surrounding each replicate by a kick net to minimize loss of organisms. All procedures used followed standard methods described in USEPA (1990c). Water depth at the time of substrate deployment and retrieval at each of the eight locations was recorded. The substrates were then placed, intact, in labeled plastic containers for shipment to the laboratory for taxonomic identification of sampled organisms. The labels were placed on the outside and inside of the containers and were coded to include information on the date and location of the site, station number, replicate number, and preservative. All samples were preserved with an ethyl alcohol solution, covered tightly, and sent to the laboratory in coolers for disassembly and taxonomic analysis. In the

laboratory, all organisms were picked, sorted, and identified to the lowest practical taxon (usually genus or species). If less than 30 individual chironomids were present in a replicate, these individuals were identified to the genus level. If 30 to 100 individual chironomids were present, a representative sub-sample of at least 30 individuals from each replicate was identified to the genus level.

2.5.7.2 Quantitative Benthic Macroinvertebrate Sampling. Benthic grab samples were collected at the eight designated locations. The locations of the benthic grab samples are the same as those for the artificial substrate samples and those on Figure 2-27 for SW/SD locations. To distinguish benthic data from other data, the benthic grab samples are designated as: SE-02, SE-04, SE-05, SE-06, SE-11, SE-09, SE-07, and SE-12. Three replicate grabs were taken at each of the locations. Samples were collected with a 6-inch PONAR grab sampler giving a 36 square inch surface area. Each replicate was transferred to US Standard No. 30 (500 μm) sieve buckets via a funnel. All samples were sieved in the field. Sieved samples were carefully transferred into wide-mouth sample bottles. Methods use for collection and analysis of these samples followed USEPA standard methods as described in USEPA (1990c). Each replicate was taken in the immediate vicinity of the location for sediment chemical analyses (as described in section 2.5). The water depth and the location of each grab were recorded in a field logbook. The sample bottles were filled to the rim with an ethyl alcohol solution (preservative), covered tightly, and stored in coolers. Samples were transported to the laboratory for taxonomic analysis. Organisms were picked, sorted, and identified to the lowest practical taxon (usually genus or species). Chironomids were identified as described in section 2.5.7.1.

2.5.7.3 Sediment Collection for Toxicity Testing. Sediment to be used for toxicity testing was collected at the eight designated locations with a 6-inch PONAR grab sampler and/or scoop. The sediment sample was a composite of sediment from the three areas where the benthic replicate samples were collected. The sediment from each of the three areas was collected to take subsamples (approximately 3 gallons) for chemical analysis and to conduct toxicity testing. The composite samples were homogenized, and a physical description was recorded in a field logbook. Labeled bottles were filled, stored on ice in coolers, and shipped to a laboratory for

chemical analyses. Sediments for toxicity testing were placed in a large container, labeled, and given to USEPA for toxicity testing at the laboratory in Lexington, Massachusetts.

Sediment toxicity tests were conducted by USEPA at its Lexington, Massachusetts, laboratory on three freshwater organisms: *Ceriodaphnia dubia*, *Pimephales promelas,* and *Hgalella azteca*. Test procedures followed were those in the *Standard Guide for Conducting Toxicity Tests with Freshwater Invertebrates,* Designation E1383 (ASTM 1990). Young organisms were exposed to sediment samples from the eight locations. The tests were performed to assess the sensitivity and response of these organisms to the sediment. Comparison of sediments from the eight locations and a reference sample (from Lexington Pond) were examined statistically for both survival and growth. For *C. dubia*, survival and reproduction data were evaluated. For *P. promelas* survival data at the 48 and 96 hour endpoints were evaluated. For *H. azteca*, growth data were used to assess significant affects. Four replicates of each sample were used during testing with the exception of *C. dubia* which had ten replicates. Originally, the *P. promelas* was designed to be a chronic test; however, due to a mortality rate greater than 20 percent in the Lexington Pond reference sample, only survival at 48 and 96 hour intervals was examined. For *C. dubia* and *H. azteca*, 7- and 10-day chronic static renewal tests were performed, respectively. The data from the *C. dubia* test was analyzed statistically for survival using Fisher's Exact Test. Each location was compared against the control to ascertain any significant difference in survival from the control ($P = 0.05$). Reproduction data were also statistically analyzed on *C. dubia* to determine if significant differences existed between site samples and reference sediment. Due to non-normal distributions, analyses were performed using Steel's Many-One Rank Test. The total number of neonates for each sample was compared.

Separate statistical analyses were run on the *P. promelas* results using survival data at 48 and 96 hours. Dunnett's test was used to evaluate statistically significant differences in survival between the mean of the reference sample and the mean of the test replicates.

The *H. azteca* growth data were analyzed using Dunnett's test. These data were used to test for significant differences in growth between the mean weight of surviving organisms for each location against the mean weight of the surviving organisms in the Lexington Pond reference sample. Appendix F of this report contains a detailed description of methods and results of the toxicity tests. The statistical procedures used followed those outlined in the *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* (USEPA 1988a).

2.5.7.4 Leachate Collection for Toxicity Testing. Leachate used for toxicity testing was collected at LE-05, located between the bulky waste area and the Saugatucket River (Figure 2-26). Leachate was collected in April 1992 on three occasions. Several gallons of leachate were transferred to a large container with a small bucket, as discussed in section 2.5.4. The leachate sample was homogenized. A subsample was taken, placed in labeled bottles, and sent to an analytical laboratory for chemical analysis. The remainder of the leachate sample was sent to the USEPA Lexington Laboratory for toxicity testing.

Leachate toxicity tests were conducted on two freshwater organisms: the fathead minnow *(Pimephales promelas)* and the Cladoceran, *Ceriodaphnia dubia*. The methods and procedures used for the toxicity testing follow those outlined in the USEPA manual for estimating toxicity (USEPA 1988a). Test methods utilized included the 48-hour acute test and the 7-day chronic static renewal test. The young of *P. promelas* and *C. dubia* were exposed to various concentrations of the leachate sample to assess the sensitivity and response of these organisms to the leachate. For the acute test, the statistical endpoints determined from the data included: median lethal concentration (LC_{50}) and no observed acute effect level (NOAEL). For the chronic testing, the endpoints were determined for growth/reproduction. These included, inhibition concentration levels (IC_{25} and IC_{50}), 7-day LC_{50}s, and no and lowest observed effect concentration (NOEC and LOEC).

The procedures used follow those outlined in the USEPA manual for estimating toxicity (USEPA 1988a). The test concentrations of leachate used were zero (control), 3.125%, 6.25%, 12.5%, 25%, 50% and 100% for both acute and chronic tests. For *C. dubia* tests, there were ten replicates per concentration initially. During the *C. dubia* chronic test, one replicate was lost in the 3.125 percent concentration. For the *P. promelas* tests, there were four replicates per concentration. Measurement endpoints were monitored every 24 hours and recorded on standard laboratory sheets. The chronic tests were renewed daily.

Statistical analyses were performed on the accumulated data. For *C. dubia,* acute test endpoints were calculated for the LC_{50} using the trimmed Spearman-Karber method. For the *P. promelas and C. dubia*, acute test endpoints for the NOAEL were also determined based upon visual analysis. For the *P. promelas* chronic test results, a non-parametric statistical test was performed on survival data using the trimmed Spearman-Karber method. Another set of tests were conducted including the Shapiro-Wilk's Test for normality, the Bartlett's test for variance, and the Dunnet's test to determine NOEC and LOEC. The growth data endpoints were determined using chronic data (mean dry weight) to calculate the IC_{25} via the ICP program, a point estimation technique, and again to NOEC and LOEC through Shapiro-Wilk's, Bartlett's, and Dunnetts Tests. Statistical analysis was also performed on the *C. dubia* 7-day chronic test results. The Wilcoxon Rank Sum Test with Bonferroni Adjustment was performed to determine the concentration of toxicant significant, relative to the control, and ultimately the NOEC and the LOEC. Appendix F of this report presents, in detail, the methodologies and results of the toxicity testing.

2.5.7.5 Calculations of Ecological Community Indices for Benthic Grab Samples and Artificial Substrates. The following ecological indices were calculated for each sample: Shannon-Wiener diversity index and Simpson's index of dominance and evenness. The use of these indices is described in Pielou (1975). Similarity indices were calculated for the eight grab sample locations. Similarity indices were calculated separately for the artificial substrate

samples using the Bray-Curtis and Jaccard indices. These similarity indices are described in Balsch (1977).

The Shannon-Wiener diversity index combines information on the number of species and the relative importance or abundance of each species. It is calculated by Shannon's formula:

$$H' = -\sum_{i=1}^{S} P_i \ln P_i$$

where P_i is the proportion of individuals belonging to the ith species. S is the number of species present.The diversity of a community is dependent on the number of species and the evenness with which the individual organisms are distributed among the species. Evenness is calculated by the ratio H'/ln S, where H' is the value of Shannon's formula and is a measure of the extent to which the resources of a community are shared among species.

Simpson's dominance is a measure of the extent to which one or a few species dominate a sample. It is somewhat inversely correlated with evenness. Simpson's dominance is calculated

by the formula:

$$\sum_{i=1}^{S} (P_i)^2$$

Values of the Bray-Curtis and Jaccard similarity coefficients were calculated to compare pairs of locations on the basis of the species found there. The Bray-Curtis coefficient is a quantitative measure that compares the abundance of each species at a pair of stations and computes a measure of similarity between the stations (Boesch 1977). Expressed in its dissimilarity form, the coefficient between samples 1 and 2 is calculated as:

$$D = \frac{\Sigma \mid N_{i1} - N_{i2} \mid}{\Sigma (N_{i1} + N_{i2})}$$

where N_{i1} = number of individuals in species i in sample 1. The similarity form of the index is

$$S = 1 - D$$

The Jaccard coefficient of similarity between stations is a qualitative measure, comparing stations only on the basis of presence or absence of species, rather than on their abundance. It is calculated by the formula:

$$\frac{a}{a + b + c}$$

where a = the number of species two stations have in common, b = the number found at the first station but not at the second, and c = the number of species found at the second station but not at the first.

2.5.7.6 Statistical Analysis of Benthic and Artificial Substrate Data. Data from benthic grab samples and from artificial substrates were analyzed using cluster analysis, analysis-of-variance (ANOVA), Kruskal-Wallis tests, and simple and multiple linear regression (Bhattacharyya and Johnson 1977; Afifi and Clark 1984). Benthic grab and artificial substrate data were analyzed separately. With the exception of a few cluster analyses, data from Mitchell Brook and Saugatucket River stations were also treated separately.

Artificial Substrates. Similarity matrices were constructed using the mean densities (from the three replicates at a station) of each observed organism at each sampled station using both the

Bray-Curtis and Jaccard similarity indices. These similarity matrices were then used in hierarchical cluster analyses using average linkage between groups.

Analysis-of-variance was used to test for differences in total densities (all organisms combined) among stations. For analyses with significant outcomes ($P < 0.05$), multiple comparison tests (least-significant difference [LSD], Duncan's multiple range test, Student-Newman-Keuls, Tukey, Modified LSD, and Scheffe's test) were used to determine which stations differed significantly. Corresponding Kruskal-Wallis tests (a nonparametric ANOVA procedure) were also conducted and compared with the ANOVA results as an empirical check of conformance to statistical assumptions. In addition to total densities, ANOVAs were conducted on densities and percent occurrence of selected individual taxa.

Simple linear regression was used to test for significant linear correlations between total densities and various contaminants (total/dissolved iron and total/dissolved aluminum) in the water column. In addition to total densities, regression analyses were also conducted using densities and percent occurrence of selected individual taxa.

Benthic Grab Samples. Cluster analysis and ANOVA procedures for benthic grab data were identical to those described for artificial substrates. Simple linear regression was used to test for significant linear correlations between total densities and various contaminants (iron and arsenic) in the sediments and between total densities and substrate composition (percent gravel, sand, or silt). Multiple linear regression was also used to regress total densities against contaminant concentrations and sediment composition simultaneously; all possible subsets of the two contaminants and the three substrate variables were run. In addition to total densities, all regression analyses were also conducted using densities and percent occurrence of selected individual taxa.

2.5.8 Landfill Gas Sampling and Analysis

In addition to sampling permanent monitoring points (sections 2.2.1 and 2.4), M&E collected six landfill gas samples from the three disposal areas between May 7 and 13, 1992, for quantitative laboratory analysis. Three samples were collected from the solid waste area, two from the bulky waste area, and one from the sewage sludge area, as shown in Figure 2-28. Sampling locations were selected based on the elevated volatile organic concentrations measured during the site reconnaissance (section 2.2.1). Other criteria, such as spacial distribution and variations in landfill gas composition, were also used. The rationale for the selection of each location is presented in Table 2-28.

The field team used steel probes manufactured by Geoprobe for the collection of all landfill gas samples for further analysis of volatile organics and reduced sulfur. Collection of samples for field screening and analysis using hand-held instruments followed the procedure described in section 2.2.1. Samples were submitted to a CLP laboratory for volatile organic analysis by Method TO-14 modified for high-concentration samples. The landfill gas samples were collected in SUMMA canisters. The collection method is described in detail in section 2.5.8.2. Total-reduced-sulfur compounds were analyzed in an on-site mobile laboratory by M&E personnel using ASTM Method D-2385-81.

2.5.8.1 Depth Profile. M&E initially conducted a depth profile at each sampling location. Hand-held instruments and the field GC were used to screen depths at 3-foot intervals to a maximum of 12 feet. The depth with the highest volatile organic concentration, as determined by field GC analysis, was used for the collection of samples for laboratory analysis of volatiles and field analysis of reduced sulfur. Conditions such as saturated or impermeable soil material and obstructions also affected the choice of sampling depth. Table 2-28 indicates the depth selected for sample collection of each point.

2.5.8.2 SUMMA Canister Sampling. M&E used SUMMA passivated canisters to collect landfill gas samples for laboratory analysis of volatile organics by method TO-14. A diagram

of the sampling equipment is shown in Figure 2-29. For each sample, an evacuated canister was connected to the sampling system using Teflon tubing. All fittings and tubing that contacted the sample were either Teflon or steel. A small pump purged the tubing leading to the SUMMA canister prior to sampling. Since the tubing up to the connection point was already purged from the field screening, a short additional purge time of 20 seconds was adequate to purge the tubing leading to the canister. A one-liter-per-minute flow rate was used for purging.

The valve leading to the purge pump was closed and flow to the SUMMA canister was started by opening the valve on the SUMMA canister. The laboratory precalibrated mass-flow controllers to a flow rate of 200 cc/min. M&E checked these calibrations and found all flow rates to be within 40 cc/min of the target.

A flow time of approximately 20 minutes was used to allow approximately 4 liters of sample to enter the canister.

2.5.8.3 Reduced-Sulfur Sampling. An impinger technique based on ASTM Method D-2385-81 was used to sample for hydrogen sulfide and total mercaptans. A diagram of the sampling apparatus is shown in Figure 2-30. Several modifications from the ASTM procedure are shown in this figure:

- A 140-mL glass sampling bulb served as a water trap at the front end of the impinger train
- A 140-mL glass sampling bulb was added at the end of the sampling train to measure the gas-flow rate
- A vacuum gauge was added inline after the last impinger

M&E estimated the hydrogen sulfide concentration using a Dräger tube prior to sampling. This estimate allowed the field team to optimize the use of the cadmium sulfate, iodide, and sodium thiosulfate solutions as well as the sampling duration time. The six locations sampled for

reduced sulfur are the same as those sampled for volatile organics using Method TO-14 (Table 2-28). These locations are shown on Figure 2-28.

2.5.8.4 Quality Control. To ensure the validity of the data collected, strict quality control measures were maintained by careful and thorough decontamination of the sampling system and the analysis of blanks.

Decontamination. Before each sampling point, the sampling system was decontaminated. The stainless steel probe was cleaned of all visible dirt. The sampling system was flushed with ambient air for several minutes after each sampling point, and new Teflon tubing was used between the tubing adapter and the sampling system for each sampling point.

Duplicates. One duplicate sample was collected for volatile organic analysis by the laboratory and reduced-sulfur analysis in the field. The SUMMA canister duplicate was collected at SW (13+300). The reduced-sulfur duplicate was collected at SW (03+300).

Blanks. An equipment blank for laboratory analysis was conducted by flushing zero air through the probe and sampling system and collecting this into a SUMMA canister. An equipment blank for the reduced sulfur analysis was not collected. However daily blanks were analyzed using the impingers and all of the sampling solutions. Blank corrections were made to all reduced-sulfur results.

An equipment blank for field analysis by field GC and OVA was collected to ensure adequate decontamination. Ambient air was drawn through the sampling system for the equipment blanks for field analysis.

Performance Evaluation Sample. Two performance evaluation samples were obtained from USEPA prior to sampling and submitted to the laboratory in SUMMA canisters for volatile organic analysis. These samples provided an estimate of the laboratory's accuracy on a sample of known composition.

2.6 ANALYTICAL DATA VALIDATION AND REVIEW

All field and analytical data obtained during the RI field investigation are presented in sections 3.0 through 7.0 of this report. The following sections discuss data validation and use and any additional data reviews.

2.6.1 Data Validation and Use

Quality control samples were taken and submitted for laboratory analysis to monitor precision, accuracy, and cross-contamination throughout the sampling episode. QC samples submitted for analysis included trip blanks, equipment blanks, bottle blanks, field duplicates, and matrix spike/matrix spike duplicate samples. Collection frequency for these QC samples is summarized in Tables 2-12 to 2-17.

All data generated by CLP laboratories were validated to determine their usability in subsequent evaluations of the RI. Validation of CLP-RAS data was performed using the guidelines specified in the following documents:

- *USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses* (USEPA 1988b)

- *USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (USEPA 1988c)

All CLP-SAS data were validated according to validation criteria set forth in the individual SAS request or analytical procedures as outlined in the appendices of the *Final Quality Assurance Project Plan* (M&E 1991c).

Data found to be suspect during the validation process were qualified, and a description of the discrepancy was noted in the validation summary. Positive and non-detect results that were shown to have serious problems with their analyses were rejected and flagged with an "R." Positive results that were shown to exhibit poor precision and/or accuracy were qualified as approximated and flagged with a "J." Nondetect results that were shown to exhibit poor precision were flagged with a "UJ." Nonqualified positive results were found to meet all validation criteria. Nondetect results that were found to meet the validation criteria were shown as the quantitation limit or detection limit followed by a "U" qualifier. Rejected values were considered as non-usable results for subsequent RI evaluations.

Approximated and nonqualified results were used in further RI evaluations, but the qualified data were first reviewed to establish their usability.

2.6.1.1 Additional Data Review. Validated data are presented in Appendix D by media. The validated data were used in subsequent evaluations of nature and extent and baseline risk assessments. During these evaluations, data that were different from the rest of a data set were further reviewed to see if there were reasons (i.e., laboratory or field artifacts), that were not apparent during validation, that may affect the useability of the data. The results of the additional review are discussed below. Also discussed are data that appear to be anomalies (i.e., metals) because of qualification during validation.

Since a discussion of individual pieces of datum that were further reviewed are too numerous and widely varied, only data that were found to result in a different interpretation than is suggested by validation are discussed below. These results are embellished in the discussion of nature and extent of contamination (section 4.0) only where it is appropriate and important. It is important to note, that alterations were not made to validated data, tables, and figures based on the results discussed below.

Acetone, 2-butanone (MEK), and different phthalates are common laboratory and field contaminants. During validation, these organic compounds were qualified when criteria were

not met. Since these compounds are potential contaminants, known to have been potentially disposed of in the site study area during landfill operations, validated data were further reviewed when these compounds were detected and not qualified, especially at concentrations near or below sample detection limits. Most cases revealed that the concentrations reported were not results of laboratory or field artifacts. The few cases where these compounds met validation criteria, but after review of laboratory and QC data, do not appear to be site related are acetone (3 μg/L) at SS-14.

Carbon disulfide (11 μg/L) and phenol (7 μg/L) were detected in MW-01-01 and MW-01-02, respectively, during April 1992. Review of laboratory QC data for other samples run at the same time, but not in the same lot, indicated that these compounds were present at low levels in equipment blanks and bottle blanks. Since the concentrations measured in the MW-01 wells were below sample detection limits, the detection of these compounds does not appear to be site related.

N,N-Dimethylformamide (*N,N*-DMF), a water-soluble organic, was detected in different aqueous samples during the study period, however, in two samples (Resident #8 and SW-10) that were collected in September/October 1991, the concentrations (1.9 and 5 μg/L) were substantially below sample detection limits (50 μg/L). At the concentrations detected in these samples, the accuracy and precision of measurements diminishes, and noise and other instrument fluctuations cause ghost peaks. Since these results were not confirmed using a second column, these data are more likely attributed to laboratory issues.

In general, interpretation of metal data is sometimes difficult because some of the data is not useable because of limitations during analysis as well as subsequent qualifications of data during validation. For instance, matrix effects and elemental interferences typically increase sample detection limits and reduce quantitation accuracies, particularly at low concentrations. Difficulty in quantifying certain metals (i.e., antimony, magnesium, vanadium, arsenic) is directly related to the concentration of that metal and the concentration of interfering elements (i.e., iron,

aluminum, vanadium). In general, quantitation becomes less accurate and precision is poorer as concentrations approach method detection limits.

Qualification of metal data during validation, for both aqueous and solid matrices, resulted in the non-useability of some pieces of data. One of the most common qualifications occurred because of the detection of metals in QC blanks. This resulted in metal data being qualified as nondetected (the sample detection limit was raised to the detected value) because validation criteria were not met. In soils (solid matrices) this type of qualification is enhanced since the QC blanks, which are water, are not directly related to the solid matrices to which they are applied. This issue is most evident in surface soil and subsurface soil where calcium and sodium were reported as nondetected, although these particular metals are normally major soil components. Because this case was widespread, it was noted in the discussion of analytical data in sections 4.2.1 and 4.2.2. However, other metal data that were reported as nondetected were not as consistent as the above case since it was generally limited to a particular sample or few samples for a any given medium and sampling round. Consequently, these more individualized occurrences were not noted unless appropriate and important.

Specific to aqueous samples, is the detection of metals at higher concentrations in filtered samples than in unfiltered samples as well as the detection of metals in filtered samples, but not in unfiltered samples. These situations typically occur for several reasons. First, inherent variability is present for any analytical value because of variability in sample collection and laboratory analysis as well as heterogeneity of the medium itself. And second, either the unfiltered or filtered data may be qualified and reported as nondetected during validation, as discussed above. These discrepancies are only discussed in section 4.0 if they are relevant and important.

2.7 SITE SURVEYING

Diversified Technologies Corporation, a licensed Rhode Island surveyor, surveyed locations and elevations for all sampling and monitoring stations including:

- New and existing monitoring wells
- Residential wells
- Landfill analytical soil borings
- Permeability testing locations
- Landfill settling platforms
- Staff gauges
- Surface soil sampling locations
- Surface water/sediment sampling locations
- Leachate sampling locations

In addition, the locations of flags placed during wetland and habitat delineation were surveyed as were the lines established during the surface geophysical surveys.

Surveying had vertical and horizontal accuracies of 0.01 and 0.1 feet, respectively. Rhode Island State Plane Coordinates were established for each surveyed location. Figure 2-31 shows the Rhode Island State Plane Coordinate grid overlayed onto the site map.

Elevations were referenced to NGVD datum. For monitoring wells, elevations were surveyed from notches made at the top of the PVC riser pipe in overburden wells and on the steel casing in bedrock wells. These notches served to establish elevation control points from which water levels were measured in all of the monitoring wells. Surveying data are included in Appendix A.

A baseline elevation for the settlement platforms was originally established on September 18, 1991. A second survey was conducted on April 15, 1992 and a third survey was conducted on

November 9, 1992. A fourth survey, as originally described in the *Final Work Plan* (M&E 1991a), will not be conducted because of a delay in the installation of the platforms.

2.8 SITE MAPPING

A topographic map of the site study area was produced by M&E's Geographic Information System (ARC/INFO). The topographic (site) map includes buildings, roads, streams, rivers, and other pertinent features in the site study area. The coordinates for all of these features were produced by the Army Corps of Engineers, St. Louis District, for the USEPA Environmental Monitoring Systems Laboratory (EMSL). EMSL provided M&E with a CADD file containing all of the coordinate information for the site map. All surveyed locations, provided to M&E in CADD files, were overlayed on the EMSL map to produce the figures used in this report.

SECTION 3.0
SITE CHARACTERISTICS

Following a description of the geographic setting of the site study area, data collected during the RI field investigation are discussed in the following sections, providing an understanding of the geology, hydrogeology, and ecological resources in the vicinity of the site.

3.1 GEOGRAPHIC SETTING

The site study area is situated in the southwest corner of Rhode Island about 5 miles inland of Narragansett Bay and 2 miles north of Wakefield, Rhode Island. The topography of the area is typical for the coastal lowlands of the northeastern United States, generally flat with gently rolling hills. Elevations range from 50 to 260 feet above mean sea level (MSL) with slopes generally less than 3%.

The following sections provide information about the demographics and land use which include extensive sand and gravel operations, for the region in which the site study area is located, as well as the natural and cultural resources and the climatological characteristics.

3.1.1 Demographics and Land Use

The site and site study area are located within the town of South Kingstown, Rhode Island, northeast of the village of Peace Dale (Figure 3-1).

3.1.1.1 Demographics. According to 1990 census data provided by the U.S. Bureau of the Census, the town of South Kingstown has a total population of 24,631. The population distribution according to race is as follows: 93.4% white; 1.5% black; 1.8% American Indian, Eskimo, or Aleut; 3.0% Asian or Pacific Islander; and 0.3% other. Twenty-six percent of the population 25 years of age and older have graduated from high school and 56% have pursued higher education.

The villages of Peace Dale and Wakefield, which are within the town of South Kingstown and are located approximately 2 miles south of the site study area (Figure 3-1), comprise a densely settled area. The 1990 census collected age distribution data for these villages. The total population was 7,134. The population was 47% male and 53% female. Seventy-four percent of the population was over the age of 18, and 26% of the population is in the 18-year-old and younger age group. Approximately 15% of the population is over the age of 65.

The University of Rhode Island, which is located approximately 2.5 miles northwest of the site study area, houses the largest population center and provides a major portion of South Kingstown's employment and business income. The university has a population of 4,350 during the school year (ATSDR 1990).

Approximately 400 permanent residents live within 1 mile of the site study area, 6,500 residents live within 2 miles of the site study area, and 15,000 live within 3 miles of the site study area (NUS 1985). As a result of South Kingstown's coastal location, there are a number of seasonal residents, and the town is more heavily populated during the summer months. The number of housing units in the Peace Dale-Wakefield area is 2,869. The median value of owner-occupied housing units was approximately $125,000 to $150,000. According to 1989 census data, the median family income for this area was $39,500.

3.1.1.2 Land Use. The site study area (bordered by the Saugatucket River to the east, Rose Hill Road to the west, and residences to the north and south) encompasses approximately 70 acres (Figure 2-1). The active transfer station, located south of the bulky waste area, is owned by the town and is zoned as public land. There is also a small area of land zoned for commercial use along the Transfer Station Road, according to the town of South Kingstown (1992). The remainder of the site study area is privately owned.

As shown on Figure 3-1, several paved roads transect the site study area: Rose Hill Road to the west, Broad Rock Road to the east, Mooresfield Road (RI Route 138) to the north (not

shown), and Saugatucket Road to the south. Over one hundred residences exist along these roads. There are no major roads running through the disposal areas; however, a number of dirt roads access the disposal areas from Rose Hill Road. One of the roads is the driveway to the site owner's residence, located approximately 500 feet northeast of the solid waste area. A second dirt road located further north accesses an area currently used as a target shooting range (Figure 2-1).

A large portion of the residentially zoned land in the site study area and surrounding vicinity is used for agricultural activities (Town of South Kingstown 1992). The main crop in the area is potatoes. Small orchards and vegetable gardens supply produce to local markets (Kaye 1960). Currently, the portion of the site study area bordered by the Transfer Station Road, Rose Hill Road, Saugatucket River, and the target shooting range is used for privately run hunting events and dog training by the site owner. The dogs are kept in the kennels near the site owner's residence. Quail are brought in and let loose in the area. The target shooting range is currently used for skeet shooting by the site owners and customers. A portion is also used by the town of South Kingstown Police for practice. A sand and gravel quarry is actively operated approximately 200 feet west of Rose Hill Road (section 3.1.2.2).

Surface water bodies in the area are used recreationally. The Saugatucket River, which runs south through the site study area, has a Rhode Island classification of B and is suitable for both fishing and swimming. Approximately 1 mile south of the site study area is Saugatucket Pond. The pond and zoned land surrounding the pond are used for recreational purposes. Mitchell Brook, which runs south through the site study area prior to merging with the Saugatucket River, may also be used for recreational purposes. This body of water has no state classification. The shore areas on Narragansett Bay, located a few miles south and southeast of the site study area, are densely settled with seasonal houses. Commercial fishing in the bay brings in much of the lobster, bluefish, and swordfish consumed in the state (Kaye 1960).

Future land use in the site study area and surrounding area is not expected to differ significantly from the current land uses. There is potential for increased residential land use at the site study

area, and perhaps, as a result, increased recreational use of the Saugatucket River and Mitchell Brook.

3.1.2 Drinking Water Resources

Drinking water used by the residents of South Kingstown comes from both overburden and bedrock public supply wells. The South Kingstown Water Supply District maintains two upgradient wells within 3 miles of the site study area at the Tucker town wellfields. The locations of these wells are shown on Figure 3-2. The University of Rhode Island also maintains three overburden supply wells, upgradient of the site study area, approximately 2.5 miles to the northwest (ATSDR 1990).

Many residents of the town of South Kingstown also maintain private drinking water wells. A detailed existing private well inventory was conducted by M&E and is described in section 2.2.1.1. Figure 3-3 shows residences currently using private wells and the public drinking water system access.

A residential well inventory of 102 properties was conducted south, east, and west of the Rose Hill site study area along Rose Hill Road, Saugatucket Road, and Broad Rock Road. The purpose of this inventory was to collect information on active drinking water wells in proximity to the site study area.

The study asked the residents and/or owners occupying the properties on these roads to provide information on existing wells, and to indicate if their property was connected to the town water supply. The survey obtained information on the status of the existing wells to determine where there were drinking water wells in active use, abandoned wells, or supplemental wells used for purposes other than drinking water.

The results of the inventory showed that 39 properties have drinking water wells in active use. Out of these properties, nine wells are located on Rose Hill Road, five wells are located on Saugatucket Road, and 25 wells are along Broad Rock Road.

Thirty-nine properties have access to the town water supply. Seventeen properties have neither access to the town water supply nor drinking water wells. Sixteen properties are undeveloped, six properties have wells used as a supplemental source, 10 properties have abandoned wells, and 11 owners did not respond to the survey.

3.1.3 Sand and Gravel Resources

A 1964 Rhode Island construction aggregate survey indicates the reserves of sand and gravel in the Rhode Island portion of Narragansett Bay totalled 8.1 million cubic yards. Because of the heavy urbanization of this area, it is unlikely that the total reserve will ever be mined. Principal sources of gravel and sand are the glacial outwash deposits of the Saugatucket and Pettaquamscutt River valleys in the South Kingstown area.

The gravel consists chiefly of granite, gneiss, sandstone, and conglomerate rock fragments. Gravel is used as high-grade aggregate material. Sand is used as fill for concrete and plaster.

The town of South Kingstown has had active sand, gravel, and till excavations in operation along Rose Hill Road, Broad Rock Road, Stoney Fort Road, and North Road. Prior to its use as a landfill, the solid waste area was originally a sand and gravel pit left by excavation activities. The target shooting range, in the northern portion of the site study area, occupies an abandoned quarry pit. Presently, an active sand and gravel quarry is located approximately 200 feet west of Rose Hill Road.

3.1.4 Climatology

The climate of the site study area is seasonably variable. The following average yearly temperature range, precipitation, snowfall, and growing season days (freeze-free period) are based on measurements taken at the Kingston, Rhode Island, Agricultural Experimental Station, a National Oceanic and Atmospheric Administration (NOAA) weather station located at the University of Rhode Island, between 1951 and 1980 (URI 1992). The Kingston station is the closest NOAA weather station to the site study area.

- Temperature range:

  Average monthly high = 70°F in July
  Average monthly low = 28°F in January

- Average yearly precipitation = 48 inches
- Average yearly snowfall = 32 inches
- Average growing season (freeze-free period) = 138 days
- Average annual temperature = 49.2°F
- Average daily temperature range = 12 to 46.5°F

Temperatures are highest in July when temperatures range from 62 to 81.5°F. During the study period, the highest temperature recorded was 98°F and occurred on July 21, 1991. The lowest temperature recorded during the study period was -3°F and occurred on February 13, 1992, although January is usually the coldest month. The first fall freeze, 32°F, occurred on September 22, 1991 and the last spring freeze, 29°F, occurred on May 20, 1992 at the URI Weather Station, Kingston, Rhode Island (URI 1992).

There are normally no seasonal patterns in the frequency and amounts of precipitation contributed to the area during a year. However, two types of storm patterns do exist. Storms that occur between October and April are primarily extratropical cyclones, and those that occur

between May and September are primarily tropical cyclones (Trigom 1974). In the late fall through the early spring, northeasters (low-pressure systems that sweep down from the northwest in Canada) bring freezing rain and snow. Although northeasters are frequent, they are seldom severe enough to cause any property damage and human injuries.

Between spring and fall, most precipitation results from thunderstorms and smaller convective storms. Rhode Island has been hit by 71 hurricanes in the past 350 years. Severe flooding has been caused by 13 of the hurricanes. In the last 40 years, two great hurricanes have struck Rhode Island: one in 1938 and the other in 1954. Most of the property damage in Rhode Island has been a result of storm surges associated with hurricanes. During the 1938 hurricane, the storm surge was 11 feet above the normal sea level at Quonset (NOAA 1991).

More recently, severe storms such as Hurricane Bob entered the Narragansett Bay area in August 1991, and a northeaster passed nearby in late October 1991. The site study area received approximately 41 inches of precipitation during the study period. This was 7 inches less than the average annual amount. The prevailing winds were generally from the northwest and occurred at a mean speed of 10.6 mph during the study period (NOAA 1991).

3.1.5 Cultural Resources

Three historic cemeteries were identified (Figure 3-1) and there is a possibility that other undocumented cemeteries exist. The potential for other types of important historic sites also exists because historic maps show many structures, most of which are probably farms and associated outbuildings.

A search conducted for the Rhode Island Historical Preservation Commission revealed that no prehistoric and historic archeological sites were identifiable in the site study area. However, the potential for unidentified prehistoric sites is high according to the commission because of the predominant soil types in the area as well as the existence of wetlands, streams, and confluences of streams, which indicate a high potential for sites to exist.

3.2 GEOLOGY

The following section summarizes the geology of the site study area. The section includes discussions on regional geomorphic features and regional and site bedrock and surficial geology. It summarizes identified geologic features and discusses their significance in terms of surface water and groundwater movement and potential contaminant migration.

3.2.1 Regional Geomorphic Features.

The site study area is located in the seaboard lowland section of New England. This region is characterized by irregular topography with north-trending, elongated, and rounded hills, river valleys, and swamps (USGS 1956). Topographic elevations range between 50 and 260 feet above sea level. The principal geomorphic features include a drowned river valley, several till moraines, drumlins, and glacio-fluvial depositional structures, as shown on Figure 3-4. The formation of these features was influenced by the regional bedrock topography, which developed during the Acadian and Alleghenian deformational events (orogenies) between 390 and 225 million years ago, and by glacial erosional and depositional processes of the Wisconsin glaciation that began approximately 30,000 years ago and ended approximately 10,000 years ago (C.E. Maguire 1977a; NUS 1989; USGS 1956; USGS 1961; Kaye 1960).

Narragansett Bay, located to the east of the site study area, forms the western flank of a drowned river basin, a topographic as well as a structural trough that controls regional surface drainage. This basin is characterized by north-trending valleys, ridges, and islands.

Southwest of the site study area is the west-trending Charlestown moraine. This moraine is part of the terminal moraine system representing the southeastern extent of the Wisconsin-age glaciations. Extending along the southwest shoreline of Rhode Island, the moraine is characterized by low hills and sharp-crested, sinuous ridges (Kaye 1960). The northeastern edge of the moraine lies near Wakefield, Rhode Island, as shown on Figure 3-4. The Charlestown moraine grades eastward into an area of low hills and ridges, which has been mapped as the

Ablation-Moraine Complex of the Narragansett Basin ice. This complex consists of till intermixed with stratified silt and sand deposits. The ablation moraines are believed to represent the accumulation of materials on the surface of the retreating ice sheets. As the ice retreated, the materials formed low-lying ridges.

A glacio-fluvial depositional valley has been identified and mapped in the vicinity of the site study area. This valley trends north-south along the Saugatucket River, as shown on Figure 3-5 (USGS 1961). These silt, sand, and gravel deposits formed terraces and broad, flat-topped ridges along the western flank of the Saugatucket River. The deposits have been extensively mined near the site study area, leaving several excavation pits along Rose Hill Road.

Several rock-core drumlins, including Tefft Hill and Rose Hill, appear west and north of the site study area. The drumlins are streamlined geomorphic features aligned parallel to the southwesterly direction of glacial flow. These features are elliptical in shape and consist of ground moraine till covering a bedrock core. The drumlins were formed by the deposition of till under the glacial ice sheet as the glaciers moved across the irregular bedrock topography. The drumlins represent regional topographic highs (261 and 221 feet above sea level, respectively) in the area.

3.2.2 Regional Surficial Geology

Surficial soils underlying the region are composed of materials deposited during the Wisconsin-age glaciation and following the retreat of the glaciers. These deposits include glacial till, ice-contact/glacio-fluvial deposits and recent swamp, marsh, and topsoil. Pre-Wisconsin-age deposits in this area are believed to have been removed by glacial erosional processes (Kaye 1990).

3.2.2.1 Till. The till consists of material deposited by ice with little or no fluvial influence. Both lodgement and ablation tills are grouped into this strata type. Lodgement till typically consists of materials that have been dragged beneath the ice or embedded in the basal part of the

glacier. Lodgement till is compact and contains high percentages of silt and clay. Ablation till, which contains larger percentages of sand and reworked sediments, represents materials that were deposited near the surface of the glacier as a result of melting ice.

No distinction between lodgement and ablation tills has been made regionally. Both tills contain sand, silt, and rock fragments. The tills exhibit little or no bedding, are poorly sorted, and have subrounded to poorly rounded gravel and pebbles. Rock fragments, more than ½ inch in diameter, constitute less than half of the volume of both of the tills, and large boulders in excess of 10 feet long are common (USGS 1961). The till is a light olive-grey color and is composed of materials derived from the erosion of Devonian/Permian/ Pennsylvanian-age gneiss and phyllite bedrock, which underlies the area.

3.2.2.2 Ice-Contact/Glacio-Fluvial Deposits. These deposits consist of well-sorted and stratified silt, sand, and gravel that were transported and deposited by glacial meltwaters. It is almost impossible to differentiate between ice-contact and glacio-fluvial deposits within the region because of the similarity in grain-size distribution and stratification (Kaye 1960). A north to south-trending glacio-fluvial valley extends along the western edge of the Saugatucket River (Figure 3-5). The glacio-fluvial deposits are surrounded by ground moraine till. The coarsening of the glacio-fluvial deposits from south to north along the east side of Rose Hill Road and to the north of Saugatucket Road suggests that a north to south depositional sequence from ice-contact to fluvial outwash deposits occurred across this area (USGS 1961). This sequence is believed to be the result of a stagnant glacial ice block positioned north of the site during the late Wisconsin glacial retreat.

3.2.2.3 Recent Deposits. Most of the brooks and rivers within the region flow on swampy floodplains. Dark-colored organic-rich peat, clay, silt, and fine-sand swamp deposits underlie these areas. The organic-rich peat deposits vary in thickness and overlie glacial deposits. Swamp deposits occur along the banks of the Saugatucket River. In the higher-elevation wooded areas, the glacial sediments are covered with a topsoil, which varies in thickness depending on

the type of wooded vegetation and typically consists of fine silt and sand with an abundance of roots and organic materials.

3.2.3 Regional Bedrock Geology

The regional bedrock is mapped as the Scituate Gneiss. The grey-to-pink gneiss is characterized by thinly banded biotite and coarse-grained, oval-shaped crystals of pink microcline (augen texture; USGS 1956). The rock is composed chiefly of quartz (40 to 50%), microcline and microperthite (28%), oligoclase (22%), and biotite (7%); minor constituents include magnetite, garnet, muscovite, chlorite, zircon, apatite, and pyrite (USGS 1956). The gneissic foliation or banding strikes northeast and dips to the southeast. The Scituate gneiss was emplaced during deformation and regional metamorphism of Narragansett Basin sediments during the Alleghenian orogeny (250 million years ago; USGS 1956). It is believed to have been formed by the recrystallization of a quartz-biotite schist during the deformation. The gneiss is exposed as surface outcrops near the site study area at the following locations (Figure 3-6):

- A closed quarry 0.5 miles southwest of Mooresfield, north of the site study area (USGS 1956)
- An outcrop along the south side of Mooresfield Road between Rose Hill Road and Broad Rock Road (M&E 1991e)
- A small outcrop on the northeast side of the solid waste area (USGS 1961; M&E 1991e)

The Scituate Gneiss grades into the Blackstone series quartz-biotite schist southeast of the site study area near the Indian Run Reservoir, as shown on Figure 3-6.

The Pennsylvanian schists and phyllites (metamorphosed sedimentary rocks) of the Rhode Island Formation are located to the east of the Scituate granite Gneiss.

South of the site study area and east of the Blackstone Series Quartz-Biotite Schist, the Narragansett Pier Granite is encountered. The Narragansett Pier Granite, considered to be younger than the Scituate Gneiss, is believed to have intruded the pre-existing Pennsylvanian schists and phyllites during the Appalachian orogeny (USGS 1956; Kaye 1960).

3.2.3.1 Regional Bedrock Structures. The most significant bedrock structure of the region is the Narragansett Basin, a large Carboniferous sedimentary basin, extending southward from Plymouth, Massachusetts, towards Narragansett Bay and out onto the continental shelf. (BCI Geonetics 1987; USGS 1956).

The structure of the basin is controlled by normal faulting of the basement rocks. An example of this normal faulting is the Beaverhead fault, a northeast-trending fault system that forms the southeast boundary of the Narragansett Basin and extends for over 40 miles. The fault crosses the northern tip of Conanicut Island in Rhode Island Sound and is projected south-southwest, east of Point Judith Neck (BCI Geonetics 1987).

3.2.4 Site Geology

The following discussion of the geology in the site study area is based on information obtained during the hydrogeologic investigation, including seismic refraction data, soil samples, bedrock core sample descriptions, and visual field observations.

Over the past 30 years, many of the surficial geologic features in the site study area have been altered by historical sand and gravel mining operations and the subsequent filling of portions of mining excavations by landfilling activities. An active sand and gravel mining operation exists across Rose Hill Road west of the site study area. There is a steep change in the topography downward in elevation from the road to the unnamed brook. This mining operation may have some influence on groundwater flow direction. In this section geologic features are discussed, the impacts from historical activities are described, and the significance of the geologic features

in terms of surface water and groundwater movement and potential contaminant migration is summarized.

Six geologic cross sections were constructed to aid in the discussion of the geology. The cross sections represent linear vertical slices through the subsurface geologic materials underlying the site study area. The location and orientation of these cross sections are shown on Figure 3-7. Cross-section A-A' (Figure 3-8) represents a west-east profile, and is orientated along the southern edge of the site study area. Cross-section B-B' (Figure 3-9) represents a northwest-southeast profile and is positioned across the middle of the solid waste area. Cross-section C-C' (Figure 3-10) represents a southwest-northeast profile and is positioned along the southern edge of the bulky waste area. Cross-Section D-D' (Figure 3-11) represents a northwest-southeast profile positioned between the solid waste area and the bulky waste area. Cross-section E-E' (Figure 3-12) represents a north-south profile and is positioned through the sewage sludge area and the western corner of the bulky waste area. Cross-section F-F' (Figure 3-13) represents a north-south profile and is positioned between the solid waste area and the bulky waste area.

3.2.4.1 Bedrock. Bedrock cores taken at monitoring well locations MW-01, MW-02, MW-03, MW-04, MW-06, MW-07, MW-08, MW-09, MW-10, MW-11, MW-12, and MW-13 were composed of a pink-to-grey granitic Gneiss, which corresponds to the regional bedrock geology, the Scituate granite gneiss. The mineralization of the cores consisted chiefly of quartz, biotite, and feldspar. The literature describes the Scituate gneiss to be composed of quartz, potassium feldspar, plagioclase, and biotite. Variations in bedrock cores included occasional white-pink to pink-grey pegmatitic and granitic zones. A bedrock surface topography map for the site study area (Plate 1) was also constructed. The elevation contours for the topographic map were generated using bedrock data from test borings and bedrock seismic refraction data.

The competency of the rock was determined by the RQD method as described in section 2.2.2.2. Overall, the competency of the bedrock in the southern and western portions of the site study area was significantly lower than that in the eastern and northeastern sections. Rock cores from borings at wells MW-07-02, MW-08-02 and MW-11-03, located along the western and southern

boundaries of the solid waste area, had the lowest RQD values, which ranged from 0 to 12% and 8 to 40%, respectively. These cores were extremely fractured and broken, appearing highly weathered, and had clay between core pieces and chlorite on many of the fractured surfaces. The competency of the rock did not significantly increase with depth, and severely broken core was observed throughout the 25 feet of coring completed in these borings. Bedrock cores from borings positioned in the eastern and northeastern portion of the site study area (east of the solid waste area) had RQD ranges between 45 and 98%, suggesting fairly competent rock. The most competent rock core was obtained from the boring at well MW-04-03, which had an RQD range between 90 and 95%. Well MW-04-03 is located between the solid waste and bulky waste areas.

Although the bedrock was fairly competent, within the eastern and northeastern portion of the site study area small fracture zones were observed in many of the borings. Most significant fractures encountered include:

Well Number	Elevations Feet Above/Below NGVD
MW-01-02	2-4
MW-01-02	(-4) - (-6)
MW-03-03	(-20) - (-28)
MW-03-03	(-100) - (-104)

These fractures are expected to be the principal zones for groundwater movement through the fairly competent rock found in the north-central portion of the site study area. The fractures of particular concern in regard to potential contaminant migration are those found in well MW-03-03, which is located downgradient of the bulky waste area.

3.2.4.2 Bedrock Structure. Two prominent bedrock fracture lineations have been observed in the vicinity of the site study area (BCI Geonetics 1987) and include one set of fractures trending northeast and a second set trending east-southeast. These fracture trends are shown on Figure 3-6. Together, the two fracture sets define a relatively homogeneous, sub-orthogonal

fracture network. From field observations, BCI Geonetics (1987) concluded that the northeast-trending fractures define the predominant set. This conclusion is consistent with observations made at Conanicut Island (USGS 1956), where five high-angle normal faults were discovered. The southeast-trending fracture set also shows a normal component of displacement. The site is located within a major concentration of southeast-trending fractures. Figure 3-6 displays fracture traces outlined by BCI Geonetics (1987).

Bedrock surface elevations range between 42 feet above sea level and 12 feet below sea level. Bedrock topography is shown on Plate 1. It is characterized by a bedrock high situated along the northeastern edge of the solid waste area and a northeast-trending trough located along the western edge of the Saugatucket River.

3.2.4.3 Surficial Geology. The bedrock in the site study area is overlain by glacial sediments. Three distinguishable types of glacial deposits were found. These include ablation till, glacial lacustrine, and fluvial outwash deposits.

A glacial ablation till overlies the bedrock surface throughout most of the site study area. The thickness of this deposit ranges from nonexistent in the middle portion of the site study area, near well clusters MW-04 and MW-02, to 20 feet along the southern portion, near well cluster MW-11, and along the eastern edge of the Saugatucket River, near well MW-10-01. The till consists of a light grey, poorly sorted sand, with varying amounts of gravel, rock fragments, and silt. Large boulders were encountered within the till in several areas immediately overlying the bedrock surface. Laboratory grain-size analysis of till from a soil sample collected from the boring at well MW-13-01, as shown on Table 3-1, indicates a grain-size distribution of approximately 27% gravel, 57% sand, 15% silt, and 1% clay.

Banded layers of silt, clay, and fine sand were found intermittently overlying the till. Based on its banded nature, the presence of material similar to varved clays, and the high silt content, this deposit was classified as glacial lacustrine. It is believed to have been deposited in small localized glacial lakes and ponds that formed during the Wisconsin-age glacial retreat. Glacial

lacustrine deposits consist of horizontal layers of silt and clay sediments. These layers appear as alternating bands of light-colored silts and darker organic-rich clays. The banded characteristic of these deposits is called lamination and is caused by seasonal variation in the supply of sediment to glacial lakes. The lacustrine deposits were found in the southern portion below the bulky waste area and along the southeastern side of the Saugatucket River, as shown on Figure 3-14. The deposits were absent between the solid waste and bulky waste areas, but were found along the southern edge of the solid waste area at well MW-14-01, where the thickness of the deposit was approximately 10 feet. The deposit thickens to the southeast and was found directly underlying the topsoil at well MW-10-01, located east of the Saugatucket River. The thickness at well MW-10-01 was approximately 14 feet. An average grain-size distribution of approximately 0% gravel, 14% sand, 81% silt, and 4% clay was obtained for the lacustrine soil samples collected, as shown on Table 3-1.

A glacio-fluvial outwash material overlies the till and lacustrine sediments. This deposit consists of a light-tan, fine-to-medium-grained, well-sorted sand. Its thickness ranges between 10 and 20 feet, with the thickest outwash found in the northeast portion of the sewage sludge area near well MW-02-02. The grain-size analysis of glacio-fluvial outwash samples collected indicates an average distribution of approximately 9% gravel, 82% sand, 8% silt, and 0% clay.

Recent swamp, topsoil, and fluvial streambed sediments were encountered at the site study area. The swamp deposits were found in the poorly drained areas along the Saugatucket River and Mitchell Brook stream banks. The swamp deposits consist of dark-brown to black silt, and fine sand. Several small peat lenses were also occasionally observed. The thickness of these materials was usually less than 2 feet. The thickest swamp deposits were found at the following areas:

- Along the eastward-flowing reach of Mitchell Brook, north of the solid waste area
- South of the bulky waste area near well cluster MW-03
- Along the Saugatucket River, north of the sewage sludge disposal area

The streambed sediments of the Saugatucket River, Mitchell Brook, and the unnamed brook are generally 1 to 2 feet thick and consist of medium-to-coarse-grained sands. The average grain-size distribution of the streambed sediments collected in June 1991, as shown on Table 3-2, was approximately 12% gravel, 72% sand, 22% silt, and 4% clay for the Saugatucket River; 6% gravel, 75% sand, 17% silt, and 2% clay for Mitchell Brook; and 2% gravel, 75% sand, 17% silt, and 5% clay for the unnamed brook.

Topsoil was encountered in the higher-elevation woods and fields. The topsoil consists of fine silt and sand with roots and organics. The thickness of the topsoil ranges from a few inches to 5 feet and was found to be thickest east of the Saugatucket River.

Fill, landfill refuse, and sewage sludge were also encountered at the site. A gravelly sand roadbed fill with a thickness between 5 and 10 feet, was found along Rose Hill Road and the transfer station access road.

A silty sand fill was found as cover material on the solid waste and bulky waste areas. The thickness of cover material ranged between 6 inches and 3 feet. The thickest cover was found in the bulky waste area. An average grain-size distribution for the cover material was 12% gravel, 54% sand, 30% silt, and 5% clay (Table 3-1). Boring information suggests that approximately 3 to 4 feet of sand fill is also present over the sludge. Boring BH-06, installed in the bulky waste area, had solid waste from 0 to 5 feet and glacial outwash beneath that to a depth of 20 feet. The permeability and infiltration capacity of the cover materials are discussed in section 3.2.2.

In the sewage sludge area, 5 to 10 feet of sewage sludge was encountered in the boring at well MW-02-02 and in soil boring BH-01. The sludge consisted of a black organic material with a strong sewage odor. This information is consistent with the reported disposal of sludge within trenches in this area.

Landfill refuse was encountered in soil boring BH-07 at well MW-14-01 (solid waste area) and in soil boring BH-06 (bulky waste area), with thicknesses of 21 and 5.5 feet, respectively. The thickness of the refuse in the solid waste and bulky waste areas is not known. It is assumed that the natural sand and gravel materials of the glacio-fluvial deposits were mined from the area leaving exposed bedrock and till in the northern portion of the solid waste area and lacustrine and till materials along southern portions. Estimates of the bottom elevations of these mining excavations between 40-45 feet above sea level can be extrapolated from elevations of bedrock, till, lacustrine deposits, and groundwater levels recorded at wells positioned near the toe of the disposal area (MW-14-01, MW-07-02, MW-13-02, MW-04-03, OW-30, and OW-25). Landfill refuse was placed into the excavations to a height of the maximum existing grade of approximately 90 feet above sea level. This information suggests that the thickness of the refuse in the solid waste and bulky waste areas is between 30 and 50 feet and within or close to the water table.

Landfill settlement platforms were installed in nine locations to measure subsidence in both the solid waste area and the bulky waste area. Platforms SP-01 through SP-06 were installed in the solid waste area, platforms SP-07 through SP-09 were installed in the bulky waste area (Figure 2-17). Elevation measurements were made on September 18, 1991, on April 15, 1992, and on November 9, 1992. The solid waste area subsidence from September 1991 to November 1992 ranged from 0.10 to 0.25 feet. The bulky waste area subsidence ranged from 0.09 to 0.12 feet. A table with the measurements from the individual platforms is included in Appendix B.

3.2.4.4 Summary and Significance of Site Study Area Geology. Several geologic features have been identified that play an important role in the movement of groundwater and the migration of potential contaminants. These features are summarized as follows:

Feature:	Coarse-grained cover material is found over the disposal areas.
Significance:	The high percentage of gravel (12%) and sand (54%) of the cover material suggests the potential for large runoff infiltration volumes into the landfill refuse.

Feature:	Approximately 30 to 50 feet of refuse is buried in the solid waste and bulky waste areas to a depth close to the water table, and some locations in the northern portion of the solid waste area is in close to the top of bedrock.
Significance:	It is expected the groundwater in the overburden and bedrock is impacted by the refuse. In addition, localized mounding of the water table is also expected as a result of differential runoff infiltration rates through the refuse material as compared to natural soils.
Feature:	The bedrock along the western and southern portion of the site is highly weathered and fractured.
Significance:	The fractured nature of the bedrock suggests a close interaction between groundwater within the unconsolidated glacial materials and bedrock. Hydraulic conductivity of the bedrock south and west of the site is expected to be higher than the more competent rock to the east and northeast. This interaction will be further discussed in section 3.3.3.
Feature:	Bedrock surface topography is characterized by a bedrock high between the solid waste and bulky waste areas and a low river valley trough located along the western edge of the Saugatucket River.
Significance:	The bedrock topography is expected to impact groundwater flow. The bedrock high will act as a partial barrier to groundwater movement in the overburden, creating a diversion of flow around it. The bedrock high will also provide a recharge point for bedrock groundwater. The bedrock trough increases the saturated thickness of the overburden. This thickness increase is anticipated to lower the horizontal hydraulic gradient and increase the storage capacity of the overburden groundwater flow system. In addition, bedrock groundwater would be expected to discharge to the deeper overburden materials along the flanks of the bedrock trough. These impacts will be discussed further in section 3.3.3.
Feature:	Till overlies the bedrock, with the exception of the middle portion of the site study area, between the solid waste and bulky waste areas.
Significance:	The sandy nature of the till and the abundance of boulders suggest that no significant barrier to vertical groundwater movement

between the overburden and bedrock exists. The connection between overburden and bedrock groundwater is expected to increase with the shallower bedrock surface found near well cluster MW-04. This will be further discussed in section 3.3.3.

Feature: Fine-grained lacustrine deposits overlie the till in the southern and southeastern portions.

Significance: Lower permeability values and higher contaminant absorption capabilities are expected of these deposits. As such, these deposits are anticipated to act as a partial barrier to vertical movement of groundwater from the upper overburden to the lower overburden and bedrock.

Feature: Extensive swamp deposits were found along the northern reaches of Mitchell Brook and Saugatucket River and south of the bulky waste area near well cluster MW-03.

Significance: Lower permeability values and higher contaminant absorption capabilities are also expected of these deposits.

Feature: Predominately coarse-grained, sandy streambed sediments were found in Saugatucket River, Mitchell Brook, and the unnamed brook.

Significance: High seepage rates between groundwater and surface water are expected as a result of the high hydraulic conductivity potential of the streambed sediments.

3.3 HYDROGEOLOGY

The site hydrogeology is summarized in the following sections, which discuss the occurrence and movement of surface water and groundwater, the hydraulic characteristics of the geologic strata, and the interaction between groundwater and surface water. In addition, hydrogeologic features that impact the evaluation of the extent, fate, and transport of potential contaminants are summarized.

3.3.1 Regional Hydrogeological Features

Surface water and groundwater occurrence and movement are controlled by the regional climatic conditions described in section 3.1 and by the geomorphic and geologic features described in sections 3.2.1, 3.2.2, and 3.2.3. These factors dictate the amount of available water to recharge the surface water and groundwater receptors and provide the mechanism for surface water drainage and groundwater movement.

The surface water runoff drains into southward-flowing rivers and brooks. These surface water bodies flow towards Narragansett Bay through drainage pathways established during the recession of the last glacial ice sheet approximately 10,000 years ago.

The storage of groundwater occurs in the coarse-grained unconsolidated deposits of the north-south-trending glacio-fluvial river valley (described in section 3.2.1) and in the regional bedrock fractures, which trend northeastward and southeastward as described in section 3.2.1. Groundwater discharges and recharges to and from surface water are frequent.

3.3.2 Surface Water Occurrence and Movement

In this section, the site study area surface water receptors, flow patterns, elevations, velocities, and flood patterns are described.

3.3.2.1 Surface Water Receptors and Drainage Patterns. The surface water drainage pattern at the site study area is influenced by localized topography and is from north to south. The anthropogenic alteration of the natural site topography by the creation of the three disposal areas has changed natural site drainage patterns, creating localized pathways around the elevated topography of the disposal areas. The surface water receptors are Mitchell Brook, the small tributary to Mitchell Brook, the unnamed brook, the Saugatucket River, five seasonal pools, and the wetlands associated with these water bodies. The locations of the surface water receptors are indicated on Figure 3-15.

Mitchell Brook flows west to east, from an area west of Rose Hill Road, under the road through a culvert, and along the north side of the site study area owner's driveway. There is a dam in Mitchell Brook located approximately 400 feet east of Rose Hill Road (Figure 3-15). An emergent wetland has formed immediately upstream of the dam, and a deep, slow-moving pool has formed immediately downstream of the dam. The brook then flows under a driveway through a second culvert and south between the solid waste and bulky waste areas. The majority of Mitchell Brook is less than two feet deep. Adjacent to the dam, the brook reaches a maximum depth of approximately 3.5 feet. The brook meanders and forms riffles and slow-moving areas. A small tributary, located north of the site study area, feeds into Mitchell Brook from a pond located in the northern portion of the study area. This tributary is dry during the low-flow summer months, disconnecting surface water drainage from the pond into Mitchell Brook.

The unnamed brook, as shown on Figure 3-15, originates west of the solid waste area and flows south under Rose Hill Road through a culvert, located approximately 1,000 feet south of the transfer station access road, and feeds into a wetland area located between Rose Hill Road and the Saugatucket River. The unnamed brook is dammed on the west side of Rose Hill Road, and a pond has formed adjacent to the road. The unnamed brook is generally less than 1 foot deep.

The Saugatucket River flows in a southwest direction east of the sewage sludge and bulky waste areas (Figure 3-15). There is large variation in the depths in the Saugatucket River, ranging from riffles less than 1 foot deep to pools over 4 feet deep.

The five seasonal pools, created by poor drainage, are isolated from the water bodies discussed above. Two of the seasonal pools are located between Mitchell Brook and the solid waste area. The third seasonal pool is located between Mitchell Brook and the transfer station. Each of these three seasonal pools is approximately 100 feet in diameter. Two additional seasonal pools are located in the target shooting range area and are approximately 200 feet by 100 feet in size.

A drainage swale flows from the east side of the solid waste area into Mitchell Brook between the solid waste area and the bulky waste area. This swale varies from 2 to 4 feet in width. There are also several swales from the east side of the bulky waste area that flow into the Saugatucket River. The runoff flow patterns of the drainage swales are indicated on Figure 3-15. Surface runoff along these swales has caused soil erosion of the landfill cover materials and is a source of sediment in the surface water receptors. In addition, surface runoff is considered to be a potential transport pathway for contaminants related to the solid waste and bulky waste area.

3.3.2.2 Surface Water Elevations. Surface water elevations, in feet above mean sea level, were recorded at staff gauge stations on June 18 and 28, 1991; September 30, 1991; October 1, 1991; January 27, 1992; and April 6, 1992. The locations of the staff gauges are shown on Figure 3-12. Surface water elevations are included in Table 3-3. Seasonal fluctuations of surface water levels were monitored at staff gauge stations SG-03 (Mitchell Brook) and SG-05 (Saugatucket River) from June 1991 to May 1992. The resulting hydrographs are shown in Figure 3-16.

The seasonal variations (subtracting short-term storm responses) in surface water elevations were minimal, ranging from approximately 0.3 feet of elevation change for Mitchell Brook to 0.9 feet of elevation change for the Saugatucket River. Surface water levels were lowest during the late spring months of 1991 and increased to a maximum in the early winter (December 1991). Surface water levels remained high through the winter months of 1992 but began to decline in the early spring.

Surface water levels were influenced by the amount of available runoff, available groundwater baseflow, and average daily temperature (evapotranspiration). A comparison of monthly rainfall amounts, monthly mean air temperatures, and long-term surface water and groundwater elevations is shown on Figure 3-16. The lowest surface water levels (late spring 1991) were associated with a period of low precipitation (low runoff), low groundwater (low baseflow volumes), and high air temperatures (high evapotranspiration). During these months, the surface

waters were fed primarily by groundwater baseflow. The principal groundwater discharge locations for the Saugatucket River and Mitchell Brook, adjacent to the site study area, will be discussed in section 3.3.5. Highest surface water levels were observed during a period of low temperatures (low evapotranspiration) and high groundwater levels (high baseflow). Highest surface water levels lagged behind the highest precipitation season by approximately two months. This suggests that low evapotranspiration, and the resulting increase in groundwater baseflow, play a greater role in impacting long-term surface water levels than the short-term increase in the frequency of rainfall.

Short-term storm-hydrographs of surface water levels are presented on Figure 3-17. The storm-hydrographs indicate that the surface water in the site study area responds quickly to rainfall events. The storm responses observed in surface waters were controlled by the volume of runoff associated with each drainage basin (as indicated by the early portion of the hydrographs) and by the short-term increase of groundwater baseflow (as indicated by the tailing portion of the hydrograph).

Mitchell Brook at SG-03 responded to a 1.33-inch, 15.4-hour rainfall event with an approximate 1.1-foot stage increase. The duration of direct runoff was approximately 32.4 hours. This approximation was derived using $A^{0.2}$, where A equals the drainage area upstream of the gauging station (Fetter 1988). The runoff calculations are included in Appendix B. The runoff duration is marked on the storm-hydrograph, Figure 3-17. The increased groundwater baseflow to the brook as a result of the rainfall event was measurable at SG-03 for a duration in excess of 120 hours, as shown by Figure 3-14.

Saugatucket River at SG-05 responded to the same storm event with an approximate 1.7-foot change in stage height. The storm hydrograph, Figure 3-14, appears much broader in shape than that of SG-03 in Mitchell Brook. This is a result of the larger drainage area upstream of the gauging station (approximately 6.4 square miles compared to 4.3 square miles for Mitchell Brook upstream of SG-03). The estimated direct runoff duration from the rainfall event was

approximately 33.6 hours. The duration of the increased baseflow was also in excess of 120 hours.

3.3.2.3 Surface Water Velocities and Flood Patterns. Surface water velocities were recorded near staff gauge stations during June 1991, September 1991, January 1992, and April 1992. Velocity data collected during these sampling periods are reported in Table 3-4. The stream-flow velocities varied greatly throughout the site study area as a result of the high number of riffles and pools in Mitchell Brook and the Saugatucket River. Low-flow conditions were observed during late spring, June 1991, and high-flow conditions were observed during mid-winter, January 1992. For each sampling period, the velocities varied between the following values:

June 1991	0.01-0.87 ft/sec
September 1991	0.18-1.05 ft/sec
January 1992	0.5-36.7 ft/sec
April 1992	0.1-32.2 ft/sec

The Flood Insurance Rate Map for South Kingstown, Rhode Island (FEMA 1986), indicates that flooding occurs over much of the low-lying area between the transfer station access road and Saugatucket Road. This backwater effect is caused by the hydraulic constriction of the culverts under Saugatucket Road. The boundary of the 100-year flood plain on the site study area is shown on Figure 3-18. Although the three disposal areas are not located within the flood plain, this backwater effect likely has an influence on the deposition of potential contaminants in areas near SE-12 and SE-06 as a result of potential contaminants washed off the disposal areas by runoff. In these areas, low water velocities and dense vegetation caused deposition and trapping of sediments and contaminants. Downstream areas that could ultimately be affected by sediment deposits include Saugatucket Pond, which is located 500 feet downstream of Saugatucket Road and provides habitat for a variety of fish species.

3.3.3 Hydraulic Characteristics of Geological Strata

Hydraulic analysis of the geologic strata included in situ slug testing of 28 monitoring wells and laboratory permeability testing of landfill cover sludge and fill materials and glacio-fluvial outwash deposits. Estimates of streambed hydraulic conductivity obtained from mini-piezometers and seepage meters were also calculated. This information was used to evaluate groundwater movement across the site study area.

3.3.3.1 Slug Test Results. The results of monitoring well slug tests, presented in Table 3-5, are as follows:

- Outwash Deposits: The hydraulic conductivity values in the nine wells screened in outwash ranged from 1.76 to 37.48 ft/day. An average value of 16.4 ft/day was calculated for this material.
- Till: Hydraulic conductivity values for the wells screened in the till ranged from 6.75 to 32.44 ft/day. An average value of 19.0 ft/day was calculated for the till.
- Outwash/Till: Hydraulic conductivity values for the wells screened in both outwash and till ranged from 4.99 to 17.06 ft/day.
- Outwash/Lacustrine/Till: A hydraulic conductivity value for the well screened in these three materials was 8.38 ft/day.
- Lacustrine/Till: A hydraulic conductivity value for the well screened across these materials was 6.13 ft/day.
- Outwash/Lacustrine: A hydraulic conductivity value for the well screened across both outwash and lacustrine deposits was 1.85 ft/day.
- Bedrock: Hydraulic conductivity values for the bedrock wells ranged from 0.06 ft/day to 9.49 ft/day. An average value of 2.78 ft/day was calculated for the bedrock. Transmissivity of the bedrock ranged between 0.06 and 396.98 ft^2/day with an average of 82.27 ft^2/day.

3.3.3.2 Laboratory Vertical Permeability Results. Laboratory vertical permeability results are presented in Table 3-6.

The laboratory-derived vertical permeabilities of soil samples shown in Table 3-6 are one to three orders of magnitude smaller than the in situ horizontal data. This is typical for laboratory data (Olson and Daniel 1979) and is usually due to one or more of the following testing differences:

- Anisotropic soil conditions
- A tendency to run laboratory tests on more clayey samples
- The presence of sand grains, fissures, and other structures in the field, which are not represented properly in laboratory tests
- Air entrapment in laboratory samples

Laboratory permeability results are summarized as follows:

- Cover Material - The landfill cover material collected from five different areas (4 from the solid waste area and 1 from the bulky waste area) had permeability values that ranged from 0.02 to 0.28 ft/day. An average value for this material was 0.18 ft/day.
- Sludge - A sludge sample had a permeability of 0.16 ft/day.
- Solid Waste - A solid waste refuse sample had a permeability of 0.29 ft/day.
- Outwash - The outwash collected from two different areas of the site study area showed a permeability value of approximately 0.04 ft/day.

3.3.3.3 Streambed Conductivity Results. Hydraulic conductivity values for the streambed sediments were calculated from seepage meter and mini-piezometer data collected during sampling in September 1991, January 1992, and April 1992. The results indicate an average of 3.1 ft/day in the Saugatucket River, 1.1 ft/day in Mitchell Brook, and 19.15 ft/day in the unnamed brook. The streambed conductivity values are shown on Table 3-7.

3.3.3.4 Summary And Significance of the Hydraulic Characteristics. The hydraulic conductivities of the outwash and till strata were similar, with average values of 16.4 ft/day and 19.0 ft/day, respectively. This close range is the result of the high percentage of gravel and sand in the two strata. The laboratory grain-size analysis, as discussed in section 3.1.4.2, indicates that the till contains approximately 27% gravel, 57% sand, 15% silt, and 1% clay; the outwash contains approximately 9% gravel, 82% sand, 8% silt, and 0% clay. In general, the higher the percentage of sand encountered over the screened interval of the well, the higher the estimated conductivity. A high conductivity of 36.77 ft/day was obtained in the well MW-02-01, where the grain-size analysis showed 82% sand. Other factors that contributed to the conductivity values found in the till and outwash were identified:

- The large boulder zones encountered in borings at wells MW-05-02 and MW-12-02 and the high percentage of gravel surrounding the screened intervals of wells MW-06-01 and MW-10-01 may explain the higher conductivities of till at these locations.

- Well MW-03-01 was screened predominantly in outwash, but the first two feet of well screen are in a swamp and peat layer, resulting in a lower measured conductivity value.

The close range between the hydraulic conductivity of the till and outwash strata suggests groundwater will move through these strata in similar manner. In addition, since the till directly overlies the bedrock, as discussed in section 3.1.4.1, it is expected that it would not act as a barrier to vertical movement of groundwater into the bedrock.

Wells screened across the silt and clay lacustrine strata had lower conductivity values (1.85 ft/day - 6.13 ft/day) than wells screened across the till or outwash. Lacustrine materials were encountered between the till and outwash strata over the south-southeast portion of the site study area. This information suggests that the lacustrine deposits are less permeable and would act to restrict groundwater vertical movement.

The laboratory-derived permeability values for the solid waste area cover material were higher than the outwash permeability values (0.18 ft/day compared to 0.04 ft/day). In addition, the approximate grain-size averages for the cover materials indicated high gravel and sand content (12% gravel, 54% sand). This information, along with the observation that the cover material is not compacted, suggests vertical infiltration of precipitation through the cover materials would be expected to be high, comparable to natural infiltration rates for the area.

The bedrock wells had a range of hydraulic conductivities from 0.06 ft/day to 9.49 ft/day. The lower conductivity values occurred in the bedrock wells where the granitic gneiss was determined to be less fractured, with high RQD values for the bedrock cores obtained. These wells included MW-01-02, MW-03-03, and MW-04-03. Highest conductivities were found in wells MW-07-02 and MW-08-02. The bedrock cores from these wells were severely broken and showed a high degree of weathering and low RQD values, as discussed in section 3.1.4.1. The low competency of the bedrock corresponds to the higher conductivity recorded. Well MW-11-03 was found to be an exception to this finding. Well MW-11-03 showed both low RQD bedrock core values and low conductivity. Examination of the core obtained from the boring at well MW-11-03 revealed the presence of large amounts of clay between the fracture zones. The result of the extreme weathering of rock, this clay is expected to reduce the ability of the fractures to transmit water.

Average conductivity values of 1.08 ft/day and 1.62 ft/day were calculated for streambed sediments along the Saugatucket River and Mitchell Brook, respectively. The results showed lower conductivity values in the northern part of the Saugatucket River, with higher values found downstream. These data suggest that moderate seepage rates between groundwater and surface water are expected along the Saugatucket River. No consistent trend was identified along Mitchell Brook. Seepage rates, groundwater recharge, and discharge points of the Saugatucket River and Mitchell Brook are discussed in section 3.2.4.

3.3.4 Groundwater Occurrence and Movement

The occurrence and movement of groundwater at the site study area are best characterized by the division of groundwater into three flow systems based on the type, areal extent, thickness, and hydraulic properties of the saturated subsurface media encountered. The three systems defined include:

- Shallow Overburden Flow System: This system is defined as unconfined groundwater within the upper 35 feet of the overburden in which the unconsolidated saturated media is predominantly the glacio-fluvial outwash strata. The shallow flow system is assumed to be continuous across the study area with the exception of areas where the outwash has been removed by previous mining activities, such as west of Rose Hill Road and under the solid waste area.

- Deep Overburden Flow System: This system is defined as the partially confined groundwater in the lower overburden (below 35 feet) till, lacustrine, and outwash sediments. The deep overburden system is continuous across the study area. At locations where the outwash deposits of the shallow flow system have been removed by mining activities, the deep overburden system is shallower and close to the ground surface, as seen at monitoring wells MW-0B-01, OW-27 and OW-30.

- Bedrock Flow System: groundwater movement through a fractured media in the granitic gneiss bedrock

Groundwater levels and surface water levels were measured on June 18, 1991; September 30, 1991; and January 27 and April 6, 1992. These data are presented in Tables 3-8 and 3-3, respectively.

Groundwater elevation contours for the shallow overburden, deep overburden, and bedrock flow systems, based on the September 30, 1991, measurements, are presented in Plates 2, 3, and 4.

3.3.4.1 Shallow Overburden Flow System. Groundwater movement in the shallow overburden was characterized by a predominantly southeast flow direction across the site study area towards the Saugatucket River. Groundwater was unconfined, and surface water along

Mitchell Brook, the Saugatucket River, and the unnamed brook provides both recharge and discharge of water to this system. The relation between surface water and the shallow overburden system is further characterized in section 3.2.4.

Groundwater levels rose between September 1991 and January 1992. The observed increase ranged from 0.55 feet in MW-03-01 to 1.75 feet in MW-I. Groundwater levels fell from January 1992 to April 1992. The decrease ranged from 0.83 feet in MW-II to 0.12 feet in MW-I. The seasonal fluctuation of the shallow overburden groundwater elevation is illustrated by the long-term monitoring results of monitoring well MW-12-01 as shown on Figure 3-19. An approximately 1.6-foot water-level fluctuation was observed over the monitoring period (September 1991 to April 1992). Lowest groundwater levels were recorded in the fall of 1991, and the highest levels occurred during mid-winter of 1992 (January).

The short-term rainfall responses of the shallow overburden groundwater flow system are illustrated by the hydrograph of MW-12-01, Figure 3-20. Groundwater responded quickly with a 0.21-foot water-level increase during the 1.33-inch, 15.4-hour rainfall event. This response suggests that infiltration of surface runoff to groundwater occurs rapidly and is consistent with the observed sandy nature and high permeability of the subsurface soils, as discussed in sections 3.2.4.3 and 3.3.3. It would be expected that during periods of large precipitation events, similar to conditions during the fall of 1991, rapid flushing of shallow groundwater would occur and cause increased dilution of potential contamination.

Using the groundwater elevation data from September 1991, the horizontal gradient for the central and eastern portions of the site study area, between wells MW-13-01 and MW-05-01 and between wells MW-V and MW-12-01, was 0.01 ft/ft. The orientation of the groundwater elevation contours indicates that groundwater movement is diverted slightly to the south and northeast of the bedrock topographic high located under the northeast edge of the solid waste area. This suggests that the bedrock acts as a localized barrier to the movement of shallow overburden groundwater across the area. In addition, localized mounding or perching of the shallow overburden groundwater within the solid waste and bulky waste areas is expected,

although not seen on the groundwater contours presented on Plate 2. The mounding would be the result of rapid infiltration of precipitation through the highly permeable cover materials followed by the slowing of infiltration though the heterogeneous landfill refuse. The mounding effects have been documented in previous investigations with groundwater level data collected during the dryer summer months of 1980 (Bricknell 1982).

Although an effect was not observed, localized groundwater flow and hydraulic gradient may be influenced by the sand and gravel operation west of the site due to the dewatering of groundwater into the excavated pits.

Over the northern portion of the site study area, the shallow overburden system is characterized by a more eastward flow direction and a lower horizontal gradient (0.003 ft/ft), calculated between wells MW-III and MW-01-01.

Similar horizontal hydraulic gradients were calculated using the highest groundwater elevation data (January 1992). The groundwater elevation contours for the January 1992 data also were similar to the September 1991 contour plots. This information indicates that seasonal elevation changes in the shallow groundwater flow system do not affect the direction and overall gradient across the site study area. Seasonal changes in the vertical hydraulic gradients between the shallow overburden groundwater flow system, the deep overburden flow system, and the surface water receptors will be discussed in sections 3.3.4.2 and 3.3.5.

The groundwater flow directions and horizontal hydraulic gradients determined for the shallow overburden are consistent with results of previous studies (Bricknell 1982). The estimated groundwater flow velocities for the shallow overburden groundwater are:

Eastern and Central Area:	0.24 ft/day
Northern Area:	0.07 ft/day

These estimates assume a porosity range between 25% and 35% for the outwash material (USGS 1967) and an average hydraulic conductivity of 7.13 ft/day (based on the average of the hydraulic conductivity values of the wells screened in the shallow overburden (Plate 2).

These values are significantly lower than the approximate groundwater velocities calculated by Bricknell (1982). However, no site-specific hydraulic conductivity values were used in these previous calculations; instead, the hydraulic conductivity was assumed to be 107 ft/day based upon regional conductivity values for the glacial sand and gravel deposits of southern Rhode Island.

3.3.4.2 Deep Overburden Flow System. Groundwater movement in the deep overburden is also south-southeast towards the Saugatucket River, as shown in Plate 3. This system is less influenced by surface water interaction as a result of the partially confined conditions created by the less permeable lacustrine strata.

The Saugatucket River is not expected to act as a barrier to the southeastward groundwater movement in the deep overburden. However, the thickening of the lacustrine deposit in the southeastward direction (east of the river), as described in section 3.2.4.3, does act to reduce movement and increase upward vertical flow from the deep overburden towards the river.

Similar to the shallow system, the eastern and central portion of the site study area is characterized by a localized southeast flow direction. The horizontal hydraulic gradient (calculated between wells OW-27 and MW-06-02 and between wells OW-30, MW-04-02, and MW-05-02) is 0.01 ft/ft.

The northeastern portion of the site study area has a more southerly flow direction with a horizontal hydraulic gradient, calculated between wells MW-02-02 and MW-12-02, of 0.004 ft/ft. The estimated average flow velocities for the deep overburden groundwater are:

Eastern and Central Area:	0.59 ft/day

Northeastern Area: 0.24 ft/day

These estimates assume a porosity of 40% for the lower overburden materials, which contain a greater silt and clay content (Morris 1967), and an average conductivity of 23.54 ft/day (based on the average hydraulic conductivity values of the wells screened in the deep overburden and used to generate the contour map, Plate 3).

The seasonal groundwater elevation changes of the deep overburden flow system are illustrated by the long-term monitoring of well MW-02-02 as shown on Figure 3-16. An approximately 1.8-foot head change was observed over the monitoring period (September 1991 to April 1992). Similar to the levels in the shallow overburden flow system, the lowest levels in the deep overburden flow system were observed in the fall of 1991, and the highest level was observed during mid-winter of 1992 (February). As with the shallow overburden groundwater flow system, these seasonal changes in groundwater elevations did not affect the direction and overall horizontal hydraulic gradient of the deep overburden groundwater. Seasonal changes in vertical hydraulic gradients will be discussed in section 3.3.4.2.

The short-term rainfall responses of deep overburden groundwater elevations are illustrated by the hydrograph of MW-02-02, Figure 3-17. Groundwater responded quickly with a 0.18-foot head increase during the 1.33-inch, 15.4-hour rainfall event. Well MW-02-02 is positioned in the northeast portion of the site study area. As discussed in section 3.2.4.3, this area is lacking the lacustrine deposit that was found separating the shallow and deep groundwater flow system towards the southeast. The short-term rainfall response of the deep overburden groundwater in areas where the lacustrine deposit is present would be expected to be reduced and possibly delayed as a result of the confining nature of the lacustrine strata.

3.3.4.3 Bedrock Flow System. Groundwater elevations in the bedrock suggest a south-southeast hydraulic gradient. Groundwater movement in the bedrock is assumed to behave as fluid flow in a fractured media. This flow is driven by the southward hydraulic gradient, and movement is along localized fractures. As discussed in section 3.1.3, the principal regional

fractures near the site study area trend southeast. These fractures are anticipated to be the dominant flow media for bedrock groundwater at the site study area. However, the weathered and fractured bedrock found along the west-southwest portion of the site study area may produce localized anomalous flow directions. The impacts on groundwater flow of the weathered and fractured bedrock are not defined by the groundwater elevation contours presented on Plate 4 and have not been fully characterized during this investigation.

Using the September 1991 elevation data, the horizontal hydraulic gradient for the bedrock flow system across the northwest section of the site study area, calculated between wells MW-07-02 and MW-11-03, is 0.004 ft/day. The south-central section of the site study area between the solid waste area and the bulky waste area has a more southward gradient and appears to converge towards Mitchell Brook. A horizontal gradient of 0.006 ft/day was calculated between residential well 3 and well MW-11-03.

The orientation of the groundwater elevation contours suggests that movement of groundwater within the bedrock is influenced by the bedrock topographic high and trough. The contours converge southward from the eastern and western portions of the site study area. As the depth to the bedrock surface increases, the horizontal hydraulic gradient decreases and contours broaden to the south. It is estimated that the bedrock high corresponds to a bedrock groundwater recharge area because of the potential direct recharge of runoff to the bedrock.

In addition, groundwater is anticipated to discharge from the bedrock into the deep overburden along the flanks of the bedrock trough. The recharge and discharge of the bedrock groundwater flow system can be further characterized by the vertical hydraulic gradient discussed in section 3.3.4.4.

Seasonal fluctuation of bedrock groundwater elevations is illustrated by the long-term monitoring of wells MW-08-02 and MW-03-03, as shown on Figure 3-19. Short-term bedrock groundwater level responses to rainfall events are illustrated by the storm hydrographs of monitoring wells MW-08-02 and MW-03-03 shown on Figure 3-20.

Groundwater in the fractured shallow bedrock along the western edge of the site study area showed little long-term seasonal change but did show a 0.32-foot water-level increase as a result of a 1.33-inch, 15.4-hour rainfall event. This behavior of the shallow bedrock groundwater indicates that the long-term storage capacity of the shallow fractured bedrock media is limited but that a strong connection exists with surface recharge. The dominant surface recharge source near well MW-08-02 is the unnamed brook. Surface water recharge from the brook to groundwater will be discussed in section 3.3.5.

The deeper bedrock monitoring well, MW-03-03, responded with approximately a 1.5-foot long-term seasonal water-level change over the monitoring period (September 1991 to April 1992). Similar to groundwater in the overburden, the lowest levels were observed in the fall of 1991, and the highest was observed during mid-winter of 1992 (January). MW-03-03 also responded to the short-term rainfall event with approximately a 0.28-foot head increase. This response was approximately 10 hours behind the response observed in the overburden groundwater for the same storm event.

As with the overburden groundwater flow systems, seasonal changes in bedrock groundwater elevation did not affect overall horizontal hydraulic gradients of the bedrock system. Seasonal changes in the vertical hydraulic gradients between the bedrock and the deep overburden flow system will be discussed in the following section.

3.3.4.4 Vertical Hydraulic Gradients Between Flow Systems. Table 3-9 summarizes the vertical hydraulic gradients calculated from water-level measurements at the monitoring well clusters on September 30, 1991; January 27, 1992; and April 6, 1992.

A predominantly downward gradient was indicated between all three flow systems in the north-central portion of the site study area. Lacustrine sediments were not present at well clusters MW-01, MW-04, and MW-07. The highest downward gradients were observed at locations where the depth to bedrock was shallowest and the sandy outwash was directly overlying the bedrock surface.

A downward gradient was also noted between surface water and shallow groundwater along the southward-flowing Mitchell Brook in the central portion of the site study area. Upward gradients between surface water and shallow overburden groundwater along the Saugatucket River were recorded. These surface water and groundwater relationships are discussed further in section 3.3.5.

Upward gradients were found in the eastern and southeastern portion of the site study area. This area is characterized by an intermittent lacustrine layer found between the outwash and till strata, which thickens eastward and replaces the outwash on the eastern side of the Saugatucket River. The strongest upward gradient from the deep overburden to the shallow overburden is seen at the well cluster MW-12, southeast of the bulky waste area. In this area, the lacustrine deposits act as a confining layer. The piezometric groundwater head in well MW-12-02, positioned in the lower till, is higher than the ground surface.

The highest upward gradient between the deep overburden and bedrock was observed between wells MW-03-02 and MW-03-03. This indicates that bedrock groundwater is discharging into the overburden flow systems. This is believed to be the result of the bedrock topographic trough, which extends along the western edge of the Saugatucket River.

Seasonal changes in the vertical hydraulic gradients were noted during the monitoring period. In general, increases in both surface water and groundwater levels that occurred during the winter months resulted in an increased intensity of the gradients measured during September 1991. An exception to this trend was noted in well clusters located in close proximity to Mitchell Brook. Well cluster MW-04 showed a decrease in the vertical gradient between the deep overburden and bedrock during the winter months. Well cluster MW-06 indicated a reversal in the gradient between the shallow and deep overburden flow system, from an upward gradient recorded in September 1991 to a downward gradient in January 1992. These exceptions are believed to result from variations in the discharge of groundwater from the bedrock into the overburden. As discussed in section 3.2.4.4, the flanks of the bedrock low are expected to allow discharge of groundwater to the overburden. This discharge is believed to be highest

during the low water-level periods, as seen in September 1991, and would result in an increased upward gradient during this time.

3.3.4.5 Summary of the Identified Geologic Features Impacting Groundwater Movement. Several geologic features have been identified that impact the movement of groundwater across the site:

- A bedrock topographic high, located under the northwest portion of the solid waste area, appears to impact groundwater flow directions and hydraulic gradients in the overburden. Elevation contours suggest that groundwater is diverted southward or eastward around the high. The shallow bedrock also acts as a localized recharge area for the bedrock flow system.

- In the overburden, horizontal groundwater gradients across the northern portion of the site study area are significantly lower than gradients at other portions of the site study area. These lower gradients are believed to be the result of an increase in thickness of the saturated outwash deposits that have accumulated in the bedrock trough. The bedrock trough also is seen as a localized discharge area for the bedrock flow system. This discharge is expected to be highest during low water-level seasons.

- A combination of the rise in the surface elevation of the bedrock and the presence of thick lacustrine deposits on the western and eastern side of the Saugatucket River plays a significant role in the increased horizontal groundwater gradient and the strong upward gradients observed south of the bulky waste area adjacent to the river.

- Fractured and weathered bedrock along the west and southwest portion of the site study area may impact localized flow in bedrock. This fracture zone demonstrates limited storage capacity but is believed to be directly connected to runoff pathways and surface water receptors.

- A combination of highly permeable cover materials, the bedrock topographic high located along the northeastern portion of the solid waste area, and the presence of heterogeneous solid waste refuse is expected to create localized mounding of the shallow overburden flow system.

3.3.5 Groundwater and Surface Water Interaction

As discussed in section 3.3.2, the principal surface waters in the site study area include the Saugatucket River, Mitchell Brook, and the unnamed brook. The interactions between these surface waters and groundwater play an important role in the movement of water and the potential transport of contaminants across the site study area. The understanding of this interaction is particularly important for the evaluation and interpretation of seasonal variations in analytical data. The surface water and groundwater interaction has previously been evaluated by Bricknell (1982) and NUS (1989).

Bricknell (1982) collected surface water data from four gauging stations located in Mitchell Brook, the Saugatucket River, and the unnamed brook. Measurements were collected in November and December 1981 and March, April, and May of 1982. NUS (1989) collected surface water data from five stations in November 1987 and March 1988.

The results of both studies suggest that the Saugatucket River receives water from groundwater as it flows across the site study area. The interaction between surface water and groundwater in Mitchell Brook and the unnamed brook was observed to vary seasonally. Generally the surface waters lose water to groundwater most of the year, but gain water during high water table and low stream-flow periods.

To further characterize the relationship between surface water and groundwater near the site study area, a stream-flow budget and surface water/groundwater hydraulic gradient and streambed seepage analysis were performed.

The stream-flow budget is an analysis of the volumetric change in stream flow across selected reaches of the river or brook. This analysis can provide data on the amount of surface water gained or lost to groundwater across each reach. Surface water volume changes, however, can also be affected by the retention capacities of surrounding lowlands as flooding occurs during high water-level seasons.

The stream-flow budget procedure was discussed in section 2.3.2. The selected reaches of the surface water receptors are shown on Figure 3-21. Stream-flow volumetric calculations are included in Appendix D. Table 3-10 summarizes the result of the stream-flow budget.

Water levels and streambed-seepage volumetric-flow rates were used to determine vertical hydraulic gradients between surface water and groundwater and to calculate streambed hydraulic conductivity values. This information is helpful for providing estimates of the gains and losses between surface water and groundwater.

Mini-piezometers and seepage meters installed at selected surface water staff gauge stations were used to collect hydraulic gradient data and seepage rates, as described in section 2.3.3. Streambed hydraulic conductivity values and seepage rates were discussed in section 3.3.3 and presented on Table 3-7. Vertical hydraulic gradients between surface water and groundwater are summarized on Table 3-11.

The following sections summarize the observed seasonal changes in stream volumetric flow and surface water interactions with groundwater.

3.3.5.1 Late Spring and Early Summer, June and July 1991. Surface water and groundwater levels were at a seasonal low during the spring and early summer of 1991, as discussed in sections 3.3.2.2 and 3.3.4.1 Precipitation was low and air temperatures were high. Recorded surface water velocities indicate that the surface water receptors were at low-flow conditions. The primary supply for surface water was groundwater baseflow and, as such, the surface water flow budget is believed to closely reflect the gains and losses between surface water and groundwater. Analytical results of the surface water receptors collected during this period are anticipated to closely reflect groundwater quality as a result of the large groundwater contribution and limited dilution potential.

Saugatucket River. The stream-flow budget indicates that the river gains water (0.18 to 0.12 ft^3/sec) throughout the northern and midsection reaches (Reaches 1 and 2), as shown on

Table 3-10. Water-level measurements from the mini-piezometers and seepage meters positioned at SG-01, SG-05, and SG-07 reflect a low hydraulic gradient or equilibrium condition between surface water and groundwater. This information suggests that during the late spring, the Saugatucket River closely interacts with the shallow overburden flow system. This interaction allows for both recharge and discharge of groundwater to the river, resulting in an overall net gain of the surface water volume. Although seepage rates were not measured during June 1991, the hydraulic gradients, as shown on Table 3-11, indicate the largest groundwater discharges to the Saugatucket River occur near SG-05, immediately east of the bulky waste area. These data are consistent with observed groundwater seeps and discharge points along the banks of the river. They are also consistent with the steep groundwater elevation gradient of the shallow overburden groundwater in this area, as shown on Plate 2. The steep gradient indicates that because groundwater is slightly above the surface water elevation, groundwater seepage would be expected along the river banks.

Mitchell Brook. The volumetric flow rates along the northern eastward-flowing reach of Mitchell Brook (Reach 1) recorded between SG-10 and SG-08, also indicate similar equilibrium conditions during the spring and early summer of 1991. No net gain or loss of surface water was observed. Water-level measurements of the mini-piezometers at SG-10 and SG-09 show upward hydraulic gradients (+0.12 ft/ft and +0.11 ft/ft, respectively) between surface water and groundwater, suggesting localized groundwater discharge points along the western upstream portion of the reach. Groundwater seeps were visually observed near SG-09 during June 1991. A small downward gradient (-0.01 ft/ft) measured at SG-08 indicates that along the eastern portion of this reach, as the brook turns southward, surface water may provide recharge to the shallow overburden groundwater flow system.

Volumetric flow rates of the upper portion of the southward-flowing reach (Reach 2) between the solid waste and bulky waste areas (recorded at SG-08 and SG-03) indicate a decrease in flow of approximately -0.18 ft^3/sec. Small downward gradients of -0.01 ft/ft and -0.02 ft/ft were recorded at SG-08 and SG-03, respectively, and suggest a loss of surface water to groundwater.

Hydraulic gradients and stream-flow volumes of the lower portion of Reach 2 of Mitchell Brook from SG-03 to SG-11 indicate that as the brook flows southward towards the Saugatucket River, downstream of the site study area, it begins to receive additional flow from groundwater. A net volumetric flow increase of approximately +0.13 ft^3/sec was recorded between SG-03 and SG-11, and a strong upward hydraulic gradient of +0.34 ft/ft was measured at SG-11.

Unnamed Brook. A strong downgradient hydraulic gradient (-0.90 ft/ft) was measured at SG-12 and suggests that the unnamed brook loses water and is a source of recharge for the shallow overburden groundwater flow system in that area. The unnamed brook also is believed to provide direct recharge to the bedrock groundwater flow system since the depth to the bedrock is shallow (less than 15 feet) in this area and the material is sandy. This direct recharge of water to the shallow bedrock from the unnamed brook may provide an explanation for the limited seasonal change in water level observed in the shallow bedrock well of MW-08-02, as seen on Figure 3-16.

3.3.5.2 Early Fall, September 1991. An increase in overall surface water levels and a slight decrease in groundwater levels were evident during the early fall of 1991. Precipitation increased while temperatures decreased. Based upon the increased frequency and size of the precipitation events occurring during the fall, as shown on Figure 3-17, runoff from storm events is expected to have a large impact on groundwater and surface water interactions. The runoff is expected to rapidly increase short-term surface water levels above groundwater levels, creating fluctuations of the hydraulic gradients between surface water and groundwater.

The stream-flow budget during this period appears to reflect variations in the retention capacity of the lowlands surrounding each reach rather than direct gains or losses from groundwater. This prevents a strong correlation or comparison between the flow budget and groundwater and surface water interactions. Hydraulic gradients and seepage rates, therefore, were used as the primary data in defining the groundwater discharge and recharge locations.

Saugatucket River. An analysis of the September/October 1991 data reveals that the overall relationship and interaction between groundwater and surface water of the Saugatucket River remained consistent with the spring data. The river gained water from groundwater, but showed low vertical hydraulic gradients. Highest groundwater discharges were observed at SG-05 (+0.27 ft^3/day).

Stream-flow volumetric analysis of the downstream reach of the river (Reach 3) south of the site (between SG-07 and SG-06) suggests that the river begins to lose water (-1.04 ft^3/sec). This loss is believed to be the result of an increased storage of water within the lowlands as a result of flooding. Since the surface water/groundwater interaction along this reach is consistent with that of June 1991, with discharges of groundwater to the river recorded at SG-07 (+0.20 ft^3/day), the loss in flow is assumed not to be related to a loss of surface water to groundwater.

Mitchell Brook. The volumetric flow rates along the northern eastward-flowing reach of Mitchell Brook (Reach 1), recorded between SG-10 and SG-09, indicate a loss of surface water of approximately -0.37 ft^3/sec during September 1991. Water-level measurements of the mini-piezometer at SG-10 showed a small downward hydraulic gradient of -0.03 ft/ft and a seepage rate into the shallow overburden of -0.01 ft^3/day. These data reflect a reversal of the trends shown by the June 1991 data and suggest that the upstream portion of Mitchell Brook is affected by the increased runoff and higher surface water levels.

The volumetric flow rates of the southward-flowing reach of Mitchell Brook (Reach 2), recorded between SG-08 and SG-03, also indicate a reversal from the June 1991 trends. A gain of approximately +0.52 ft^3/sec was recorded between SG-08 and SG-03. Upward gradients of +0.14 ft/ft and +0.02 ft/ft were recorded at SG-08 and SG-03, respectively.

Stream-flow volumes of the lower portion of the brook (Reach 3) between SG-03 and SG-11 indicate a loss of flow of approximately -0.37 ft^3/sec. This loss is assumed to result from the flooding of the lowlands along this reach and is similar to the losses observed along Reach 3 of

the Saugatucket River. Seepage rates measured at SG-11 of +0.14 ft^3/day suggest that, as the brook merges with the Saugatucket River, groundwater begins to discharge to the brook.

Unnamed Brook. A strong downgradient hydraulic gradient (-0.33 ft/ft) recorded at SG-12 and a groundwater seepage rate of approximately +3.32 ft^3/day suggest that the unnamed brook loses water to groundwater consistent with June 1991 trends.

3.3.5.3 Winter, January 1992. Groundwater and surface water levels were at the highest during the 1991/1992 monitoring period. The volume of groundwater baseflow contribution to surface water was also highest during this period. Precipitation amounts had declined, suggesting that direct runoff effects were reduced from the September 1991, results.

Saugatucket River. Large stream volumetric gains were measured between SG-01 and SG-05 (+15.68 ft^3/sec), and large losses were measured between SG-05 and SG-07 (-9.7 ft^3/sec). These losses and gains are believed to reflect variations in the retention of surface water by the lowlands surrounding the banks of the river. Losses were recorded along portions of the reach where topography was lowest and flooding occurred. Gains were seen along portions of the river with better-defined stream banks. The flow budget along the river does not reflect overall changes in the groundwater and surface water interaction. The hydraulic gradient and seepage measurements indicate similar trends, with groundwater discharges occurring at locations similar to those noted during September 1991. Hydraulic gradients and seepage rates did increase, however, during this higher water-level season. The maximum discharge of groundwater recorded at SG-05 was +0.51 ft^3/day.

Mitchell Brook. Groundwater discharged to the brook during the winter of 1991 with the exception of the northwest portion near SG-10. The highest groundwater discharge was measured at SG-11 (+0.22 ft^3/day). The largest increase in the groundwater discharge occurred at SG-03, which increased from +0.01 ft^3/day (September 1991) to +0.15 ft^3/day (January 1992).

Reach 1 of Mitchell Brook lost flow volume between SG-10 and SG-09 as it did during the fall (September 1991). The upstream portion of Reach 2 also lost approximately -3.8 ft^3/sec, a reverse of the fall data. This loss is believed to be the result of flooding of the lowlands area of this reach, similar to the losses seen across Reaches 2 and 3 of the Saugatucket River. The downstream portion of Reach 2 between SG-03 and SG-11 indicates a net gain in surface water volume as the brook moves southward towards the merge with the Saugatucket River.

Unnamed Brook. The seepage data collected at SG-12 indicates that surface water is lost to groundwater (-1.92 ft^3/day) along the upstream portion of Reach 1. The hydraulic gradient had decreased from -0.9 ft/ft recorded during low-flow conditions (June 1991) to -0.15 ft/ft during high-flow conditions (January 1992). This trend suggests that groundwater recharge of surface water from the brook is greatest during low-flow conditions and decreases as water levels rise.

3.3.5.4 Early Spring, April 1992. Surface water and groundwater levels began to decline during the early spring of 1992 as a result of increased temperatures and lack of precipitation and snow melt. Groundwater and surface water levels measured during April 1992 were lower than January 1992 but still substantially higher than those measured during June and September 1991.

Saugatucket River. Analysis of April 1992 data reveals a similar relationship between groundwater and surface water as that seen in January 1992. Volumetric flow rates and groundwater seepage rates had declined from those recorded during January 1992. The highest rate (0.44 ft^3/day) remained at SG-05, located southeast of the bulky waste area.

Mitchell Brook. The stream-flow volumetric budget for Mitchell Brook indicates that Reaches 1 and 2 remained consistent with January 1992 results. The hydraulic gradient and seepage rates showed a decrease in flow between groundwater and surface water. The most significant reduction in seepage rates was recorded at SG-11 along the southern downstream portion of the river.

Unnamed Brook. The mini-piezometer data at SG-12 indicates a consistent loss of surface water along the upstream portion of the reach.

3.3.5.5 Summary and Significance of Groundwater and Surface Water Interaction. Changes in stream-flow volumes of the surface water receptors were controlled by groundwater baseflow during low-flow seasons; however, during high-flow, high surface water-level periods, changes in flow volumes were driven by the flooding potential of the lowlands surrounding the river reaches. The reaches most affected by flooding were Reaches 2 and 3 of the Saugatucket River and the lower portion of Reach 2 of Mitchell Brook.

Figure 3-22 illustrates the overall stream volumetric flow trends and the principal groundwater discharge and recharge locations.

The relationship between groundwater and surface water along the Saugatucket River did not significantly change seasonally. Highest discharges were consistently seen at SG-05, while upstream and downstream stations SG-01 and SG-07 remained generally in equilibrium. Long-term seasonal water-level changes impacted the magnitude of groundwater discharges; higher water levels created higher groundwater seepage rates. The limited effects from seasonal changes on the relationship between groundwater and surface water are believed to be due to the thickness of the saturated overburden along the Saugatucket River. This thickness results in a large storage capacity of the overburden groundwater flow system. This storage capacity creates a balance between surface water and groundwater levels, allowing both recharge and discharge to occur along the reaches.

The significance of these findings in regards to the fate and transport of potential contaminants along the Saugatucket River is as follows:

- Potential contaminants found in the shallow overburden groundwater flow system would be expected to discharge to the surface water along most of the Saugatucket River adjacent to the site observed study area. The greatest outlet for the shallow groundwater was along the eastern edge of the bulky waste area.

Saugatucket River is not expected to act as a barrier to contaminant migration in the lower overburden or bedrock groundwater flow systems.

- The flooding that occurs along Reaches 2 and 3 of the river during high-flow-volume periods provides the potential for redistribution of contaminants found in the surface water and shallow groundwater to the sediments along the river banks.

- The contaminant transport via surface water flow southward and groundwater discharge to surface water is expected to remain consistent throughout the year.

Mitchell Brook received groundwater throughout most of the year along the lower reaches between SG-03 and SG-11. The seepage rates between groundwater and surface water were higher during the high-flow seasons; this was also the case in the Saugatucket River. The upstream reaches of the brook (Reach 1 and the upper portion of Reach 2) were more sensitive to long-term seasonal water-level changes and runoff events than the downstream portion of the brook and the Saugatucket River. This sensitivity is believed to be the result of a limited storage capacity of the shallow overburden groundwater flow system caused by the thin nature of the saturated overburden materials in these areas and the shallow depth of the bedrock. The limited storage capability resulted in a greater response to small increases or decreases in surface water elevations.

The significance of these findings in regards to the fate and transport of potential landfill contaminants along Mitchell Brook is as follows:

- Potential contaminants primarily associated with the solid waste area found in the shallow overburden groundwater flow system would be expected to discharge to the surface water along the lower reaches of the brook.

- Contaminant transport to and from groundwater in the shallow, deep, and bedrock flow system may be possible along the northern reaches of the brook due to the thin saturated overburden and bedrock high located in this area.

- Contaminant transport along the northern reaches of the brook is season dependent. Surface water transport to groundwater is possible throughout the year, while high runoff may result in groundwater discharges and increased sediment load caused by erosion.

The unnamed brook consistently remained a source of water for groundwater. Largest surface water contributions to groundwater were estimated during low-flow conditions. Based upon the groundwater hydrograph of monitoring well MW-08-02, as discussed in section 3.3.4.3, it is expected that the unnamed brook is a source of recharge for the bedrock groundwater flow system as well as the overburden flow systems.

3.3.6 Summary and Significance of Site Study Area Hydrogeology

In summary, groundwater occurs in both the unconsolidated overburden deposits and in bedrock fractures. Movement of groundwater is towards the southeast and is governed by the predominant southeast regional drainage pattern established during the Wisconsin glacial age.

Groundwater in the unconsolidated overburden can be subdivided into two flow systems, the shallow flow system and the deep flow systems, based upon the type and thickness of the geologic strata encountered and the depth to the bedrock. The shallow system consists of the saturated overburden made up of predominantly sandy outwash deposits found within the upper 35 feet of the subsurface. Groundwater within this system is unconfined and is directly interconnected with surface water of Mitchell Brook and the Saugatucket River. The shallow groundwater discharges to the both surface water bodies, south of the study area.

The deep overburden groundwater flow system consist of the saturated till, lacustrine and outwash deposits generally deeper than 35 feet below ground surface. The lacustrine deposits found in the southeastern portion of the site study area creates partially confined flow conditions resulting in upwards vertical gradients and artisan conditions. The deep overburden groundwater is less influenced by surface water, as a result of the deepness of the system and the presence of lacustrine deposits separating the southern portion of the Saugatucket River from the lower groundwater system. The Saugatucket River is not a boundary for the eastward flow of groundwater within this system. The bedrock trough, west of the Saugatucket river and the thicker lacustrine deposits east of the river, however, limit the flow in the deep overburden groundwater eastward past the river.

Groundwater flow velocities within the overburden is estimated between 0.07 and 0.59 ft/day. Highest velocities occur in the easter and central portions of the study area where the overburden is less than 30 feet in thickness. Although not observed, due to the limited number of wells positioned in the refuse areas, mounding of the overburden groundwater is expected over the solid waste area. This mounding would produce a localized radial flow outwards from the topographic landfill high.

The bedrock flow system consist of the groundwater stored within bedrock fractures. The bedrock groundwater elevations indicate a south-southeast hydraulic gradient and regional movement. The bedrock flow system is interconnected with the overburden groundwater as evidenced by the permeable outwash and till directly overlying the bedrock surface. The bedrock surface topography is expected to control this interconnection. High surface bedrock elevation topography, as seen along eastern portion of the solid waste area, are areas of bedrock recharge from the overburden groundwater system. Low bedrock elevations of the bedrock trough along the western edge of the Saugatucket River are areas of bedrock groundwater discharge. The Saugatucket River is not a boundary for the eastward movement of the bedrock groundwater.

Several hydrogeologic features have been identified which are considered to be important for the evaluation of the extent, fate, and transport of potential on site contaminants:

Feature:	Similarity in hydraulic conductivity of the till and glacial outwash.
Significance:	Because of the close range in conductivities, the till does not act as a hydraulic barrier to the movement of groundwater or potential contaminant transport from the overburden into the bedrock along the central and northern portion of the site study area.
Feature:	Low hydraulic conductivity of the glacial lacustrine sediments.
Significance:	The lacustrine deposits act as a partial confining layer between the outwash and till. This confining layer provides a partial separation of the shallow overburden groundwater from bedrock groundwater along the southeastern portion of the site study area. Groundwater

elevations in the deep overburden are higher than those in the shallow overburden and at several locations are above the ground surface.

Feature: Similarity of the hydraulic conductivity of the landfill cover materials and the surrounding natural materials.

Significance: The cover materials of the disposal areas will have similar infiltration capacities as those of the surrounding natural sandy outwash materials. Precipitation across the topographic flattop areas of the disposal areas is expected to percolate through the landfill refuse to create leachate. In addition, the combination of the infiltration of precipitation and the heterogeneous nature of the solid waste refuse will result in localized mounding of the shallow overburden groundwater.

Feature: Groundwater movement in the shallow overburden is unconfined and is interconnected to the surface water in Mitchell Brook and the Saugatucket River.

Significance: Infiltration of precipitation and transport of potential near-surface contaminants into the shallow overburden groundwater is unrestricted. Both Mitchell Brook and the Saugatucket River are receptors for shallow groundwater flow and potential contaminants.

Feature: Bedrock topography impacts both the overburden and bedrock groundwater flow systems.

Significance: The bedrock high provides a partial barrier to groundwater movement in the shallow overburden along the northeast edge of the solid waste area. Movement of groundwater and potential contaminants in this area is diverted to the south around the high or into the bedrock groundwater flow system. The bedrock trough situated along the western edge of the Saugatucket River increases the saturated thickness of the overburden and decreases the hydraulic gradients of the overburden flow systems. The decrease in gradients results in slower groundwater velocity. In addition, the bedrock groundwater moving through the higher bedrock areas to the northwest discharges to the overburden along the flanks of the trough.

3.4 ECOLOGICAL ASSESSMENT

The objective of the ecological assessment was to describe the ecological resources that occur at the site and to assess their relative health. The information obtained for this assessment was also used in the ecological risk assessment (section 7) to determine potential contaminant exposure pathways and to analyze the effects of contaminants.

A biological field program was implemented to investigate the ecological resources within the site study area. The results of the initial site reconnaissance surveys of terrestrial, wetland, and aquatic habitats, in combination with information on the nature and extent of contamination (section 4) and the fate and transport mechanisms of the site contaminants (section 5), suggested that potential impacts were most likely to occur in aquatic habitats located adjacent to and downgradient from the disposal areas. Based upon this determination, additional biological field sampling was limited to quantitative surveys of the benthic segment of the aquatic community in Mitchell Brook and the Saugatucket River. No sampling was conducted in the unnamed brook since, within the site study area, it is dry most of the year. No additional surveys were conducted in terrestrial or wetland habitats. This section describes the results of the biological field program.

3.4.1 Wildlife

This section describes the results of wildlife surveys conducted within the site study area on May 30 and 31, 1991, as part of the initial reconnaissance field survey. The discussion is subdivided by major taxonomic group (birds, mammals, reptiles and amphibians, and other organisms). Scientific names of species observed on the site study area are given in Table 3-12.

3.4.1.1 Birds. Field observations of avian species are summarized in Table 3-12. Brief life histories of selected species can be found in Table 3-13. These species were selected because of their observed use of the site study area and to represent a number of ecological niches for feeding and nesting.

A total of 41 species of birds were observed (visually, aurally, or by sign) on the site during the May reconnaissance survey (Table 3-12). This list of bird species should be considered a minimum count of species using the site study area because of the low intensity of this reconnaissance-level survey and seasonal limitations.

Passerines were most numerous; relatively few waterbirds and raptors were observed. Two species of waterfowl (Canada goose and mallard) were observed, as were several belted kingfishers. As many as four glossy ibis and a single great egret were observed feeding or resting in shallow ponds in the former quarry located on the extreme northern portion of the site. Killdeer and greater yellowlegs were the only shorebird species observed, and only one species of raptor (red-tailed hawk) was sighted. A single gull was observed flying over the solid waste area. Northern bobwhites (a species of quail) were observed in small numbers on portions of the site. This species is released on site by the site's owner for hunting purposes; a release of 150 birds occurred several days prior to the survey.

A single species of woodpecker (northern flicker) was observed on site. Another woodpecker species was observed incidental to other site activities; based upon the description, this bird was likely a male red-bellied woodpecker (*Melanerpes carolinus*). Among passerines, species utilizing field, shrub, or edge habitats were most commonly observed. These included barn swallow, American goldfinch, field sparrow, gray catbird, prairie warbler, and rufous-sided towhee. Passerine species utilizing forested areas, such as black-capped chickadee, blue jay, northern cardinal, and wood thrush, were less frequently observed.

Old nests of three bird species were discovered on site. Because these nests were heavily weathered, identification was not certain but they appeared to be of gray catbird, American goldfinch, and American robin. No active nests were found, although adult gray catbirds and European starlings were observed with food in their bills, suggesting a nearby nest or recently fledged young. A single, intact northern bobwhite egg was discovered in a shrubby area on the edge of the sewage sludge area. This egg was likely deposited by a recently released bird and did not represent an active attempt at nesting, as the egg did not contain a viable embryo.

Although northern flickers and black-capped chickadees were regularly observed on site, few nest holes were apparent and no active nests were located. It should be noted that many more avian species than indicated by this brief reconnaissance survey may breed on the site.

Since surveys were not conducted during the winter period, winter bird usage of the site study area and general vicinity was characterized using Christmas bird count (CBC) data from 1987 to 1991 (Kraus 1988; 1989; 1990; 1991). Christmas bird counts are one-day counts conducted annually during the months of December or January within a circle with a diameter of 15 miles. Birds seen or heard are enumerated during these counts.

The CBC plot within South Kingstown, Rhode Island, is centered about two miles southwest of the site. Thus, the site is within the 15-mile diameter of the census plot. Table 3-14 lists the number of birds, by species, counted during the past four surveys. Suitable habitat for all of the species listed in this table may not occur within the site study area, however. For example, the habitat within the CBC plot includes coastal areas and several large ponds, and the species associated with these habitats (e.g., loons, grebes, cormorants, and most species of waterfowl and shorebirds) would not be expected to occur within the site study area, as these habitats do not occur on site.

3.4.1.2 Mammals. Field observations of mammals, or their sign, are summarized in Table 3-12. Brief life histories of selected species can be found in Table 3-15. These species were selected because of their observed use of the area and to represent a number of ecological niches.

Eight species of mammals were observed either visually or by sign during the May reconnaissance survey (Table 3-12). Signs of two additional species, muskrat (*Ondatra zibethicus*) and woodchuck (*Marmota monax*), were observed during aquatic surveys. Little tracking media was available, except on dirt roads and along Mitchell Brook; dense vegetation obscured tracks and scat over most of the site. Thus, results of this brief survey probably do not fully document typical use of the site study area by most species of mammals. Dog and

horse tracks were common on the roads, and the strong dog scent in these areas may have discouraged use by some mammalian wildlife species.

Eastern cottontails were the most numerous mammalian species observed, with a total of four sightings on the disposal areas and adjacent ecotones. Rabbit droppings and forms were also commonly observed on the disposal areas, especially on the solid waste area. Eastern chipmunks were seen or heard on several occasions in wooded and edge habitats. Eastern gray squirrels were observed in forested areas, as were several leaf nests; mast-producing trees (e.g., oaks) were abundant in these forested habitats. A woodchuck burrow was observed near SW/SD-10 during aquatic surveys.

A dead white-footed mouse was found in a shrubby area just north of the sewage sludge area. The carcass was unscavenged and showed some trauma on the back and right flank; these injuries are consistent with an animal killed by a hawk or owl. In addition to the white-footed mouse, small mammal species that may use the site, based upon geographic range and available habitat, include northern short-tailed shrew (*Blarina brevicauda*), hairy-tailed (*Parascalops breweri*) and eastern (*Scalopus aquaticus*) moles, and meadow vole (*Microtus pennsylvanicus*) (DeGraaf and Rudis 1983).

Although not observed, bats are likely to use the site study area during the spring and summer periods. The two species most likely to use this area are the little brown bat (*Myotis lucifugus*) and the big brown bat (*Eptesicus fuscus*); these species would likely use the open field habitats to forage for insects (DeGraaf and Rudis 1983).

A road-killed Virginia opossum was found on Route 138 near the site. The landowner also reported finding two dead Virginia opossums and two dead striped skunks on the site last year (Frisella 1991). Cause of death was unknown, but none of these carcasses were reported to have any signs of external trauma.

Raccoon tracks were observed at two locations along Mitchell Brook and along the Saugatucket River near SW/SD-02. Suitable habitat for other semiaquatic or wetland-dependent mammals, such as beaver (*Castor canadensis*), muskrat, and river otter (*Lutra canadensis*), is generally absent from most of the site study area except along the Saugatucket River. However, old muskrat bank burrows were reportedly observed in the small palustrine emergent wetland north of the solid waste area by geophysical personnel (Hasiotis 1991). No signs of muskrats were observed in this area during the wildlife reconnaissance survey, and the water levels in this wetland appeared too shallow and the vegetation too sparse to support muskrat. Muskrat tracks were observed in Mitchell Brook near SW/SD-07 (south of the transfer station road) during aquatic surveys. Only marginal habitat exists along Mitchell Brook for wetland-associated species, such as mink (*Mustela vison*), because of an apparently reduced prey base of fish and amphibians.

White-tailed deer tracks were observed in two locations during the May reconnaissance survey: in the abandoned quarry at the northern end of the site study area and near Mitchell Brook by the northeastern corner of the solid waste area. The running of hunting dogs on site (observed on May 30 and 31, 1991, and June 18 to 28, 1991) probably discourages use of the area by deer, at least of the open, grassy areas. Deer tracks were also observed along Mitchell Brook near SW/SD-15 and SW/SD-10 and along the Saugatucket River near SW/SD-05 during aquatic surveys.

Mammalian species using the site study area during the winter season are likely to be similar to those described above. Several species observed during the on-site surveys (eastern chipmunk and woodchuck) hibernate during the winter months but would likely do this on site. White-tailed deer would not likely use the site study area during cold periods with significant snow cover, since little thermal cover, in the form of patches of coniferous trees, exists on site.

3.4.1.3 Reptiles and Amphibians. Field observations of reptiles and amphibians are summarized in Table 3-12. Brief life histories of selected species can be found in Table 3-16.

These species were selected because of their observed use of the area and to represent a number of ecological niches.

Compared to birds and mammals, most reptiles and amphibians are much more difficult to observe. The most frequently observed group were frogs/toads. Several bullfrogs were heard calling from the emergent wetland north of the solid waste area and from small ponds near Mitchell Brook further downstream. Several tadpoles were also observed in Mitchell Brook during aquatic surveys at SW/SD-15 and SD/SW-01 and in the Saugatucket River at SW/SD-11. Two American toads were observed in the wooded area near the transfer station. Although only two species were identified, bullfrog and American toad, other species that are likely to be found on site include spring peeper (*Pseudacris crucifer*), green frog (*Rana clamitans melanota*), wood frog (*Rana sylvatica*), and gray treefrog (*Hyla versicolor* and *H. chrysoscelis*) (DeGraaf and Rudis 1983).

Newts and salamanders are also likely to occur on site based on available habitat. The only observation of these organisms was a single salamander (species unknown) observed during aquatic surveys in Mitchell Brook at SW/SD-09. Species likely to be present on the site include northern dusky salamander (*Desmognathus fuscus*), spotted salamander (*Ambystoma maculatum*), northern two-lined salamander (*Eurycea bislineata*), redback salamander (*Plethodon cinereus*), and red-spotted newt (*Notophthalmus viridescens*) (DeGraaf and Rudis 1983).

A single common snapping turtle was observed on the sewage sludge area during geophysical surveys (Hasiotis 1991). This may have been a female that traveled from the Saugatucket River in search of an upland nest location. Other turtle species would not be expected to frequently utilize the site study area due to the lack of permanent water in most locations.

Several eastern garter snakes were observed in upland areas during geophysical surveys (Hasiotis 1991). Other species common to the area which may be present on the site include northern brown snake (*Storeria dekayi dekayi*), smooth green snake (*Opheodrys vernalis*), northern

ringneck snake (*Diadophis punctatus edwardsii*), eastern ribbon snake (*Thamnophis sauritus sauritus*), and eastern milk snake (*Lampropeltis triangulum triangulum*) (DeGraaf and Rudis 1983).

Reptiles and amphibians, being cold-blooded, hibernate during the winter months. Salamanders, newts, and frogs may hibernate in aquatic (bottom mud) or terrestrial (typically under litter) habitats, depending upon species. Turtles typically winter under mud in ponds or other water bodies. Snakes generally hibernate on land, usually in burrows of other species or in rock or slash piles (DeGraaf and Rudis 1983).

3.4.1.4 Other Organisms. Various terrestrial invertebrate taxa were also noted during wildlife surveys. Numerous insects were observed on site including butterflies (monarch [*Danaus plexippus*] and tiger swallowtail [*Papilio glaucus*]), and several species of moths, dragonflies, and beetles. Ant colonies were commonly observed in exposed dirt areas on the disposal area. Spiders and ticks were also observed.

3.4.2 Threatened and Endangered Species

Species listed as threatened, endangered, of special concern, or of state interest were identified within the site study area through field reconnaissance, literature review, and contacts with federal, state, and local agencies. This search identified one plant species of state interest and one plant species of state concern known to occur within the vicinity of the site study area. A Rhode Island species of state interest is a native species not currently considered to be state endangered or state threatened that occurs in only six to ten known sites in the state. A Rhode Island species of concern is a native species listed by the Rhode Island Natural Heritage Program because of rarity and/or vulnerability or for which information on its status is not currently well known.

The Rhode Island Department of Environmental Management (RIDEM 1991) identified an obligate wetland species of state interest, tickseed sunflower (*Bidens coronata*), as occurring in the vicinity of the Saugatucket River immediately upstream of Saugatucket Road (Figure 3-23). The bloodroot (*Sanguinaria canadensis*), a state species of concern, was also identified by RIDEM (1991) as occurring immediately north of Mitchell Brook on the west side of Rose Hill Road (Figure 3-23).

Two bird species listed as species of state interest, great egret and glossy ibis, were also observed within the site study area. However, the state designation applies only to breeding sites for these species; suitable breeding areas for these species do not occur within the site study area, except possibly along the Saugatucket River. A probable observation of a red-bellied woodpecker, a state species of concern, also occurred within the site study area.

A number of other state-listed bird species were documented in the site study area region during CBC surveys. State designations, except for the bald eagle, are based on breeding sites for these species. All of these species, except possibly the horned lark, are unlikely to breed on site, based upon available habitat. The bald eagle, a federally listed endangered species, occurs infrequently in the site study area region and would not be expected to regularly occur on site.

3.4.3 Habitat Types

The site study area contains a variety of upland and wetland habitat types (Figure 3-24). The site is dominated by deciduous forest (44%) and successional old field (30%) habitats (Table 3-17). Scrub and shrub habitats exist in small amounts. Structures associated with the owner's residence and the transfer station exist on site and are surrounded by mowed lawn. Unvegetated areas are associated with the abandoned quarry in the northern portion of the site.

The three disposal areas are vegetated with a variety of grasses and forbs, although a portion of the sewage sludge area is dominated by low shrubby growth (Figure 3-24). Soils are

generally sandy or silty with little organic matter in these areas. Small areas of emergent wetland vegetation were found on the solid waste and sewage sludge areas (see section 3.4.4).

The areas along Mitchell Brook, between the disposal areas and the Saugatucket River and south of the transfer station road, are forested (Figure 3-24). Red maple (*Acer rubrum*) and white oak (*Quercus alba*) dominate the overstory, and scattered pine (*Pinus* spp.) and northern white cedar (*Thuja occidentalis*) also occur. Snags are generally uncommon. Understory woody vegetation along Mitchell Brook and the Saugatucket River is very dense and is dominated by common greenbrier (*Smilax rotundifolia*). The understory of the drier areas is more open, and the ground layer in these areas is dominated by ferns.

The area near the owner's residence is a mixture of mowed lawn, old field, scrub, and open deciduous forest habitats (Figure 3-24). The northern portion of the site, a former quarry, is sparsely vegetated and used by the owner for target and skeet shooting. Scattered depressions, sparsely vegetated and filled with water, occur in this area.

Mitchell Brook is a relatively narrow and shallow watercourse, varying from 5 to 15 feet in width and from 6 to 24 inches in depth. The substrate is mud interspersed with rocky areas, and the flow is relatively swift, at least in the spring. The banks are generally steep and up to two feet high. During the reconnaissance survey, the water was mostly clear in the northern portion of the site, although geophysical personnel reported seeing an oily sheen in the water near the junction of Rose Hill Road and the access road to the owner's residence. The sediments in this brook were orange-stained (iron oxide) beginning downstream of where the brook crosses the road connecting the solid waste and bulky waste areas (see section 3.4.5). The sediments, in general, became increasingly stained from this point southward; the staining was most noticeable south of the transfer station road.

The Saugatucket River is wider and deeper than Mitchell Brook. Rocky, fast-flowing areas are interspersed with pools and emergent wetland areas. South of the bulky waste area, large amounts of orange floc coat submerged rocks and logs.

Approximately 23 acres of wetland habitats exist on the site study area, nearly all of which is palustrine forested wetland (Figure 3-24; Table 3-17). Palustrine forested wetlands are largely confined to the areas bordering Mitchell Brook and the Saugatucket River. The only major emergent wetland area occurs just north of the access road into the owner's residence. This wetland, bordering Mitchell Brook, is about 300 feet long by about 100 feet wide (see section 3.4.4). Water levels in this wetland were low during the reconnaissance survey, exposing areas of soft mud. Small areas of open water were also present in some areas, especially in the forested areas near Mitchell Brook and in the northern quarry area (Figure 3-24). Most of these open water areas are likely to dry out seasonally.

3.4.4 Wetlands

The Rhode Island Freshwater Wetlands Act protects freshwater wetlands including, but not limited to, "marshes; swamps; bogs; ponds; rivers; river and stream floodplains and banks; areas subject to flooding or storm flowage; emergent and submergent plant communities in any body of fresh water including rivers and streams and that area of land within fifty feet of the edge of any bog, marsh, swamp, or pond...; land within two hundred feet of the edge of any flowing body of water having a width of 10 feet or more, and that area of land within one hundred feet of the edge of any flowing body of water having a width of less than 10 feet during normal flow." Wetlands are defined, under the Rhode Island Freshwater Wetlands Act, according to the plant community present or the association of plants that collectively comprise more than 50 percent of the plant cover present in a given area.

3.4.4.1 Off-Site Wetland Determination. The literature-based wetland determination included review of the USGS map (USGS 1975), the U.S. Department of Agriculture, Soil Conservation Service soil survey of Rhode Island (USDA 1981), and the National Wetlands Inventory maps (USFWS 1975). The USGS map identifies Mitchell Brook, the Saugatucket River, and an unnamed brook as perennial streams. One small open water area occurs along Mitchell Brook north of the site owner's driveway. According to the USGS, three areas are designated as wetlands on the site. One wetland is located on the west side of the Saugatucket River adjacent

to the sewage sludge area. A second wetland is located at the intersection of Mitchell Brook and the Saugatucket River and downstream of this intersection to Saugatucket Road. A third wetland is located along the unnamed brook in the vicinity of the intersection of the brook with Rose Hill Road. No other wetlands or open water areas are indicated by the U.S. Geological Survey map.

Review of the Soil Conservation Service (SCS) soil survey of Rhode Island indicates the presence of hydric soils in the vicinity of Mitchell Brook, the Saugatucket River, and the wetlands associated with these water bodies. Ridgebury fine sandy loam (Re) occurs along Mitchell Brook upstream of the site owner's driveway and along the Saugatucket River upstream of the bulky waste area. Walpole sandy loam (Wa) occurs along Mitchell Brook downstream of the site owner's driveway. Ridgebury, Whitman, and Leicester extremely stony fine sandy loams (Rf) occur along the Saugatucket River from the northern end of the bulky waste area to the intersection of the Saugatucket River with Mitchell Brook. Downstream of this intersection, Scarboro mucky sandy loam (Sb) occurs. Scarboro mucky sandy loam also occurs along the unnamed brook on the east side of Rose Hill Road. No other hydric soils occur on the site based on review of the SCS data.

The National Wetlands Inventory (NWI) map indicates that the wetlands associated with Mitchell Brook, upstream of the site owner's driveway, are palustrine scrub-shrub broad-leaved deciduous wetland (PSS1). The PSS1 wetland indicated along Mitchell Brook upstream of the site owner's driveway corresponds to the woodland, perennial stream, and wetland designated on the USGS map and the hydric soils indicated on the USDA SCS soil survey. Palustrine scrub-shrub wetlands are typically characterized by woody vegetation, including shrubs or young trees, less than 20 feet tall.

Wetlands associated with Mitchell Brook downstream of the site owner's driveway, wetlands associated with the Saugatucket River, and wetlands associated with the unnamed brook are indicated as palustrine forested broad-leaved deciduous wetland (PFO1). The PFO1 wetlands indicated along Mitchell Brook downstream of the site owner's driveway and along the Saugatucket River correspond to the woodland, perennial stream, and wetland designations on

the USGS map and the hydric soils on the USDA SCS soil survey. Palustrine forested wetland is characterized by woody vegetation more than 20 feet in height (Cowardin et al. 1979). No other wetland or open water areas are indicated on the Rose Hill site by the NWI map.

The 100-year flood plain for Mitchell Brook and the Saugatucket River, shown on Figure 3-18, is defined by the U.S. Department of Housing and Urban Development, Federal Emergency Management Agency (FEMA 1986). This area is protected under the Rhode Island Freshwater Wetlands Act. Wetland resource areas protected under the Rhode Island Freshwater Wetlands Act are identified on Figure 3-25.

3.4.4.2 Wetland Field Delineation. Using the off-site information as a basis, an intermediate-level on-site investigation was conducted to delineate wetland boundaries and to characterize on-site wetlands in accordance with the U.S. Fish and Wildlife Service's classification system (Cowardin et al. 1979). The wetland field delineation was conducted on May 30 and 31, 1991. Flags marked with a letter series and a flag number (i.e., A1..A23) were placed along the wetland-upland boundary, surveyed, and located on a site map. Four flag series (A through D) were used to delineate on-site wetlands. The A series delineates fringe wetlands associated with Mitchell Brook. The B series delineates a small palustrine emergent wetland, dominated by common reed (*Phragmites communis*), located at the southern end of the solid waste area. The C series delineates a small palustrine open water wetland, possibly a vernal pool, near the southeastern edge of the solid waste area. The D series delineates a small brook with adjacent forested wetland near the site owner's residence. Several very small patches of emergent wetland were observed on the sewage sludge area. Because these areas were remote, isolated, and very small, they were not delineated. Wetland borders, flag series, and selected individual flags are shown on Figure 3-26. Vegetation, soils, and hydrology transect summaries from the wetland delineation are included in Appendix D.

3.4.4.3 Wetland Functional Assessment. The Mitchell Brook wetlands were evaluated using the U.S. Army Corps of Engineers Wetland Evaluation Technique Volume II (WET II) model

(Adamus et al. 1987). The assessment area, input zone, service area, and watershed utilized during this analysis were defined and delineated in section 2.2.1.5.

The resulting model rankings for each function or value apply only to the assessment area (i.e., the on-site wetlands). The results are summarized in Table 3-18 and are discussed below by individual function or value. Answer sheets generated during this analysis are contained in Appendix D. This assessment defines current conditions, which can be used as a baseline to help determine the effects of remediation activities.

Two small emergent wetland areas were identified on the southern end of the solid waste area, and one small emergent wetland was identified on the sewage sludge area. These wetland areas do not support standing water under average conditions. These small wetlands probably provide some sediment, toxicant, and nutrient retention because they do not have permanent outlets and because they are vegetated. However, inflow to these areas is largely limited to precipitation. In addition, because of the small size of the areas, the retention value is limited. These wetlands are also unlikely to be effective for groundwater recharge because they are situated on the disposal areas. They are also not considered to have exceptional habitat value because of their small size, the lack of open water, the absence of special habitat characteristics (such as tree cavities) and seed- or nut-producing plants, and previous anthropogenic impacts. As a result, these small wetlands were not evaluated for function or value.

Wildlife Diversity/Abundance. Like all wetlands, the wetlands in the site study area can provide habitat for a wide variety of wildlife species on a seasonal or year-round basis. According to the results of the model, the Mitchell Brook wetlands are highly effective in providing breeding, migration, and wintering habitat for wildlife. The wetlands constitute a relatively large, contiguous forested or scrub-shrub habitat and thereby provide cover for wintering species. Mitchell Brook and the upland forested areas adjacent to the wetland area are also of sufficient size to provide breeding habitat for a variety of wildlife species and to support a diversity of migratory birds. Mitchell Brook is part of an extensive stream system and could provide an excellent travel corridor for wildlife species, especially mammals with

relatively large home ranges. On the other hand, none of the habitats in the study area are locally uncommon.

WET II indicates that the wildlife diversity and abundance provided by the Mitchell Brook wetlands are highly socially significant because Rhode Island is located in a waterfowl use region of major concern as defined by the U.S. Fish and Wildlife Service. The area of open water in the Mitchell Brook wetlands is limited, and these wetlands alone probably do not support waterfowl. However, nearby ponds and the Saugatucket River could support waterfowl, as well as other water-dependent birds such as shorebirds and wading birds.

Aquatic Diversity/Abundance. Wetlands are often important in providing breeding areas for a wide variety of aquatic organisms and may provide habitat values during other seasons as well. Though this area can support aquatic life such as aquatic invertebrates, amphibians, and small fish, the Mitchell Brook wetlands do not provide an abundance of ideal aquatic habitat, as described in section 3.4.5. The aquatic diversity/abundance provided by the Mitchell Brook wetlands has low social significance because the wetlands do not support any aquatic species of limited occurrence or fish species known to be rare or declining in the region. In addition, the wetlands are not unique to the area.

Sediment Stabilization. Wetlands may serve to stabilize sediments, largely through supporting vegetative communities, which bind soil with their roots and dissipate erosive forces. The dense woody vegetation along the banks of Mitchell Brook is highly effective for binding soil and dissipating erosive forces. Emergent vegetation along the banks of Mitchell Brook, although not dense, also serves to stabilize sediment. However, sediment stabilization provided by the Mitchell Brook wetlands has low social significance because the wetland is not in an erosion-prone area or in an urban area and the wetland system (palustrine) is not unique in the locality.

Sediment/Toxicant Retention. Inorganic sediments and chemical substances toxic to aquatic life may be trapped and retained by wetlands on a net annual basis. The WET II analysis indicates that the Mitchell Brook wetlands have a high opportunity for trapping and retaining

sediments and toxicants because of the proximity of agricultural land and disposal areas. However, the effectiveness of the Mitchell Brook wetlands in retaining sediment or toxicants is low because flow through the wetlands is channelized, reducing vegetation/water interspersion. However, the wetlands may be more effective at sediment/toxicant retention than predicted by the model because, during high flow and flooding, there is likely to be some water/vegetation interspersion, as the banks are densely vegetated. The significance of the sediment/toxicant retention function is high because there is a high potential for fish spawning downstream of Mitchell Brook in Saugatucket Pond, and because the Mitchell Brook wetlands comprise a large percentage of the wetlands in the watershed of Saugatucket Pond.

Nutrient Removal/Transformation. Wetland vegetation is often effective in removing inorganic nutrients, such as nitrogen and phosphorus, and transforming them into organic forms (plant tissue) on either a net annual basis or during the growing season. The WET II analysis indicates that the Mitchell Brook wetlands have a high opportunity for nutrient removal and nutrient transformation because of the presence of disposal areas within the input zone and agricultural land upstream of Mitchell Brook. However, the model also indicates that the Mitchell Brook wetlands are ineffective in removing and transforming nutrients because of the lack of interspersion between emergent vegetation and water and because of the rate at which Mitchell Brook flows through the wetlands. As a result, much of the flow in the brook never contacts vegetation. During high flow and flooding, however, the emergent vegetation that lines the banks is likely to remove some nutrients.

The Mitchell Brook wetlands are moderately socially significant for the nutrient removal/transformation function. There are no surface drinking water areas, swimming areas, or nutrient-sensitive water bodies in the vicinity. However, because the Mitchell Brook wetlands comprise a large portion of the wetlands in the watershed of the service area, any nutrient removal and transformation that occurs in Mitchell Brook is significant for the service area.

Production Export. Wetlands with high net annual primary production may export large amounts of organic plant material to downstream areas. The Mitchell Brook wetlands are

moderately effective for production export because they have a permanent outlet that allows downstream transport of plant and animal material. However, these wetlands comprise only a small portion (less than 20 percent) of the total watershed area.

Groundwater Recharge. Wetlands serve to purify and recharge groundwater supplies through infiltration of floodwaters. There is uncertainty about the amount of groundwater recharge that occurs in the Mitchell Brook wetlands. The brook is located in a precipitation surplus region, and the majority of the watershed for Mitchell Brook is pervious; thus, infiltration from the Mitchell Brook wetlands is not critical to groundwater supplies in the area. Site-specific piezometric and flow data for Mitchell Brook, collected in June and September, 1991, and January and April, 1992, indicate that the groundwater appears to discharge along the lower reaches of the brook throughout most of the year. The upper reaches of the brook appear to be more sensitive to long-term seasonal water-level changes and runoff events. Although the Mitchell Brook wetlands are not in the vicinity of a sole-source aquifer or near wells with exceptional yields, the level of recharge provided by the wetlands is considered moderately socially significant because the Mitchell Brook wetlands comprise a large percentage of the wetland acreage in the watershed of the service area.

Groundwater Discharge. Wetlands with a high probability of receiving groundwater discharge on a net annual basis include permanently flooded or saturated wetlands that occur in precipitation-deficit regions, wetlands located immediately below dams or steep slopes, or wetlands in relatively small watersheds with pervious surfaces. Because the Mitchell Brook wetlands do not appear to satisfy these conditions, the wetlands would be expected to be relatively ineffective for groundwater discharge. However, as mentioned above, site-specific piezometric data indicate that groundwater appears to discharge along the lower reaches of the brook throughout most of the year. Because the Mitchell Brook wetlands comprise a large percentage of the wetland acreage in the service area watershed, the groundwater discharge function is considered moderately significant.

Floodflow Alteration (Attenuation). Wetlands may serve to store floodwater or attenuate its velocity, thereby protecting downgradient areas from flood damage. The WET II analysis indicates that the Mitchell Brook wetlands have a moderate opportunity for floodflow alteration because the wetlands have a large watershed relative to the size of the wetlands, and because there are few wetlands within the same watershed that are upslope of the Mitchell Brook wetlands, although the majority of the watershed of the Mitchell Brook wetlands is pervious. The woody vegetation in the wetlands (providing some channel roughness) and the sinuous nature of the channel contribute to the moderate effectiveness in floodflow alteration, although the Mitchell Brook wetlands have a permanent outlet, limited instream vegetation, and are relatively small, thereby decreasing effectiveness. Floodflow alteration provided by the Mitchell Brook wetlands has low social significance because the wetlands are not located in an urban area.

Uniqueness/Heritage. In some situations, wetlands may provide values that are unique to a particular area or important to an area's cultural heritage. The uniqueness/heritage of the Mitchell Brook wetlands has low social significance because the wetlands are not located in an urban area or in an area that is losing wetlands at a rate greater than the national average (USACOE 1987). The Rhode Island Historical Preservation Commission has indicated that the Rose Hill site, as a whole, has a high potential for containing prehistoric sites based on soil types and the presence of wetlands, streams, and confluences of streams. Three historic cemeteries have been identified on site or adjacent to the site (Figure 3-1). However, none of these historic cemeteries is located within the wetlands.

Recreation. The recreational value of the Mitchell Brook wetlands was rated low in terms of social significance. The wetland is not used regularly for recreational activities and it is not a major public access point to a recreational waterway. However, according to the WET II model, "no scientific basis exists for an objective assessment [of recreational function] without considerable site-specific data collection."

Saugatucket River. It must be noted that the functional analysis provided above encompasses on-site wetlands adjacent to Mitchell Brook and does not address the Saugatucket River. Although a full WET II analysis was not performed on the river, a qualitative analysis of the functions and values of these areas, based on the wetland attributes evaluated in the WET II model, is provided to evaluate their ecological significance.

The Saugatucket River wetlands consist of palustrine forested and scrub-shrub habitats with emergent vegetation along the banks and in quiescent areas along the river. The Saugatucket River contains larger areas of open water than Mitchell Brook, with pools of water up to four feet deep and more than 30 feet wide. The vegetation around the river is denser than the vegetation found bordering Mitchell Brook, and there is greater water/vegetation interspersion in the river. As a result, the physical and biological characteristics of the Saugatucket River wetlands are markedly different from those of the Mitchell Brook wetlands.

Piezometric data from June and September, 1991, and January and April, 1992, indicate that the Saugatucket River is generally in equilibrium with the groundwater. The Saugatucket River wetlands have a larger watershed than the Mitchell Brook wetlands. The watershed of the Saugatucket River is comprised, in large part, of other wetlands. Because there are wetlands upgradient of the site, and because of the permanent outlet, the river probably does not provide a large amount of floodflow alteration. The flow through the river is fairly rapid in areas, but there are many areas in the river where the water pools and is quiescent. These areas are marked by emergent vegetation and could function in sediment, toxicant, and nutrient removal. Because the disposal areas are located within the input zone of the river, these quiescent areas could serve a major role in retaining and removing toxicant or nutrient loads.

The Saugatucket River wetlands likely provide significant habitat for a diversity of wildlife species. The dense wooded areas and large areas of open water provide suitable habitat for a variety of breeding, wintering, and migrating species. A species of state interest, tickseed sunflower (*Bidens coronata*), may occur in the Saugatucket River wetlands immediately upstream of Saugatucket Road. The river habitat is likely to support a variety of aquatic species. The

emergent vegetation in quiescent areas along the river is likely to provide breeding habitat for a variety of fish and other organisms.

3.4.5 Aquatic Resources

The benthic community (living in or on the sediments) of any water body is likely to be one of the better indicators of long-term environmental conditions because the adult stages of organisms in this community are relatively non-mobile. The benthos, therefore, can reflect the more long-term environmental conditions of the water and sediments prior to the time of sampling. Certain indicator benthic species are tolerant of stressed environmental conditions (such as pollution) while other species are very sensitive to stress. The relative abundance of these indicator species is a very important parameter in assessing the health of the community. High relative abundance of tolerant species and low abundance or absence of sensitive species are generally indicative of environmentally stressed conditions. Conversely, the presence of sensitive species and a diverse community is generally indicative of healthy environmental conditions.

The benthic community was surveyed at the site study area (as described in sections 2.2.1.5 and 2.5.7) in order to document the existing aquatic ecological conditions in the site study area. Types of sampling conducted included benthic grab sampling and artificial substrate sampling. The grab samples provide a quantitative description of the relative abundance and species composition of macroinvertebrates in the sediments. The artificial substrates provide information on macroinvertebrates in the water column that could potentially colonize the sediments. Both types of sampling are important since together they may document if the sediments are unsuitable for population by benthic macroinvertebrates moving freely in the water column which are capable of colonizing substrates.

Water and sediment quality measurements were also taken during the aquatic survey; these data are presented in section 4. Additionally, toxicity testing was conducted on sediments and leachate samples and is discussed in section 7.

The following sections provide a discussion of the results of the aquatic field survey for both the Saugatucket River and Mitchell Brook. These results were also used to determine the ecological risk to aquatic organisms living in the site study area, which will be discussed in the baseline risk assessment (section 7).

3.4.5.1 Physical/Chemical Environment. Table 3-19 presents a summary of grain size and iron concentrations at the locations sampled for benthic species. Iron is presented as an indicator contaminant based on the results of the reconnaissance survey where iron floc was observed in several locations. Sediments in both the Saugatucket River and Mitchell Brook consist primarily of sand. Total combustible organics were relatively low throughout both water bodies, ranging from approximately 0.4% to 8%. Sediment iron concentrations at the benthic sampling locations appear to increase just downstream of the disposal areas in both the Saugatucket River and Mitchell Brook. The highest concentrations were found at SD-05 and SD-06 in the Saugatucket River and at SD-07 in Mitchell Brook; SD-05 is located just downstream of a major leachate seep. Further downstream, levels were lower, but not as low as at the most upstream location. Section 4 contains a detailed discussion of the nature and extent of contamination in the sediments.

Comparison of surface water quality data to USEPA Water Quality Criteria for the Protection of Aquatic Life indicates that, at the time of benthic sampling, the concentration of iron exceeded water quality criteria at locations downstream of the disposal areas (SW-07 and SW-12) in Mitchell Brook. Aluminum exceeded criteria at all sampling locations in both water bodies. Aluminum appears to occur naturally at relatively high concentrations in this area. Cyanide exceeded criteria at two locations in Mitchell Brook. Dissolved oxygen (DO) concentrations in the water column ranged from 8.9 mg/L to 10.2 mg/L at all stations during the benthic sampling and pH ranged from 5.6 to 6.4. A detailed discussion of surface water quality from all sampling rounds is presented in section 4.

Table 3-20 lists all benthic taxa identified during the June 1992 sampling. Table 3-21 summarizes life history characteristics of selected benthic taxa. Tables 3-22 to 3-37 present

species and densities of all species identified at each benthic grab and artificial substrate sampling location. Figures 3-27 and 3-28 show the relative percentage of commonly occurring species in the survey.

3.4.5.2 Saugatucket River. The Saugatucket River was sampled at five benthic locations upstream, adjacent to, and downstream of the disposal area. The following is a discussion of the benthic invertebrate community in this area.

Sediment Species Composition. The chironomid *Conchapelopia*, a member of the class Insecta, was the most commonly occurring organism in the sediments at locations adjacent to the bulky waste and sewage sludge areas, representing 14% to 22% of the community at SE-04 and SE-05 (Figure 3-27). This taxa was found throughout the river but was less relatively abundant both upstream and downstream of the disposal areas, representing less than 5% of the community at these locations (Figure 3-27). Chironomids commonly occur in all types of aquatic substrates (including sediments, plants, rocks, and wood); and in shallow and deep water. *Conchapelopia* are predators that engulf or pierce their prey (Merrit and Cummins 1978).

The most commonly occurring species in the sediments upstream of the disposal areas in the Saugatucket River was the amphipod Crangonyctidae (Table 3-22) representing 30% of the community at SE-02. This taxa occurred in relatively lower numbers adjacent to and downstream of the disposal areas, representing from 0% to 9% of the community. Locations adjacent to the disposal areas (SE-04 and SE-05) had the lowest occurrence of this amphipod (0% to 1.6%), while downstream (SE-06 and SE-11) occurrence increased but was still lower than upstream. Amphipods are typically scavengers and some are considered pollution sensitive (Hart and Fuller 1974; USEPA 1990c).

As shown in Tables 3-25 and 3-26, commonly occurring species in the sediments downstream of the disposal areas in the Saugatucket River include the bivalve *Sphaerium* (representing 15% to 37% of the community at SE-06 and SE-11) and the isopod *Caecidotea communis*

(representing 16% of the community at the most downstream location, SE-11). The bivalve *Sphaerium* occurs in a range of aquatic habitats and is considered facultative with regard to organic waste (USEPA 1990c). The isopod *C. communis* is a scavenger and is also considered facultative with regard to organic waste (USEPA 1990c).

Qualitatively, the sediment locations adjacent to the disposal areas appear to have a different species composition than the upstream and downstream locations. An analysis of variance (ANOVA) and multiple comparison tests were run on the most abundant species occurring in the sediments at all five locations as described in section 2.5.7.6. The ANOVA was used to test for differences in densities of species among locations. For analyses with significant outcomes ($P<0.05$), multiple comparison tests were used to determine which locations differed significantly. Table 3-38 summarizes the differences among locations for individual dominant taxa densities and total densities. This analysis indicates that the chironomid *Conchapelopia* occurred at significantly higher densities adjacent to the disposal area (at SE-05) than at all other locations. This location is just downstream of a major leachate seep. There were no significant differences in species densities found among the other commonly occurring taxa (*Caeidotea communis*, *Natarsia*, *Tanytarsus*, and *Crytochironomus*). The percent occurrence of *Conchapelopia* within the community was also significantly higher adjacent to the disposal area just downstream of the major leachate seep (at SE-05).

The taxa Ephemoptera, Trichoptera and Plecoptera are generally considered to be pollution sensitive (Hart and Fuller 1974). A comparison of the percent occurrence of these taxa (Table 3-39) at all locations indicates that the highest percent occurrence of these taxa occur adjacent to the bulky waste area in the vicinity of the leachate seeps (at locations SE-04 and SE-05). These taxa represent 13% to 17% of the community at these locations. Percent occurrence was less than three at all other locations.

Artificial Substrate Species Composition. The chironomid *Conchapelopia* also commonly occurred on the artificial substrates in the Saugatucket River, representing 15% to 37% of the

community throughout the site study area (Tables 3-30 to 3-34; Figure 3-28). The highest percent occurrence was at locations adjacent to and downstream of the bulky waste area.

The plecoptera *Leutra* was very abundant on artificial substrates upstream of the disposal area (36% of the community) and decreased in relative abundance downstream (representing 12% to 14% of the community; Figure 3-28). *Leutra* is a detritovore and considered pollution intolerant (USEPA 1990c). The decrease in the relative abundance of this pollution intolerant taxa corresponds to the increase in iron concentration downstream.

The chironomid *Polypedilum fallax* was abundant adjacent to and downstream of the bulky waste area (Tables 3-32 to 3-34), representing 16% to 30% of the downstream community with the highest relative abundance occurring at AS-06. This species is considered intolerant of heavy metals and facultative with regard to organic waste (USEPA 1990c).

ANOVA and multiple comparison tests of the most abundant species occurring at all five locations sampled with artificial substrates indicate that the densities of *Conchapelopia* in several sets of locations were significantly different from each other (Table 3-38). Densities of this taxa decreased progressively downstream; mean densities were significantly different between the two most upstream locations and the two most downstream locations. *Leutra* occurred at all five locations though its density was significantly higher at the upstream location (AS-02) relative to the downstream locations. Total species densities were significantly higher at upstream locations relative to downstream locations (Table 3-38).

A comparison among locations of the relative abundance of pollution-sensitive taxa (Ephemoroptera, Plecoptera, and Trichoptera) indicates that these taxa generally occur at their highest relative abundance upstream (AS-02) and decrease in relative abundance downstream (Table 3-39). This decrease in abundance corresponds to the increased iron concentrations in the surface water downstream.

Ecological Community Indices. A summary of ecological community indices for benthic grabs and artificial substrates in the Saugatucket River is presented in Table 3-40. In the Saugatucket River grab samples, diversity, dominance, and evenness were fairly similar at all stations with no obvious spatial patterns. Diversity ranged from 2.0 to 2.76. Dominance ranged from 0.08 to 0.20. Evenness ranged from 0.75 to 0.85. ANOVA and LSD multiple comparison tests indicate that the mean density of total species in the sediments did vary significantly between locations (Table 3-38); however, there were no obvious spatial patterns from upstream to downstream (Figure 3-29). Total species density at location SE-02 is higher than at all other locations. The number of taxa, ranging from 24 to 40, generally declined from upstream to downstream locations (Table 3-40).

As with the grab samples, artificial substrate samples in the Saugatucket River showed fairly similar values at all stations for diversity, dominance, and evenness (Table 3-40). ANOVA and LSD multiple comparison tests indicate that density differs significantly between locations (Table 3-38). Densities showed a general decline from upstream to downstream locations (Figure 3-30), ranging from a mean of 164 organisms/36 square inches upstream (AS-02) to 51 organisms/36 square inches downstream (AS-11). Number of taxa ranged from 20 to 29.

Similarity Indices. Bray-Curtis and Jaccard similarity indices were calculated separately for grab samples and artificial substrate samples and separately for Mitchell Brook and Saugatucket River sampling locations. Figures 3-31 and 3-32 show the results of cluster analyses of these indices for the Saugatucket River.

For the Saugatucket River grab samples, the most upstream location (SE-02) and the most downstream (SE-11) were grouped together and the three intermediate locations (SE-04, SE-05, and SE-06) were grouped together based on the Jaccard index. These groupings are based on common taxa. With the Bray-Curtis index (which takes into account relative abundance and common taxa), SE-02, SE-05, and SE-11 grouped together and SE-04 and SE-06 grouped together. For the artificial substrate samples in the Saugatucket River, the two most upstream

locations (AS-02 and AS-04) grouped together and the remaining three locations downstream (AS-05, AS-06, and AS-11) grouped together based on both similarity coefficients.

Summary of the Saugatucket River. In the sediments, species composition adjacent to the disposal areas appears to be different than at upstream or downstream locations. The density of the most dominant species at this location is significantly higher than at any other location. This different community structure may be associated with a leachate seep occurring just upstream of this location. SE-05 had the highest iron concentration in the sediments (Table 3-19). There were no obvious spacial patterns with regard to total species densities or occurrence of pollution-sensitive taxa in the sediments. In fact, relative abundance of these taxa were actually highest at location SE-05, immediately downstream of the major leachate seep.

Organisms colonizing the artificial substrates showed a distinct trend of decreasing total densities from upstream to downstream locations. The occurrence of pollution-sensitive taxa also decreases from upstream to downstream locations. The communities colonizing the artificial substrates appear to be more directly influenced by the disposal areas (with regard to total densities and the occurrence of pollution-sensitive species) than the communities in the sediments. This suggests that the water column may be more affected by disposal area contaminants than the sediments.

3.4.5.3 Mitchell Brook. Mitchell Brook was sampled at three locations. Location SE/AS-09 was located between the bulky waste and solid waste areas, and locations SE/AS-07 and SE/AS-12 were located downstream of the disposal areas before the convergence with the Saugatucket River. As with the Saugatucket River, locations were sampled with benthic grabs and artificial substrates.

Sediment Species Composition. The chironomid *Paratendipes* was the most abundant taxa in the sediments in the area between the solid waste and bulky waste areas (SE-09), representing 22% of the community. *Paratendipes* are tube-building burrowers that feed by collecting and

gathering (Merrit and Cummins 1978). This species did not occur at the downstream locations (SE-07 and SE-12).

The bivalve *Sphaerium*, comprising 40% of the community, was the most abundant organism in the Mitchell Brook sediments just downstream of the disposal areas (SE-07); however, it was not present at the most downstream location (SE-12). Only four species were identified in the sediments at the most downstream location in Mitchell Brook (SE-12). *Conchapelopia* was the most abundant taxa there; however, the average density in this location was only 2 organisms/36 square inches. No species identified in Mitchell Brook sediments occurred at all three sampling locations.

Percent occurrence of pollution-sensitive taxa (Ephemoptera, Plecoptera, and Trichoptera) was relatively low at all locations, ranging from 0% to 4% (Table 3-41). Percent occurrence generally decreased downstream of the disposal areas.

Artificial Substrate Species Composition. The chironomid *Polypedium fallax* was relatively abundant at all Mitchell Brook artificial substrate locations, with the lowest percent occurrence (12%) adjacent to the disposal areas, and with increasing relative abundance downstream (Figure 3-28). ANOVA and multiple comparison tests reveal that no significant difference exists between locations for density and percent occurrence of this species (Table 3-42).

The chronomid *Unniella multivirga* was the most abundant species on the artificial substrate adjacent to the disposal areas (SE-09) representing 26% of the community. This species was also present at the most downstream location (SE-12). *Unniella multivirga* is a member of Orthacladirae, which are generally tube-building burrowers. The chironomid *Conchapelopia* occurred at all three locations ranging from 5% to 8% of the community (Figure 3-28). Based on ANOVA and multiple comparison tests, no significant differences in densities and percent occurrence of this species occur between locations (Table 3-42).

The relative abundance of pollution-sensitive taxa (Ephemoptera, Plecoptera, and Trichoptera) decreased from upstream to downstream, ranging from 23% to 0% of the community (Table 3-41).

Ecological Community Indices. In Mitchell Brook, diversity, dominance, and evenness in grab samples varied between locations (Table 3-40). This is primarily because only six organisms were collected in the three replicate grabs at the downstream location. Total densities in the sediments adjacent to the disposal areas (SE-09) and just below the disposal areas (SE-07) were significantly higher (based on ANOVA and multiple comparison tests) than densities at the most downstream location (Figure 3-33; Table 3-42). Diversity and dominance indices for the artificial substrates were fairly consistent between locations in Mitchell Brook. Mean density on the artificial substrates appeared to decline from upstream to downstream locations (Figure 3-34). However, the differences between the locations were not statistically significant.

Similarity Indices. In Mitchell Brook, sediment grab samples do not show a high degree of similarity between locations (Figure 3-35). The most downstream location is distinctly different from the other two locations. This is likely due to the very low densities of organisms at the downstream location. For the artificial substrates, locations adjacent to and upstream of the disposal areas are similar while the downstream location is distinct (Figure 3-36).

Summary of Mitchell Brook. The community structure in the sediments at the three locations sampled all appear to be distinct from each other since no species was common to all three locations. Because the physical characteristics of the sediments at these locations appear to be similar (Table 3-19), the difference in community structure may be associated with differences in chemical concentration. The concentration of iron at location SD-07 was an order of magnitude higher than the iron concentration at the upstream and downstream locations (Table 3-19).

Communities colonizing the artificial substrates appear more diverse than those in the sediments, with many more taxa identified on the substrates. This may indicate that, although these

organisms may occur in the water column, the sediments are not suitable for colonization. As with the grab samples, total species densities on the artificial substrates appear to decline from upstream to downstream.

3.4.5.4 Comparison to the Reconnaissance Survey. The results of the quantitative benthic survey do not directly correspond to the results of the qualitative reconnaissance survey (described in section 2.2.1.5). During the reconnaissance survey, areas with abiotic conditions and low diversity along with iron floc formation were observed, while during the quantitative survey, no abiotic conditions were observed and only a small amount of floc occurred throughout the site study area. The differences between the two surveys is likely associated with changes in flow and associated changes in floc formation. The reconnaissance survey was conducted in the summer when flows are low, and floc is able to form. The quantitative spring survey was conducted during higher flow which would tend to scour the floc from the sediment and also, with more uncontaminated water available, the iron and other contaminants in the sediments would dissolve and be carried downstream more rapidly.

The sediment cleaning process is also probably partially self-sustaining because of more benthic activity, as there is more sediment mixing and thus more opportunity for the contaminants to redissolve into the water column and for the physical characteristics of the sediment to improve.

3.5 CONCLUSIONS AND SIGNIFICANCE OF SITE CHARACTERISTICS

The principal geologic, hydrogeologic, and ecological features of the site have been identified and evaluated during the remedial investigation. The objective for this work was to provide an understanding of physical and ecological characteristics of the site study area in order to evaluate the nature and extent of potential contamination, assess the fate and transport of those contaminants, and to identify potential downgradient receptors.

Several conclusions can be made regarding the physical and ecological characteristics of the site study area and their interactions. These conclusions are summarized below.

3.5.1 Bedrock: Features, Topography, and Groundwater Flow

The behavior of bedrock groundwater was found to be influenced by the bedrock topography at the site. Recharge and discharge of bedrock groundwater occurred at the bedrock topographic high and low areas respectively. The predominant hydraulic gradient for the bedrock flow system was southeast. The dominant transport media for bedrock groundwater was the southeast trending regional fractures identified in the area.

The impact of the weathered and fractured bedrock, located south and west of the solid waste area on influencing localized flow direction has not been fully defined. The effects are anticipated to be limited due to low transmissivity values of the bedrock and the presence of a more competent rock towards the east.

3.5.2 Overburden Materials: Distribution, Composition, and Groundwater Flow

The three main constituents of the overburden include an ablation till, glacial lacustrine, and glacial outwash sediments. The till is very sandy in composition with a hydraulic conductivity similar to the glacial outwash. The till did not appear to restrict movement of groundwater downward to the bedrock. The lacustrine deposits, encountered in the south-southeastern portion of the site between the till and outwash strata, were less permeable, and acted as a confining layer, thereby restricting groundwater movement between the till and outwash. The restricting flow caused upward vertical gradients in the overburden. The increased thickness of this material and the upward slope of the bedrock surface on the eastern side of the Saugatucket River produced a partial barrier to overburden groundwater movement east of the river. Glacial outwash permits unconfined groundwater flow in a south-southeast direction across the site and is the principal water bearing strata.

Laboratory permeability data of the cover material of the disposal areas demonstrated that grain size and permeability characteristics were similar to the outwash strata. Runoff infiltration through the cover materials is expected to be high due to the permeability of the cover and the

flatness of the tops of the disposal areas. The combination of this infiltration and the heterogenous nature of the solid waste refuse may create localized groundwater mounding within the disposal areas. This mounding may be enhanced by the high bedrock topography along the northeastern portion of the solid waste area. Further characterization of the mounding can be accomplished by the installation of piezometers positioned along the toe of the disposal area. In addition, it is recommended that an evaluation of the potential leachate volumes be performed using collected data on disposal areas, cover material permeabilities, and thicknesses.

3.5.3 Groundwater and Surface Water Interaction

Groundwater and surface water interaction across the Saugatucket River and Mitchell Brook is believed to be significant and is expected to play an important role in the fate and transport of potential contaminants. The Saugatucket River was observed to gain water from the shallow overburden, deep overburden, and bedrock groundwater flow systems along the east-southeast portion of the site study area. The fluctuation observed in Mitchell Brook from losing to gaining was dependent upon precipitation events and the responsiveness of groundwater to the recharge events.

3.5.4 Ecological Assessment

The site study area is dominated by deciduous forest (44%) and successional old field (30%) habitat types. The latter habitat type is largely confined to the three disposal areas. In general, habitat types occur in large blocks with relatively little interspersion among types. None of the habitat types occurring within the site study area are rare in the region. Avian species observed were mostly passerines utilizing the old field and edge habitats; relatively few waterfowl, raptors, and shorebirds were observed. The extensive running of dogs and hunting on the site have influenced the use of the site by mammalian species. Reptiles and amphibians utilizing the site study area are likely to be confined largely to terrestrial species, as Mitchell Brook does not appear to support large numbers of these organisms or other prey species, such as fish.

However, the Saugatucket River likely supports a more diverse assemblage of wildlife and aquatic species.

Approximately 23 acres of wetlands occur within the site study area. Palustrine forested wetlands predominate and are largely confined to relatively narrow strips along Mitchell Brook and the Saugatucket River. These wetlands are protected under federal and state regulations. The wetland functional assessment of the Mitchell Brook wetlands suggests that these wetlands are of high social significance and/or effectiveness for sediment/toxicant retention, sediment stabilization, and wildlife diversity/abundance. Although wetlands associated with the Saugatucket River were not formally evaluated for functions and values, they likely provide significant wildlife and aquatic habitat and nutrient/toxicant retention values, among others.

Rare plant species known to occur within the site study area include a species of state interest, tickseed sunflower, and a species of concern, bloodroot. Tickseed sunflower is likely to occur in the vicinity of the Saugatucket River, immediately upstream of Saugatucket Road. Bloodroot may occur north of Mitchell Brook on the west side of Rose Hill Road. A probable sighting of an avian species of concern, red-bellied woodpecker, also occurred within the site study area. Two avian species of state interest, glossy ibis and great egret, were also observed within the site study area. However, the state designation applies only to breeding sites for these two species, and suitable breeding habitat does not exist within the site study area, except possibly along the Saugatucket River.

Based on the results of quantitative surveys, the benthic communities in the Saugatucket River and Mitchell Brook are relatively diverse. In the Saugatucket River, a distinct community appears to be associated with the leachate seep. The composition of this community is statistically different from that of the other locations. Densities of organisms colonizing the artificial substrates in the water column of the river show a trend of decreasing total density from upstream to downstream locations. This trend is not apparent in the sediments, indicating that the water column may be more affected by landfill contamination than the sediments are. This is also supported by the results of the sediment and leachate toxicity tests (see section 7).

In Mitchell Brook, total densities of organisms in the sediments were relatively low. Densities appeared to decrease from upstream to downstream locations for both the benthic grab samples and the artificial substrate samples. This decrease in density may be associated with increased contamination. Several taxa that occurred on the artificial substrates did not occur in the sediments in Mitchell Brook. This implies that the sediments are not suitable for colonization by benthic taxa in the water column.

SECTION 4.0
NATURE AND EXTENT OF CONTAMINATION

Chemical data for surface soil, subsurface soil, groundwater, surface water, sediment, leachate, and landfill gas are presented in this section. The nature and extent of contamination in the site study area was evaluated using analytical data generated during the RI field investigation. The results of the field investigation and information on the historical activities associated with the site study area were used to provide an understanding of contamination.

4.1 CONTAMINANT SOURCES

The source of organic and inorganic contamination in the soil, groundwater, and surface water and the generation of landfill gas and leachate in the site study area are primarily attributed to past disposal activities in the three waste disposal areas at Rose Hill Regional Landfill. A detailed description of the site study area was provided in section 1 and is summarized in relation to contaminant sources in the following text.

Prior to landfill operations, the entire site study area was used for agriculture. Around 1948, sand and gravel quarry operations began and continued until about 1963 (USEPA 1987a, 1991a). The target shooting range in the northern portion of the site study area is in an excavation pit (Figure 2-1). Landfill operations in the site study area occurred from 1967 to 1983.

Today most of the land in the vicinity of the site study area is privately owned and residentially zoned. Residential properties, small-scale farms, and undeveloped wooded areas are evident throughout the immediate area. Quarry operations, while no longer active in the disposal areas, occur west of Rose Hill Road.

4.1.1 Disposal Areas

Rose Hill Regional Landfill consisted of three disposal areas that operated from 1967 up until the transfer station was completed in 1983 (Figure 1-2). The solid waste area opened in 1967 and ceased operation in 1982. The bulky waste area was in operation from 1978 up until it ceased operation in 1983. The sewage sludge area began operation in 1977 and also ceased operation in 1983. The three disposal areas are the primary suspects of sources of contamination in groundwater and other media in the area.

4.1.1.1 Sewage Sludge Area. In 1977 the sewage sludge area began operations. It continued operations until 1983. This area accepted sludge from the town of South Kingstown wastewater treatment plant, which provides secondary treatment. There are no records of industrial waste disposal in this area. There are no known chemical data for the sewage sludge disposed of at the Rose Hill landfill. However, averages from two different national studies of municipal wastewater sludge composition are presented in Table 4-1 (USEPA 1990b) for constituents that were detected in more than 20 percent of the analyses.

4.1.1.2 Solid Waste Area. The solid waste area began operation off Rose Hill Road in an abandoned gravel quarry. It operated until 1982 accepting both municipal and industrial waste. USEPA describes municipal landfill waste at NPL sites as follows: "Municipal wastes disposed of in these landfills typically includes a heterogeneous mixture of materials primarily composed of household refuse such as yard and food wastes and paper, and commercial waste such as plastics, inert mineral waste, glass, and metals. There are four ways in which hazardous wastes may have been disposed of in municipal landfills. First, landfills that operated before the implementation of RCRA on November 19, 1980, typically accepted and co-disposed of both liquid and solid hazardous waste. Second, small quantity generators contribute varying quantities of hazardous wastes to municipal landfills. Small quantity generators are those that produce no more than one kilogram per month of designated acute hazardous waste or no more than 100 kilograms per month of all other hazardous wastes combined (see 40 CFR 261.5). Third, some household wastes such as batteries and paints, are hazardous. And fourth,

biodegradation of wastes within the landfill can create new compounds that are hazardous (USEPA 1991b). A 1987 USEPA survey assessed that 0.35 to 0.40% of household waste could be categorized as hazardous (Kinman and Nutini 1988). Typical household wastes that contain hazardous components include drain and oven cleaners, metal polishers, grease solvents, batteries, paint and paint removers, adhesives, and herbicides/pesticides (Lee and Jones 1989). Table 4-2 lists typical solvents that can be found in household products disposed of in municipal landfills. Liquid waste codisposed of typically includes degreasers, solvents, paints, and chemical cleaning agents.

A significant industrial waste known to be disposed of in the solid waste area came from Peacedale Processing, Inc. Liquid waste, primarily a urethane adhesive, was regularly accepted from Peacedale Processing and was to be spread over the other waste deposited in the landfill to take advantage of the adsorptive characteristics of the waste. However, a letter dated March 16, 1971, from the Rhode Island State Division of Solid Waste Management notified the South Kingstown Town Manager that liquid waste from Peacedale Processing was being improperly disposed of at the landfill. In addition, a resident observed and reported to RIDEM in 1979 the dumping of a number of barrels with lids intact. One of these barrels was also observed to be at least part liquid. RIDEM investigated this report and found a drum labeled "DALTOSLEX 535" and "DRANO 21." Daltoslex is a polyurethane fabric coating dissolved in trichloroethylene (TCE), dimethyl formamide (*N,N*-DMF), and cellosolve solvent (RIDEM 1979b). Cellosolve is the "trademark for mono- and dialkyl ethers of ethylene glycol and their derivatives" (Sax and Lewis 1987). Analysis of samples collected from these drums identified hexane, 2-butanone (MEK), TCE, and toluene as components of the liquid (RIDEM 1979b). All of these chemicals are widely used industrial solvents. Dimethyl formamide and cellosolve cannot be detected by the common methods used to analyze for volatile organic compounds.

In 1979, the State Division of Solid Waste Management reported the analysis of "a solid waste adhesive" procured from Peacedale Processing. The analysis of an extract of the sample contained TCE at 29,000 parts per billion (ppb), toluene at 400 ppb, and tetrachloroethene

(PCE) at 4 ppb. An analysis of the waste itself revealed that it contained 0.35% TCE. Based upon the analyses, the waste adhesive produced at the plant was deemed not hazardous as defined by Rhode Island regulations and could be disposed of at any licensed solid waste management facility in solid form (RIDEM 1979a).

On October 22, 1979, Kenyon Piece Dyeworks filed an application with RIDEM for special permission to dispose of hazardous wastes at the Rose Hill Regional Landfill. This application lists the landfill as a previous disposal facility for "mixed solvents," including *N,N*-dimethyl formamide (*N,N*-DMF), cellosolve acetate, MEK, "laminating waste" containing polyurethanes, TCE, MEK, and ethyl acetate (Kenyon Dyeworks 1979). Peacedale Processing notified the USEPA in 1981 that the company disposed of laminating adhesive at the Rose Hill landfill from 1971 to 1979 (USEPA 1990a).

During the initial M&E site walkover in November 1990, a large piece of foreign waste material was found on the eastern perimeter of the solid waste area. This waste was suspected to be hardened residue, composed of methyl methacrylate from a batch of polymeric latex or adhesive. The material appeared to be a solidified portion of partially melted latex beads that had been mixed with soil and partially degraded. The residue was likely a precursor to a coating solution used for water-proofing cloth or paper.

A small portion of the material was collected and analyzed by M&E using an infrared spectrometer at Hydrosample Laboratory in Northboro, Massachusetts. Infrared spectroscopy is a fast and general method for the identification of high polymer materials. The screening provides a fingerprint of the chemical structure and allows for comparison to reference spectra for identification.

The suspected glue waste that was analyzed most closely resembled the reference spectra (Appendix D) of polymethyl acrylate (Nyquist 1961). Polymethyl acrylate (also known as methyl methacrylate) is a common component of adhesives and laminates (Sax and Lewis 1987).

4.1.1.3 Bulky Waste Area. In 1978 the bulky waste area began operations. After the solid waste area closed in 1982, the bulky waste area also accepted solid waste. It is unknown whether industrial waste, including waste from Peacedale Processing, was disposed of here during that time frame. Types of materials disposed of in this area likely included appliances, construction debris, and other large items. Upon completion of the transfer station in 1983, the bulky waste area concluded operations.

4.1.2 Typical Landfill Processes and Contaminants

Chemicals not directly disposed of in landfills are generated and released as part of the decomposition (or degradation) of materials deposited in the landfill. Chemicals either directly deposited or released in the landfill can migrate from the original source to groundwater, air, and void spaces in the landfill itself as well as to surrounding soil, leachate originating from water infiltrating through refuse, or surface water runoff.

Leachate is produced as rain, surface water runoff, or other water infiltrates the waste deposited in a landfill. The character of the leachate is dependent on factors such as the types of wastes deposited in the landfill, the cover material, and quantity of water infiltration (Kinman and Nutini 1988). Leachate can seep out from the ground surface and contact groundwater. Table 4-3 lists constituents that have been found in typical municipal landfill leachate.

While specific chemicals may not have been disposed of, degradation of waste materials deposited in landfills contributes to the release of chemicals to subsurface media. For example, some chemicals may be transformed by microbial degradation into different chemicals. The biological transformation of PCE into TCE and the transformation of TCE into *cis*-1,2-dichloroethene, (*cis*-1,2-DCE), *trans*-1,2-dichloroethene (*trans*-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and vinyl chloride have been well documented (Cline and Viste 1984; Parsons et al. 1984; Howard 1990a). Similarly, 1,1,1-trichloroethane (1,1,1-TCA) has been shown to degrade into 1,1-DCE, 1,1-dichloroethane (1,1-DCA), *cis*-1,2-DCE, *trans*-1,2-DCE, chloroethane, and vinyl chloride (Smith and Dragun 1984; Howard 1990a).

Biological action also plays a major role in the generation of landfill gases. Methane and carbon dioxide, the principle components of landfill gas, are the byproducts of anaerobic microbial degradation. "Other volatile organics often emitted from CERCLA (municipal waste) landfills include halogenated hydrocarbons, simple alkanes, vinyl chloride, benzene and other aromatic compounds and mercaptans (USEPA 1991b)." These chemicals may be components of the landfill gas and become airborne emissions.

4.1.3 Hot Spots

The practice of landfilling is such that different wastes are disposed of in a manner that results in heterogeneous and nonuniform pockets of materials creating "hot spots" of potential contaminants. A landfill is typically composed of multiple hot spots. This may result in the variable or inconsistent detection of chemicals in groundwater, leachate, and soils. As is discussed in section 5, transport processes also affect contaminant detection in groundwater, leachate, and surface water.

4.2 CONTAMINANT DISTRIBUTION AND TRENDS

The field investigation has determined that volatile organics and other chemicals present throughout the three disposal areas are impacting groundwater quality. Past disposal practices within the three areas are considered to be the primary source of contamination at the Rose Hill site study area, although the specific waste sources have not been confirmed.

Volatile organics (primarily solvents) and water-soluble organics, the main contaminants of concern, have been found in varying concentrations throughout the site study area. Peacedale Processing, a past waste disposer at the Rose Hill landfill, was known to have disposed of adhesive wastes with solvents and water-soluble organics comprising major components.

4.2.1 Data Presentation

This section discusses the nature and extent of contamination in each media, focusing on the organic and inorganic analytical data obtained during the RI field investigation. Section 2 provided a detailed discussion of data collection, sources, and use.

Analytical data collected during the field investigation were validated in accordance with USEPA data validation guidelines (USEPA 1988b,c), as discussed in section 2.6.1. All analytical data generated during the RI are reported by media in Appendix D. In addition, averages, minimum and maximum values, and frequency of detection for chemicals detected in different media are summarized and presented on tables in this section. The treatment of analytical data to obtain these values is described in Appendix G.

To more effectively present analytical data throughout the site study area, sampling locations are grouped according to geographical location, disposal area, or water body. Table 4-4 presents, by media, the different groupings used in this section.

As shown in these tables, background samples for the site study area were collected for comparison with surface and subsurface soil, groundwater, surface water, and sediment. In addition, a literature search was conducted and government agencies were contacted to obtain background information, if available for each media. Through this effort, only background data for surface soil (Table 4-5) were gathered for comparison with samples collected from the site study area. These data are presented in the appropriate sections that follow.

4.2.2 Surface Soils

Thirteen surface soil samples (SS-01 to SS-13), from 0 to 6 inches in depth, were collected in September/October 1991. In April 1992, 11 additional samples (SS-14 to SS-24) were collected from depths of 0 to 12 inches.

Three background locations (SS-01, SS-02, and SS-14) were selected and sampled. Three samples were located on the sewage sludge area (SS-11, SS-12, and SS-15), three on the bulky waste area (SS-09, SS-10, and SS-24), six on the solid waste area (SS-03, SS-04, SS-05, SS-13, SS-16, and SS-17), and nine in nondisposal areas (SS-06, SS-07, SS-08, SS-18, SS-19, SS-20, SS-21, SS-22, and SS-23). Surface soil sampling locations are shown in Figure 2-20. Samples were analyzed for the following parameters:

- Volatile organics
- Semivolatile organics
- Pesticides and PCBs
- Metals
- Cyanide
- Total combustible organics (TCO; September 1991 only)
- Grain size (September 1991 only)

The analytes detected in surface soils are presented in Tables 4-6 and 4-7. A summary of the organic compounds detected in surface soil samples is presented in Figures 4-1 and 4-2. The analytes detected in each of the different areas (Table 4-4) are discussed in the following sections.

4.2.2.1 Background. Three background samples (SS-01, SS-02, and SS-14) were collected north of the disposal areas. The locations selected were in areas that are upgradient of disposal areas and appear undisturbed by landfill operations. Samples were collected from topsoil materials and did not exhibit any signs of recent disturbance. As a result, the samples collected are considered to be representative of background conditions for surface soil.

Five organic compounds were detected infrequently at concentrations below sample quantitation limits in the background samples. Acetone was detected at 480 μg/kg in SS-14. Two phthalates, diethylphthalate and butylbenzylphthalate, were each detected at SS-02 (31 μg/kg) and SS-01 (41 μg/kg), respectively. Phthalates are widely distributed in residential as well as

commercial areas because they are components in many plastics, pesticides, hydraulic oils, and lubricants. Since much of the site study area has been used for multiple purposes, such as farming and residential use, the detection of phthalates is not unlikely.

Two polycyclic aromatic hydrocarbons (PAHs), fluoranthene (25 μg/kg) and pyrene (29 μg/kg), were also detected in SS-01, which is located approximately 20 feet away from a dirt road, and are most likely attributable to vehicular activities. Four pesticides were found in SS-01 and SS-14 at concentrations ranging from 0.6 to 1.2 μg/kg: 4,4'-DDT, 4,4'-DDE, aldrin, and endrin ketone. This family of chlorinated pesticides has been regularly used for insect control in both residential and agricultural applications from the early 1900s to the 1980s. The concentrations detected are most likely residual pesticides that were applied in the past to areas in or surrounding the site study area. PCBs were not found in any of the background samples.

With the exception of sodium, major-metal ions (aluminum, iron, calcium, magnesium, and potassium) were detected in the three background samples at concentrations higher than those for other metals. Aluminum ranged from 12,200 to 16,600 mg/kg, iron ranged from 12,300 to 18,100 mg/kg, and basic cations (calcium, magnesium, and potassium) ranged from 213 to 1,360 mg/kg. Sodium was not reported as discussed in section 2.6. Other metals detected in the background samples include barium (15.4 to 37.8 mg/kg) and 12 heavy metals:

arsenic	2.1 to 2.8 mg/kg
chromium	11.2 to 17.5 mg/kg
cobalt	3 to 3.6 mg/kg
copper	3.5 to 5.3 mg/kg
lead	11.1 to 30.1 mg/kg
manganese	82 to 267 mg/kg
mercury	0.17 mg/kg
nickel	4.1 to 5.5 mg/kg
thallium	0.28 mg/kg
vanadium	16 to 25.7 mg/kg
zinc	21 to 30.1 mg/kg

These metals are present in other soil samples in the eastern United States and Rhode Island (Table 4-5), with the exception of thallium, which was not analyzed for, and beryllium, which was not detected in the literature samples. Barium, beryllium, chromium, cobalt, copper, lead, manganese, mercury, vanadium, and zinc were also found in background subsurface soil samples collected in the site study area (section 4.1.3). Aluminum, lead, and mercury were found at concentrations within the ranges listed for the eastern United States and at concentrations less than those reported in the Rhode Island sample. Lead and beryllium were found at concentrations above those reported for the Rhode Island sample but within the range reported for the eastern United States. Since metals are naturally occurring in soils and can potentially vary within a small area, it was not possible to determine the significance of differences between literature values and concentrations detected in these samples. However, lead concentrations may be elevated throughout the site study area because of bullets (or pellets, shot) used in the shooting of game birds, skeet shooting, and target practice, over more recent years.

Cyanide was not detected in any of the background samples. The organic content of the samples was measured as 6.8 and 7.5% at SS-01 and SS-02, respectively, which indicate low organic content in the soils.

Distribution and Significance. As described in section 1, over the last 50 years, the entire site study area has had various uses, besides the landfill operation, which could have affected chemical conditions in surface soils. The background surface soils were selected from areas that could be used to distinguish between impacts from various uses of the site study area and potential impacts from the disposal areas. Background surface soil was collected from vegetated areas north of the three disposal areas and consisted of topsoil and sandy materials. One location was near a dirt road.

Several organic compounds consisting of acetone, phthalates, pesticides, and PAHs were detected infrequently and at relatively low concentrations in the background surface soils. The organic compounds detected most likely have resulted from the impact of various activities that occurred or are continuing to occur throughout and in the vicinity of the site study area. Besides

major-metal ions, barium, beryllium, and 12 heavy metals were detected in the background surface soil. Lead may be partially related to current hunting and skeet shooting activities. Comparison of 1991 and 1992 background data shows similar concentrations for all detected analytes.

4.2.2.2 Sewage Sludge Area. Surface soil samples were collected at three locations (SS-11, SS-12, and SS-15) in the sewage sludge area. Topsoil/fill material was encountered at thicknesses of 2 to 5 feet (based on boring activities) in several locations in the sewage sludge area. The origin and thickness of fill overlying the sewage sludge area is not entirely known. The fill is reportedly from a combination of off-site sources and sand and gravel excavated from areas north of the disposal areas (i.e., current target shooting area; Frisella 1992; Figure 2-1). There was no evidence of sludge material in any of the surface soil samples. In addition, vegetation was not present in the immediate vicinity of SS-11.

The analytes detected are presented in Tables 4-6 and 4-7. Figures 4-1 and 4-2 present a summary of the organic compounds detected.

A few organic compounds, including several volatile and semivolatile organics and pesticides, were identified in two of the surface soil samples (SS-11 and SS-12), but were not detected in SS-15 (Tables 4-6 and 4-7). PCBs were not detected in any of the samples.

Acetone was detected in SS-11 (23 μg/kg) and SS-12 (14 μg/kg), and 2-butanone (MEK) was detected in SS-12 (4 μg/kg). Diethylphthalate was also detected at a concentration less than sample quantitation limits (29 μg/kg) in SS-12. A similar concentration was found in a background surface soil sample. Tetrachloroethene and pyrene were detected in SS-11 at concentrations below sample quantitation limits (2 μg/kg and 26 μg/kg, respectively). Pyrene was also detected in the background surface soil.

In addition, 4-chloroaniline, dieldrin, and *alpha*-chlordane were detected in SS-11 at 490, 4.5, and 3.7 μg/kg, respectively. The source of these compounds is not clear. The immediate area

from which SS-11 was collected is characterized by the absence of vegetation. While there was no physical evidence of sludge material at this location, similar compounds were detected in subsurface media investigated in this area. *alpha*-Chlordane was detected from 2 to 8 feet in BH-01 (section 4.2.2), located in the southern portion of the disposal area, and 4-chloroaniline was also found in groundwater from MW-II (section 4.2.3), in the central portion of the sewage sludge area. Both the boring and well are in contact with sludge material (section 3.1).

The pesticides detected in SS-11 were also found in 16 percent of the samples collected from municipal sewage sludge in one national survey (USEPA 1990b). If present in buried sludge, limited partitioning of pesticides from the sludge material upwards into the cover material would be expected because of strong adsorption and low volatility characteristics of pesticides in soils. Dieldrin is a photo- and biodegradation product of aldrin, which was found in background surface soil. In addition, chloroanilines are formed from the degradation of some pesticides and can be produced during wastewater treatment. For these reasons, these compounds may be attributed to the underlying sludge material. However, 4-chloroaniline is also used in agricultural chemicals (Howard 1990b).

Of the 20 metals detected in surface soil samples, major-metal ions (aluminum, iron, calcium, magnesium, and potassium) were detected in each of the samples and at higher concentrations than those for other metals. Concentrations ranged from 3,450 to 6,740 mg/kg for aluminum, from 7,190 to 10,400 mg/kg for iron, and from 263 to 1,300 mg/kg for basic cations. Sodium would also be expected to be detected, but was not reported, as described in section 2.6.2. Besides major-metal ions, barium, lead (2.6 to 11.8 mg/kg), manganese (96.4 to 135 mg/kg), and zinc (19.9 to 56.5 mg/kg) were detected in the three surface soil samples. Other heavy metals, consisting of arsenic (0.52 to 0.86 mg/kg), chromium (5.3 to 9.8 mg/kg), cobalt (3 to 3.6 mg/kg), and nickel (3.9 to 5.4 mg/kg), were found in SS-11 and SS-12 (both were collected in September/October 1991 from depths of 0 to 6 inches), while copper (9.9 to 99.3 mg/kg) and vanadium (12 mg/kg) were detected at SS-11 and SS-15, which was collected in April 1992 from depths of 0 to 12 inches. Antimony, mercury, and silver were detected in SS-11 at 78.8, 0.28, and 1.6 mg/kg, respectively. Thallium (0.25 mg/kg) was found in SS-12. Beryllium

(0.4 mg/kg) was detected at SS-15. Generally, more heavy metals and higher metal concentrations were measured in SS-11 relative to the other two samples.

With the exception of antimony, all of the metals detected in these surface soil samples were also found in background surface soils. In comparison to the largest metal concentrations detected in background samples, concentrations were less than two times greater for barium, manganese, and zinc, but were as much as 20 times greater for copper. Copper was the only metal that was significantly higher in concentration in the sewage sludge area than in the background samples (Appendix D). All of the other metals detected in the surface soil samples were within or below the range detected in the background samples.

Cyanide was not detected in any of the samples. The organic content of the samples was measured at 0.9 and 2.8% in SS-12 and SS-11, respectively.

Distribution and Significance. Although coverage of the entire area is unknown, field activities indicated that the thickness of topsoil/fill material ranged from 2 to 5 feet. A few organic compounds, primarily ketones, were detected at relatively low concentrations in two locations, SS-11 and SS-12. Organic compounds were not detected at SS-15. This agrees with the findings of the landfill gas survey, in which minor quantities of acetone were the only volatile organics detected (section 4.2.8).

Since other organic compounds (TCE, pyrene, 4-chloroaniline, dieldrin, and *alpha*-chlordane) were detected in only one location (SS-11), it is not clear if this location is representative of the area. The detection of several elevated metal concentrations, particularly copper, is also associated with this one location. The material sampled at all locations consisted of fill and topsoil, and neither sewage sludge material nor odors were evident. Since the only other difference between SS-11 and the other locations is the absence of vegetation, the extent of organic compounds and elevated metal concentrations may be largely localized.

4.2.2.3 Bulky Waste Area. Three surface soil samples (SS-09, SS-10, and SS-24) were collected from the bulky waste area. The sample located at SS-09 was selected because of the detection of elevated volatile organics in landfill gas at this location. The other sample locations were chosen to characterize the area. During installation of landfill settlement platforms, 2 to 4 feet of fill was encountered at ground surface in this area, whereas refuse was found at ground surface at the eastern perimeter during boring activities (BH-06). This indicates that fill/soil material does not continuously cover the area.

The surface soil samples collected consisted predominantly of topsoil and sand or sand/gravel material. Refuse was not observed, although organic vapors and methane (CH_4) were measured during sampling. Vegetative cover in the area generally consisted of tall grass (section 3.4).

Organic compounds were detected at SS-09 and SS-10 but were not detected at SS-24. The types of organic compounds found included chlorinated and aromatic volatiles, ketones, and one phthalate. Acetone, MEK, and PCE were the only compounds detected at concentrations above sample quantitation limits. Pesticides and PCBs were not detected in any of the samples.

Two ketones, acetone (45,000 μg/kg) and MEK (1,400 μg/kg), were detected at SS-09. Acetone was also detected at SS-10 (37 μg/kg). Acetone is commonly found in municipal and industrial landfills from the disposal of solvents or industrial materials, and MEK was identified in industrial waste disposed of in the solid waste area. In addition, production of acetone during degradation processes results in releases to subsurface media.

Chlorinated organics detected at SS-09 include PCE (24 μg/kg) as well as 1,2-DCE, chloroform, and TCE at concentrations less than the sample quantitation limit (8, 2, and 2 μg/kg, respectively). Tetrachloroethane was also found at SS-10 (3 μg/kg). Three aromatic volatiles consisting of toluene, ethylbenzene, and xylene were also detected at concentrations up to 10 μg/kg at SS-09. Butylbenzylphthalate, which was also found in background surface soil, was detected in SS-10 at a concentration less than the sample quantitation limit (120 μg/kg). These

organic compounds are known to have been disposed of during landfill operations, and are typically found in municipal wastes.

Of the 13 metals detected in the surface soil samples, major-metal ions (aluminum, iron, calcium, magnesium, and potassium) were detected at the highest concentrations in all of the samples. Aluminum ranged from 6,500 to 8,940 mg/kg, iron from 9,240 to 11,650 mg/kg and basic cations from 442 to 1,270 mg/kg. Sodium was also detected at similar concentrations, but was not reported (section 2.6.2). Barium (14.4 to 16.5 mg/kg), manganese (105 to 154 mg/kg), lead (4.3 to 5.6 mg/kg), vanadium (10.2 to 15 mg/kg), and zinc (19.3 to 36 mg/kg) were also found at all three locations. In addition, beryllium and copper (0.52 and 5.6 mg/kg, respectively) were detected at SS-24. Arsenic, chromium, cobalt, and nickel were detected at concentrations from 1.05 to 9.8 mg/kg at SS-09 and SS-10. All of these metals were also found in background surface soil. Concentrations measured in the three bulky waste samples were near (less than two times greater) or within the range found in background surface soil (Appendix D). Cyanide was not detected in any of the surface soil samples. The organic content of the samples ranged from 1.9 to 2.9%.

A field duplicate collected at SS-09 demonstrates the degree of variability associated with the sample and duplicate. For example, no aromatic volatiles and only one of the chlorinated volatiles (PCE) detected in the sample were found in the duplicate. However, the compounds not detected in the duplicate were present in the sample at concentrations below sample quantitation limits. In addition, the concentrations of acetone and MEK were lower in the duplicate (2,400 and 33 μg/kg, respectively) than in the sample. Similar differences also occurred in metal concentrations such as for barium or iron. These differences are related to the variability that can occur because of the heterogenous nature of soil.

Distribution and Significance. The entire bulky waste area was covered with fill, although the exact source of the fill is not known. However, it is more likely that the compounds detected in surface soils in this area are related to the refuse underlying it. The amount and depth of cover appears to vary. Fill materials were encountered at thicknesses of 2 to 4 feet in some

parts of this area and thin out or may not be present at other parts, particularly near the boundary edges.

The organic compounds detected in surface soils in the bulky waste area are consistent with the types of solid and bulky refuse suspected of being landfilled at this area. The primary organic compounds identified were volatile organics (Figure 4-3), including chlorinated and aromatic volatiles and ketones. In particular, the majority of and greatest concentrations of volatile organics were found at SS-09. This location is in an area where elevated volatile organic concentrations were measured in landfill gas (section 4.2.8). The types of compounds detected in the landfill gas, including ketones, aromatic volatiles, and some chlorinated volatiles, are similar to those found at SS-09. To a lesser extent, similar volatiles were also found in surface soil at SS-10.

Except for butylbenzylphthalate, which has been identified at similar concentrations in other surface soils in the site study area, other less volatile organic compounds were not found. In addition, metals were not found at concentrations significantly different from those in background surface soil.

The differences between concentrations of organic compounds or metals, as seen for the sample and field duplicate at SS-09, demonstrate the degree of variability as well as the heterogeneous nature of soil. In landfills, this is enhanced because of the randomness of landfill contents.

4.2.2.4 Solid Waste Area. Six surface soil samples were collected from the solid waste area. Surface soils SS-03, SS-04, and SS-05 were located to evaluate points where volatile organics were detected in landfill gas. Locations for SS-16 and SS-17 were chosen to further characterize the area, and SS-13 was located near exposed glue-like waste.

During walkovers of the solid waste area many places of exposed refuse were observed. Many of these areas are located near the perimeters of the disposal area, although other exposed areas are also within the boundaries of the disposal area. Two of the samples (SS-03 and SS-05) were

collected in areas where there was little topsoil or fill material, and outcrops of exposed refuse occurred. Elevated levels of organic vapors were measured during excavation of these samples. The sample collected at SS-03 consisted of sandy soil intermixed with decomposing refuse and spongy glue-like waste material, while the sample collected at SS-05 was composed of topsoil and refuse. At SS-04, 3 inches of brown weathered sand underlain by a darkly stained sand was sampled. Elevated readings were detected at this location with the FID but not the PID. Similar measurements were made at SS-13, where organic-enriched topsoil, sand, and spongy glue-like waste were collected. A chunk of this waste removed from near SS-13 was analyzed and found to consist of methyl methacrylate, a component of laminants and adhesives (section 4.1). Again elevated FID readings were measured, although no PID readings occurred at this location. The other two samples (SS-16 and SS-17) were collected from locations where topsoil and vegetative cover were present. These samples consisted of compacted sand and silt intermixed with pebbles and organic-enriched soil, respectively. There was no visible evidence of refuse in these samples.

Similar findings were also noted during boring and excavation (installation of landfill settlement platforms) activities, as fill material at the ground surface ranged in thickness from 0 to 1.5 feet. In addition, grey or dark-stained soil that was similar to the material collected at SS-04 was also noted at about 0.5 feet below the ground surface at several locations.

The types of volatile organics detected in the surface soils consisted of chlorinated and aromatic volatiles and ketones. Semivolatile organics found include PAHs and phthalates. Pesticides were also detected. PCBs were not detected in any of the samples.

Volatile organics were detected in all of the surface soil samples except at SS-17. Eight of the volatile organics (including 1,1-DCA, 1,2-DCE, toluene, ethylbenzene, xylenes, acetone, and MEK) were generally found in higher concentrations and more often than other volatile organics. Other volatile organics (including PCE, 1,1,1-TCA, 1,1-DCE, chloroform, benzene, 4-methyl-2-pentanone (MIBK), and 2-hexanone were found at concentrations less than sample quantitation limits. Vinyl chloride was also detected.

The majority of chlorinated volatiles were detected in SS-03 and SS-13. Total concentrations at SS-13 were 2,700 μg/kg and at SS-03 were 1,000 μg/kg. As previously mentioned, these samples were collected near refuse and glue-like waste. Chlorinated volatiles were also detected in SS-05 and SS-04. These locations were also sampled near refuse or in discolored fill, respectively. Tetrachloroethene was detected at concentrations below sample quantitation limits (2 to 5 μg/kg) in SS-03, SS-04, and SS-13. 1,1,1-Trichloroethane was also found at 8 μg/kg in SS-03. 1,2-Dichloroethene was found at the highest concentrations in SS-03 (970 μg/kg) and SS-13 (2,400 μg/kg). 1,1-Dichloroethane was also detected in SS-03 (25 μg/kg), while 1,1-DCE was detected in SS-13 (4 μg/kg). Vinyl chloride was also detected at SS-13 (250 μg/kg) and at SS-03 (4 μg/kg). Dichlorinated volatiles and vinyl chloride are common degradation products. In addition, up to 3 μg/kg of chloroform was found at SS-05 and SS-03.

Aromatic volatiles consisting of benzene, toluene, ethylbenzene, and xylenes (BTEX compounds) were present at three of the surface soil samples (SS-03, SS-04, and SS-13). Toluene (58 to 110 μg/kg), ethylbenzene (11 to 21 μg/kg), and xylenes (20 to 84 μg/kg) were found in all three samples. In addition, benzene was detected at 6 μg/kg in SS-03 and SS-13. The highest total BTEX concentrations (220 μg/kg) occurred at SS-13.

The ketones detected in surface soils in this area include acetone, MEK, 2-hexanone, and MIBK. Ketones were detected more often and in the highest total concentrations at SS-04 (160,000 μg/kg), and were also found in SS-03, SS-05, SS-13, and SS-16 at concentrations ranging from 24 to 4,000 μg/kg. Acetone was detected at an elevated concentration (160,000 μg/kg) in SS-04. Acetone concentrations at other locations were lower (75 μg/kg in SS-05 to 4,000 μg/kg in SS-16). 2-Butanone was detected in SS-03, SS-04, and SS-13. 2-Hexanone and MIBK were each detected once at SS-04 at concentrations below sample quantitation limits (3 and 6 μg/kg, respectively).

Isopropanol (IPA) was also detected as a tentatively identified compound (TIC) in SS-04 at a relatively high estimated concentration. Since this was an isolated occurence at elevated concentrations, it is not suspected of being an artifact from field procedures. In addition, IPA

was potentially disposed of in the solid waste area (Kenyon Piece Dyeworks 1979). The other volatile organics are all commonly found in municipal waste, and some of these compounds (MEK, PCE, TCE, and toluene) were components of industrial wastes deposited in this area.

Phthalates and PAHs were detected in several samples at concentrations below sample quantitation limits. Butylbenzylphthalate (41 μg/kg) was detected at SS-03, and diethylphthalate (29 μg/kg) was detected at SS-13. Similar concentrations were also detected in background samples. Ten different PAHs were each detected in SS-04, SS-05, and SS-17 at concentrations ranging from 19 to 170 μg/kg. Two of the PAHs, pyrene (38 μg/kg) and fluoranthene (33 μg/kg), were also detected in SS-13. The detection of PAHs in surface soils in urban areas is common. Debris from fires or ash from boilers or fireplaces may contain PAHs. In the past, used oils were typically applied to the surface of dirt roads or the shoulders of paved roads to reduce airborne dust. Also, fuel oil, asphalt, tar, or heavier fractions of petroleum products contain PAHs, which can be released to the environment either directly or by combustion (i.e., automobile fumes). These PAHs may also be attributed to wastes disposed of in the solid waste area.

The DDT family of pesticides was detected at SS-04, SS-13, SS-16, and SS-17. Except for 4,4'-DDE, concentrations were less than sample quantitation limits. 4,4'-DDT was detected at SS-04 (4.7 μg/kg) and SS-17 (0.9 μg/kg). 4,4'-DDD was detected at SS-13 (5.2 μg/kg) and SS-16 (0.24 μg/kg), and 4,4'-DDE was detected at SS-13 (7.6 μg/kg) and SS-17 (0.33 μg/kg). 4,4'-DDE and 4,4'-DDT were also detected in background surface soil samples. The concentrations found in the solid waste area, however, were generally greater than those in the background samples. The disposal of insecticides, rodenticides, or herbicides in municipal solid waste landfills was not regulated until the mid-1980s. Until then, these chemicals were regularly disposed of by the public. Hence, it is likely that these contaminants would be present in the site study area.

Major-metals ions (aluminum, iron, calcium, magnesium, and potassium) were detected at concentrations greater than other metals. Sodium was also detected at similar concentrations,

but was qualified as nondetected (section 2.6). Barium (15.5 to 20.3 mg/kg), manganese (92.1 to 138 mg/kg), and four heavy metals (copper, lead, vanadium, and zinc at concentrations ranging from 5.4 to 253 mg/kg) were also detected in all of the samples. Arsenic, chromium, copper, and nickel were detected at concentrations from 0.81 to 12.8 mg/kg in the four samples collected from 0 to 6 inches (SS-03, SS-04, SS-05, and SS-13). In addition, beryllium was found at SS-16 and SS-17, while silver was detected at SS-03 and SS-13, and thallium was found at SS-03. Except for silver, all of the metals detected in the solid waste area were also found in background surface soil. The highest concentrations tended to occur at SS-13 or SS-03. Of the metals detected, copper concentrations were as much as 50 times greater than found in background surface soils. However, based on the available data, no statistical difference was evident between the metal concentrations, including copper, and concentrations in background surface soil (Appendix D).

Cyanide was not reported in any of the surface soil samples. The organic content of the soil ranged from 2.3 to 9.4%.

Distribution and Significance. Fill/soil material overlying the solid waste area is generally less than 1 foot thick but thins out and is not present in many areas, particularly near the boundary edges. Scattered pockets of exposed refuse and glue-like waste are readily evident throughout the area. Organic compounds and elevated concentrations of metals were found in surface soil at several locations in the solid waste area.

The types of organic compounds detected include chlorinated and aromatic volatiles, ketones, phthalates, PAHs, and DDT pesticides. More organic compounds and higher metal concentrations tended to be found in areas where refuse or glue-like waste (SS-03, SS-04, SS-13) was present. At locations where fill/soil was present (SS-16, SS-17, SS-05), few to no organic compounds were found. Metal concentrations also tended to be somewhat lower.

Volatile organics were the primary type of organic compounds detected in surface soil near or at areas of exposed refuse or glue-like waste. Detected in the highest concentrations were vinyl chloride and 1,2-DCE. Other dichlorinated volatiles (1,2-DCA and 1,1-DCE) were also detected

at relatively low concentrations. These compounds are degradation products of chlorinated volatiles like those found at this location (1,1,1-TCA and PCE) as well as other compounds like TCE. The majority of and highest volatile organic concentrations generally occurred at the location where glue-like waste was the most apparent (SS-13), near the west-central perimeter of the disposal area.

As discussed in section 4.1, the glue-like waste collected near SS-13 was identified as methyl methacrylate, an acrylic resin that is a component of laminants and adhesives. In addition, toluene, TCE, and MEK were among the major industrial solvents reported to have been deposited along with adhesive glue waste during landfill operations (section 4.1). Vinyl chloride is also commonly used in latex and adhesive manufacturing and may be found as a trace element in the final product.

Ketones (acetone and MEK) and elevated concentrations of BTEX compounds were also detected at this location. Elevated concentrations of acetone and MEK were found within 20 feet of SS-13 (at SS-04). Isopropanol, an industrial waste potentially disposed of during landfill operations, was also identified at SS-04.

Ketones and chlorinated and aromatic volatiles were also detected, to a lesser extent, at other locations where exposed refuse was evident (SS-03 and SS-05). Disposal of these solvents in the solid waste area, along with generation of other volatile compounds from decomposing wastes and solvents, are the most likely sources of volatile organics in surface soil in the solid waste area. These compounds were similar to the types of volatile organics found in elevated concentrations in landfill gas in the solid waste area (section 4.2.8). These findings suggest that the fill/topsoil, when present, serve to restrict escaping landfill gases to some extent.

Other organics were also detected in surface soils in this area. Pesticides, PAHs, and phthalates were all found at concentrations below sample quantitation limits. Unlike volatile organics, these organic compounds were more widely distributed and were not entirely related to locations

with exposed refuse or glue-like waste. These compounds may be present because of material disposed of during landfill operations or material from a variety of non-related sources.

In addition, elevated concentrations of several metals (i.e., copper, lead, zinc) were found. The highest concentrations usually occurred at SS-13 or SS-03, where refuse and glue-like waste were present. When statistically compared with background surface soil, however, no significant differences were evident.

4.2.2.5 Nondisposal Areas. Nine sampling locations were selected outside of the disposal area boundaries. The rationale for each of these locations is described in section 2.5.2. Two surface soil samples, SS-07 and SS-08, were collected on residential property to evaluate volatile organics detected in soil gas. Samples collected from these locations consisted of roots and organic-enriched soil with sand. Organic vapors were measured at SS-07. Locations for SS-18, north of the solid waste area, and SS-22 and SS-23, between the bulky waste area and Saugatucket River, were positioned near leachate outbreaks. Samples from these locations were characterized by dark organic matter intermixed with sand, silt, and roots. An orange leachate outbreak was observed about 3 feet from SS-23. Surface soil samples SS-19 and SS-20 were collected south of the solid waste area, in a wooded area near Mitchell Brook. Samples consisted of decomposing organic matter intermixed with sand and silt. In an open area, approximately 150 feet south of the Transfer Station Road, SS-06 was collected. SS-21 was collected in a low-lying drainage area next to the eastern perimeter of the solid waste area. The sample was collected from a 4-by-25-foot area with little to no vegetation and orange-stained sand that was presumed to be a dried-up leachate seep since a drainage swale was identified near this location (Figure 3-15). Orange-stained sandy soil was collected at this location.

Volatile organics (chlorinated and aromatic volatiles and ketones) were detected at five locations. Chlorinated volatiles were detected at concentrations below sample quantitation limits in three locations. Tetrachloroethene was found at 4 μg/kg in SS-08, while 1,1-DCA and 1,2-DCE were found in SS-07 at 2 (field duplicate only) and 6 μg/kg, respectively. SS-07 was collected near an area where leachate seeps were observed in past years by the residents and elevated volatile

organic concentrations were measured in landfill gas a few feet away. Chloroform was detected in SS-06 (2 μg/kg), which is less than 100 feet from where landfill gas was detected. Concentrations of BTEX compounds ranged from 2 to 12 μg/kg. Ethylbenzene, toluene, and xylene were detected at SS-22, and toluene was found at SS-23. These compounds were also detected in a nearby leachate seep (section 4.2.3). Acetone and MEK were found in SS-06, SS-07 (in field duplicate), SS-08, and SS-22 at concentrations ranging from 15 to 4,400 μg/kg and 23 to 33 μg/kg, respectively. Volatile organics were not detected at three locations: SS-19, SS-20, and SS-21.

Diethylphthalate (27 to 42 μg/kg) was detected in SS-20 and SS-22 at concentrations similar to those found in background surface soil. Ten individual PAHs, at concentrations ranging from 31 to 100 μg/kg, were detected at SS-07. While individual concentrations were below sample quantitation limits, total concentrations equaled 560 μg/kg. At this location, these compounds have likely resulted from runoff from Rose Hill Road, approximately 10 feet away. Several PAHs were also found in background surface soil at similar concentrations.

Other PAHs were detected in SS-08, SS-22, and SS-23 at concentrations ranging from 23 to 120 μg/kg. Two pesticides, 4,4'-DDT (0.38 to 5.2 μg/kg) and 4,4'-DDE (0.38 to 11 μg/kg), were found in SS-07, SS-18, SS-22, and SS-23. Endrin ketone was found at a concentration of 2.3 μg/kg in SS-08. These pesticides were also found in background surface soil, although at lower concentrations. PCBs were not detected in any of the samples. SS-22 and SS-23 are located downslope and downgradient of the bulky waste area, near large leachate outbreaks. SS-18 is located downslope of the solid waste area, and SS-08 is located on residential property.

Major-metal ions (aluminum, iron, calcium, magnesium, and potassium), barium (3.1 to 3.5 mg/kg), lead (2.8 to 6.3 mg/kg) manganese (12.9 to 6,120 mg/kg), vanadium (3.2 to 27.2 mg/kg), and zinc (10.3 to 37.4 mg/kg) were detected in each of the samples. Other metals detected include beryllium (0.37 to 0.88 mg/kg), arsenic (3.1 to 3.5 mg/kg), chromium (3.2 to 13.9 mg/kg), cobalt (3.8 to 12.8 mg/kg), copper (2.8 to 6.3 mg/kg), mercury (0.2 to 4.1 mg/kg), nickel (6.2 to 10 mg/kg), and selenium (5.9 mg/kg). Concentrations of major-metal

ions were larger than those of the other metals detected: aluminum was 1,740 to 14,400 mg/kg, iron was 4,090 to 149,000 mg/kg, and basic cations were 106 to 1,710 mg/kg. The number of metals as well as concentrations tended to be higher in surface soil collected near leachate seeps (SS-18, SS-22, and SS-23). In particular, iron concentrations (15,100 to 149,000 mg/kg) at these locations were elevated in relation to background surface soil. Elevated iron concentrations were also found at SS-21 (40,500 mg/kg), collected from a large area of orange-stained soil to the east of the solid waste area, presumed to be a dried-up leachate seep or drainage area.

Cyanide was not detected in any of the surface soil samples. The organic content of soils analyzed for TCO ranged from 3.2 to 12.6%.

Distribution and Significance. Numerous organic compounds, including volatile organics, PAHs, and pesticides, as well as elevated metal concentrations were found in surface soils collected near leachate seeps in the vicinity of the solid waste area and the bulky waste area (SS-22 and SS-23). The surface soil collected on residential property west of Rose Hill Road (SS-07) also exhibited similar chemical characteristics. Seeps have also been reported in this area, which is near the northern portion of the solid waste area. Surface soils at these locations exhibit chemical characteristics that are similar to those found in surface soil and other subsurface media associated with the disposal areas.

In other nondisposal area locations, several organic compounds were also detected, but less frequently and generally at lower concentrations. For the most part, the types of organics detected (primarily PAHs, phthalates, and pesticides) were also found in background surface soil and appear to be more related to general activities characteristic of typical residential areas. As discussed in section 4.2.8, volatile organic plumes extend beyond the disposal area boundaries, and may be contributing to some of the volatile organics detected in surface soil outside of the disposal areas.

4.2.2.6 Summary of Surface Soil Findings. The detection of organic compounds and elevated metal concentrations in surface soil is largely related to location in the site study area. Volatile organics were the most prevalent of the organic compounds detected, and chlorinated volatiles (i.e., 1,2-DCE, 1,1-DCA, vinyl chloride, chloroethane), aromatic volatiles (i.e., BTEX compounds), and ketones were among the compounds detected more frequently and in higher concentrations. Refuse and landfill gas are the primary sources contributing to volatile organics in surface soil investigated. This was most evident in the solid waste area. Soil associated with refuse or glue-like materials exhibited elevated concentrations of chlorinated and aromatic volatiles and ketones, which are widely used as solvents and are formed during degradation of municipal wastes. Elevated concentrations were also found in several locations in the bulky waste area. These concentrations are attributed to diffusion of volatile organics via landfill gas. In the sewage sludge area, volatile organics were not detected in any substantial concentrations.

On the other hand, organic compounds such as PAHs, phthalates, and pesticides were more widely distributed throughout the area. Although elevated concentrations in the solid waste area coincided with surface soil near exposed refuse and glue-like wastes, landfilled refuse is not likely the only source of these compounds in most of the area given their many general uses. However, in the sewage sludge area, the presence of several pesticides and 4-chloroaniline, which are common agricultural chemicals, in an area that was visibly stressed (no vegetation) suggests that these compounds were either locally dumped or that there may be an exposed area of sludge, although this was not evident.

Metal concentrations were also found to be related to location. For the most part, elevated concentrations of iron were found most often in surface soil found near leachate seeps because of the elevated concentrations found in the leachate. Elevated concentrations of copper were also found in the sewage sludge and solid waste areas, although no significant difference with the background surface soil was evident. Elevated lead concentrations throughout the site study area (including background surface soil) are probably from shot used during hunting, target practice, and skeet shooting.

4.2.3 Subsurface Soil

Fourteen samples were collected from seven soil borings (two from each boring). Each of the borings was advanced to a depth of 20 feet. One background boring, BH-05, was drilled. Four borings were advanced in the sewage sludge area (BH-01 through 04), one boring was advanced in the bulky waste area (BH-06), and one was advanced in the solid waste area (BH-07). Two samples from each boring were analyzed for the following parameters:

- Volatile organics
- Semivolatile organics
- Pesticides and PCBs
- Metals
- Cyanide
- Total combustible organics (TCO)
- Grain size

The analytes detected in subsurface soils are summarized in Table 4-8. A summary of organic compounds detected is presented in Figure 4-3. Samples were also submitted for permeability and Atterberg limits. These results were presented in Table 3-6 and were discussed in section 3.1.

4.2.3.1 Background. The background boring, BH-05, was located in a wooded area just northwest of the sewage sludge area. Trees in the area appear to be at least 20 to 30 years old. In addition, aerial photographs taken from 1941 to 1988 (USEPA 1987a, 1991a) indicate that excavation has not occurred and that this location has remained largely undisturbed during landfill operations. Glacial outwash was present throughout the boring. For these reasons, the samples collected from BH-05 are considered to be representative of background conditions in subsurface soils.

Volatile organics, pesticides, and PCBs were not identified in either of the samples from BH-05. The only semivolatile organics detected in samples from this boring were two phthalates, at concentrations less than sample quantitation limits. Di-n-butylphthalate was detected at 62 μg/kg from 0 to 2 feet, and di-n-octylphthalate was detected at 19 μg/kg from 10 to 16 feet but was not detected in the field duplicate for this sample.

Major-metal ions (aluminum, iron, magnesium, and potassium) were detected in both samples at concentrations that were higher than those for other metals. Concentrations ranged from 3,955 to 11,800 mg/kg for aluminum, from 6,415 to 12,800 mg/kg for iron, and from 415 to 1,350 mg/kg for magnesium and potassium. Calcium and sodium were also detected, but were not reported because of qualifications during validation (section 2.6.2). Beryllium (0.47 to 0.59 mg/kg) and seven heavy metals including chromium (3.8 to 9.2 mg/kg), cobalt (3.1 to 5.4 mg/kg), copper (3.4 to 3.5 mg/kg), lead (2.6 to 12.6 mg/kg), manganese (125 to 148 mg/kg), vanadium (6.2 to 19.3 mg/kg), and zinc (12.1 to 20 mg/kg) were also detected in each of the samples. In addition, barium (19.1 mg/kg) and mercury (0.15 mg/kg) were each detected in only one sample. All of these metals were also detected in background surface soils. With the exception of beryllium and cobalt, which were as much as two times greater, concentrations of the metals detected were within the range found in background surface soil. Aluminum concentrations were higher than those reported for soils in the eastern United States, but were lower than those reported for Rhode Island (Table 4-5).

Cyanide was not detected in either of the background subsurface soils. An organic content of 0.7% was measured in BH-01 (10 to 16 feet). The grain-size distribution shows that the outwash material is predominately composed of sand (51.1%), with some silt and small quantities of clay and gravel present (39.4, 3.1, and 6.5%, respectively).

Distribution and Significance. The background samples collected at BH-05 are considered to be representative of background conditions for subsurface soils in the site study area. Phthalates, at concentrations similar to background surface soil, were the only organics detected. The metals detected were also found in surface soils at similar concentrations.

4.2.3.2 Sewage Sludge Area. Four borings (BH-01 to BH-04) were advanced in the sewage sludge area. Soil borings BH-01, BH-03, and BH-04 were located to evaluate minor landfill gas readings, while BH-02 was advanced to help define the western perimeter of the disposal area boundary. Between 2 and 6 feet of topsoil and fill material were encountered at the top of each borehole. At BH-02 and BH-04, the remainder of the borehole consisted of glacial outwash material. Although no odors, staining, or sludge material were observed in these borings, organic vapors were measured in BH-04. Sludge material and sewage odors were evident during advancement at BH-01 and BH-03. Elevated organic vapor levels were also measured in these borings.

The analytes detected are summarized in Table 4-8. The organic compounds detected are shown on Figure 4-3. Volatile organics, phenols, phthalates, and pesticides were detected in several subsurface soil samples. PCBs were not found in any of the samples.

No volatile organics were detected in the shallow sample at BH-03 (2 to 4 feet) or in either of the samples collected at BH-02 and BH-04. Sludge material and sewage odors were observed in the samples in which volatile organics were found. Toluene was detected in one sample, BH-03 (16 to 20 feet). Acetone and MEK were each found in samples from BH-01 (2 to 8 feet and 10 to 16 feet) and in BH-03 (16 to 20 feet). Concentrations ranged from 84 to 740 μg/kg for acetone and 73 to 340 μg/kg for MEK. Acetone was also found in landfill gas at a depth of 12 feet in this area (section 4.2.8). The highest concentrations for both these chemicals occurred in BH-01 (2 to 8 feet).

Phenol, PAHs, and phthalates were found in BH-01, BH-02, and BH-03. One PAH, 2-methylnaphthalene was detected at 27 and 140 μg/kg in the two samples from BH-01 (0 to 8 feet and 8 to 10 feet, respectively). Likewise, 4-methylphenol (2,200 and 5,600 μg/kg) was found in the two samples from BH-01 (2 to 8 feet and 8 to 10 feet), respectively. Phenol (240 μg/kg) was also detected in the shallow sample (2 to 8 feet). Concentrations of these compounds tended to be higher in the sample from 2 to 8 feet than in the deeper sample from 8 to 10 feet. Another phenol, 2-methylphenol (700 μg/kg), was detected from 16 to 20 feet at BH-03.

Phthalates, which are ubiquitous in the environment, were found in all of the borings in this area and in background subsurface soil. Two phthalates were detected at concentrations less than the sample quantitation limit. Di-n-butylphthalate was detected at concentrations ranging from 40 to 120 μg/kg in four samples: BH-02 (8 to 10 and 16 to 18 feet), BH-03 (16 to 20 feet), and BH-04 (8 to 10 feet). Di-n-octylphthalate was detected in BH-02 (16 to 18 feet) and BH-03 (16 to 20 feet) at concentrations of 26 to 86 μg/kg, respectively. Although BH-02 and BH-04 were composed of glacial outwash, it is likely that the material was disturbed because of the extensive excavation throughout the disposal area.

Two chlordane pesticides (*alpha* at 6.2 mg/kg and *gamma* at 7.5 mg/kg) were detected in one sample, BH-01 (2 to 8 feet). *alpha*-Chlordane was also detected in surface soil and has been reported in other sewage sludge landfills (USEPA 1990b).

Of the 15 metals detected in the subsurface soils in this area, major-metal ions (aluminum, iron, magnesium, and potassium) were detected at the highest concentrations (367 to 8,635 mg/kg). Aluminum concentrations ranged from 3,705 to 6,000 mg/kg, iron ranged from 3,400 to 8,635 mg/kg, and magnesium and potassium ranged from 367 to 1,700 mg/kg. Beryllium (0.35 to 0.71 mg/kg) and six heavy metals, including chromium (1.6 to 8.9 mg/kg), cobalt (1 to 6.3 mg/kg), copper (4.2 to 79.2 mg/kg), lead (2.3 to 8.8 mg/kg), vanadium (5.7 to 11.4 mg/kg), and zinc (16.5 to 188 mg/kg), were reported in at least seven of the samples (Table 4-8). Barium (10.1 to 54.3 mg/kg), antimony (5.4 to 16.8 mg/kg), manganese (106 to 213 mg/kg), and mercury (0.13 to 0.47 mg/kg) were detected less often.

Generally, the highest concentrations were found in one of the two samples from BH-01. Except for antimony, all of the metals detected were also found in background surface soils. Most of the metal concentrations were near (less than two times greater) or within the range detected in background subsurface soils. Barium and manganese were as much as two to three times higher, while zinc was as much as nine times higher, and copper was as much as 20 times higher than the concentration detected in background surface soil.

As shown in Table 4-1, elevated metal concentrations typically occur in sewage sludge landfills. The highest metal concentrations tended to occur in samples collected from BH-01 and BH-03, where sludge was observed. Even though large differences in concentrations were evident for some metals, none of the differences were found to be significantly higher for samples associated with sludge material from this area in comparison to background subsurface soil (Appendix D).

Cyanide was not detected in any of the samples. The organic content in samples from BH-01 (2 to 8 feet) and BH-03 (16 to 20 feet) was 3.0 and 0.5%, respectively. Grain-size distribution for these samples shows that sand is the predominant fraction (61.4 to 79.9%), with some silt (14.1 to 29.4%), and only small percentages of gravel and clay (5.5 to 6.8% and 0.4 to 2.3%, respectively).

Distribution and Significance. During the time of operation, primary and secondary sludge from the town of South Kingstown was hauled to this disposal area (Town of South Kingstown 1992). It is well documented that the sludge was deposited into excavated cells (section 1). The largest of the cells was a trench extending the entire north-south length of this disposal area. Sewage sludge material was found in subsurface soil collected from the northeastern and southeastern corners of the sewage sludge area, which tends to coincide with the approximate location of the large trench. The few volatile organics detected (ketones and toluene) were associated with subsurface soil from this portion of the disposal area. Similarly, elevated metal concentrations also occurred in subsurface soil consisting of sludge. Only copper was found at significantly higher concentrations than concentrations in background subsurface soil. On the other hand, less volatile organics (phenols and phthalates) were found in subsurface soil throughout the area. Although sludge material was not evident in other subsurface soil, extensive excavation has occurred and has likely contributed to the widespread distribution of the less volatile organics found in this disposal area.

4.2.3.3 Bulky Waste Area. One soil boring (BH-06) was located in the bulky waste area. This boring was placed along the eastern perimeter of the disposal area to evaluate elevated landfill gas readings. During drilling, a large amount of refuse was encountered from 0 to

6 feet, which was underlain by glacial outwash from 6 to 20 feet. The types of refuse identified included nylons, paper, bottles, wire, and black organic (decomposed) material. Two samples were collected: one from 2 to 4 feet and a second from 6 to 10 feet.

One volatile organic (acetone) and one pesticide (4,4'DDE) were detected at this boring. No semivolatile organics or PCBs were found at either of the depths. A summary of the organic compounds is presented in Figure 4-3.

Acetone was detected at concentrations of 350 and 48 μg/kg at 2 to 4 feet and 6 to 10 feet, respectively. This compound was also found in landfill gas at other portions of this disposal area. 4,4'-DDE was detected at 4.6 μg/kg in the 2-to-4-foot sample. The detection of this pesticide is most likely attributed to the materials disposed of in the bulky waste area, although 4,4'-DDE was also found in background surface soil at a lower concentration.

Major-metal ions (aluminum, iron, magnesium, and potassium) were detected in both samples at the highest concentrations (401 to 9,530 mg/kg). Barium, beryllium, and seven heavy metals [chromium (3 to 6.3 mg/kg), cobalt (3.5 mg/kg), copper (3.3 to 4.1 mg/kg), lead (4.5 to 61.4 mg/kg), mercury (0.2 to 0.24 mg/kg), vanadium (6.7 to 11.3 mg/kg), and zinc (18.9 to 95.9 mg/kg)] were also detected in both samples. In addition, antimony was found at 6.0 mg/kg from 6 to 10 feet, and manganese was found at 116 mg/kg from 2 to 4 feet. Concentrations of individual metals were usually near or within the range detected in background samples. Concentrations of mercury were less than two times greater, and lead and zinc were as much as five times higher than those in the background. Even though some of these metal concentrations were elevated, it cannot be demonstrated that there is any significant difference between concentrations in these subsurface soil samples compared to those in background subsurface soil (Appendix D).

Cyanide was not detected in either sample. The grain-size distribution and TCO analysis conducted on BH-06 (6 to 10 feet) indicate that sand (59.8%) was the largest fraction present,

followed by silt (29.8%), gravel (8.8%), and clay (5.5%). An organic content of 1.0% was also measured.

Distribution and Significance. Six feet of refuse was encountered, beginning at the ground surface, in subsurface soil at the eastern perimeter of the bulky waste area. Acetone and 4,4'-DDE were the only organic compounds detected in subsurface soil. As indicated by landfill gas and surface soil data, there is likely more organic contamination, particularly in the central portions of the disposal area, than suggested by the available subsurface soil data. Chlorinated and aromatic volatiles were detected in landfill gas at depths ranging from 3 to 12 feet in other parts of the bulky waste area (section 4.2.8). Similarly, volatile organics, which are presumed to have been transported by landfill gas, were also found in surface soil. The absence of these organic compounds at BH-06 is most likely associated with this soil boring's location. As suggested by landfill gas data, volatile organic concentrations were highest in more central portions of the disposal area and decreased or were not detected near the boundaries, where BH-06 was located. This can also be attributed to the heterogeneous nature of landfill contents in general. Several metals (i.e., lead and zinc) were also found at elevated concentrations, although these differences were not statistically confirmed.

4.2.3.4 Solid Waste Area. One soil boring (BH-07) was drilled at the southern end of the solid waste area. A strong refuse odor was present during drilling activities, and organic vapors ranging from 30 to 300 ppm occurred. Assorted refuse, including household garbage, milk cartons, plastic, and paper, was encountered throughout the entire 20 feet of the boring. Both samples (4 to 8 feet and 14 to 18 feet) collected from this boring contained refuse material.

Volatile organics were not detected in either sample collected from BH-07 because of elevated detection limits that may have masked detectable concentrations. This was discussed in more detail in section 2.6.2. However, semivolatile organics, pesticides, and PCBs were detected.

Even though volatile organics were not identified in subsurface soil, landfill gas (section 4.2.8) and surface soil data indicate that aromatic and chlorinated volatiles were present in a large range of concentrations throughout most of the solid waste area. Ketones were also identified in these media.

Semivolatile organics (PAHs, phthalates, dichlorobenzenes, and phenols) were found in the two samples collected at BH-07. Seven different PAHs (naphthalene, 2-methylnaphthalene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, and chrysene) were detected from 4 to 8 feet. Three PAHs (naphthalene, 2-methylnaphthalene, and phenanthrene) were also found in the sample collected from 14 to 18 feet. When detected, individual PAH concentrations were higher at the 14 to 18 foot depth.

Two dichlorobenzenes (1,2-dichlorobenzene and 1,4-dichlorobenzene) were found from 4 to 8 feet at 240 and 97 μg/kg, respectively. Two phenols, consisting of 2-methylphenol and 4-methylphenol, were detected from 4 to 8 feet at 260 μg/kg and from 14 to 18 feet at 4,000 μg/kg, respectively. Dichlorobenzenes and methylphenols (creosols) have many uses including uses as disinfectants, moth control agents, synthetic resins, and wood preservatives. A variety of mixtures containing methylphenols include degreasers and cutting oils (ATSDR 1990b). Dichlorobenzenes are also used in pesticides, waxes, and agricultural chemicals (Howard 1990a). Because of the various uses of these chemicals, municipal or industrial disposal to this area is probably the dominant source.

Five different phthalate compounds (diethylphthalate, di-n-butylphthalate, bis(2-ethylhexyl)phthalate, di-n-octylphthalate, and butylbenzylphthalate) were found in both samples from BH-07 at concentrations ranging from 96 to 18,000 μg/kg. Total phthalate concentrations were generally higher in the sample collected from 14 to 18 feet (25,000 μg/kg) than in the sample collected from 4 to 8 feet (2,556 μg/kg). Given that phthalate concentrations were higher in the subsurface soil than in other soils in the study area, coupled with the types of refuse found, these phthalates may be attributed to the materials deposited in this disposal area.

Five pesticides detected from 14 to 18 feet included 4,4'-DDD (26 μg/kg), 4,4'-DDE (12 μg/kg), dieldrin (14 μg/kg), *alpha*-chlordane (17 μg/kg), and *gamma*-chlordane (15 μg/kg). Only 4,4'-DDE was found from 4 to 8 feet (12 μg/kg). Although these pesticides have been found in other surface and subsurface soils in the site study area, it is likely that they are associated with the buried refuse in the solid waste area.

Two PCB aroclors, 1242 and 1254, were detected in samples from BH-07. Aroclor-1242 was detected at 310 μg/kg in the sample collected from 14 to 18 feet, while aroclor-1254 was detected at 270 μg/kg in the sample collected from 4 to 8 feet. PCBs were also detected in monitoring wells MW-08-01, MW-08-02, and MW-05-01 (section 4.2.4), although a different aroclor was identified. The primary use of PCBs is in capacitors and transformers. Aroclor-1242 was also used in light ballasts, and aroclor-1254 was also used in small appliances. Because disposal of PCBs was not regulated until 1978, it is possible that materials containing PCBs could have been disposed of during landfill operations.

In addition to the organic compounds, major-metal ions (aluminum, iron, magnesium, and potassium), barium (16 to 22.9 mg/kg), beryllium (0.39 to 0.7 mg/kg), chromium (5.5 mg/kg), cobalt (1.8 to 3.3 mg/kg), copper (7.4 to 18.9 mg/kg), lead (19.4 to 20.2 mg/kg), mercury (0.18 to 0.39 mg/kg), vanadium (5.5 to 9.3 mg/kg), and zinc (45.5 to 68.2 mg/kg) were detected in both the samples. Concentrations ranged from 3,620 to 5,250 mg/kg for aluminum, 4,800 to 7,540 mg/kg for iron, and 618 to 1,090 mg/kg for basic cations. Antimony was also detected from 4 to 8 feet (6 mg/kg). In comparison to background subsurface soil concentrations, mercury and lead concentrations were about two times greater, zinc was about three times greater, and copper was about five times greater. These differences, however, were not found to be statistically significant in relation to background surface soil. The sample analyzed for grain size and TCO was predominantly sand (60.7%) with 27.6% silt, 8.1% gravel, and 3.5% clay. The organic content of this sample was 3.8%.

Distribution and Significance. Refuse was evident down to at least 20 feet in subsurface soil at the southern end of the solid waste area. The refuse encountered appeared to be primarily

household waste. The types of organic compounds that were prevalent include phthalates, PAHs, dichlorobenzenes, several pesticides, and PCBs. While not identified, substantial quantities of volatile organics were also evident based on organic vapors detected in the subsurface soil. Widespread distribution of volatile organics in the solid waste area is evident, as over 20 different compounds were detected in landfill gas (section 4.2.8). Elevated metal concentrations (mercury, lead, zinc, and copper) occurred, although these were not statistically significant (Appendix D).

4.2.3.5 Summary of Subsurface Soil Findings. Subsurface soil was collected to better characterize the types of waste materials found and potential sources of contaminants in each of the three disposal areas. Since landfill contents are typically very heterogeneous, materials disposed of and contaminants released in subsurface media vary widely over even small areas. As a result, the data gathered in subsurface media are not necessarily representative of the entire contents, but of localized regions within each of the disposal areas.

In the sewage sludge area, sludge material was not encountered in the western and central portions of the area. Sludge material was found along the eastern side of the area, which appeared to coincide with the large trench where sludge was deposited. The primary organic compounds detected include ketones, although toluene, PAHs, and phthalates were also found. For the most part, the detection of these chemicals occurred in sludge material collected from the eastern side of the disposal area. These results are relatively consistent with landfill gas and surface soil data for this area. Several metals were also detected at elevated concentrations in the subsurface soil collected from the eastern side, but only concentrations of copper were found to be significantly elevated.

Six feet of buried waste was found along the eastern border of the bulky waste area. Acetone and 4,4'-DDE were the only organic compounds detected. However, as indicated by landfill gas and surface soil data for other portions of the area, volatile organics and other less volatile chemicals are abundantly present in this disposal area. As a result, buried waste still provides

an active source for the release of potential contaminants in the subsurface media. The metal concentrations measured were not found to be significantly elevated.

Buried waste, 20 feet thick, was encountered at the southern end of the solid waste area. This indicates that the boundaries of this disposal area may extend further south. Most of the waste found was municipal in nature, and numerous organic compounds were detected. The chemicals detected, which include pesticides, phthalates, phenols, and dichlorobenzenes, are typical components in both municipal and industrial wastes. In addition, PCBs appear to have been disposed of in this area. While volatile organic data were not available, chlorinated and aromatic volatiles generated from buried waste materials were found throughout the solid waste area in landfill gas, surface soil, and exposed refuse and glue-like waste. Metal concentrations were not significantly elevated.

4.2.4 Leachate

During the study period, leachate seeps were observed around the solid waste and bulky waste areas. Leachate was collected from six locations at which seeps were present. Five of the leachate seeps (LE-02 to LE-06) were located between the bulky waste area and the Saugatucket River. The other seep (LE-01) was just north of the solid waste area, near Mitchell Brook. Leachate locations are presented on Figure 2-26. Historically, leachate seeps have been identified at the disposal areas by aerial photographs (USEPA 1987a, 1991a). In the past, a resident has reportedly observed leachate seeps with sulfur odors and varying colors and quantities west of Rose Hill Road, near the northern portion of the solid waste area. At the bulky waste area, a trench filled with crushed stone was reportedly dug to drain water to the Saugatucket River (RIDEM 1992a). During the field investigation a crushed-stone trench running vertically along the eastern bank of the bulky waste area toward the Saugatucket River was observed. In addition, colored leachate originating from the hill slope near the bulky waste area has been observed (RIDEM 1992a).

All six leachate locations (LE-01 to LE-06) were sampled during June 1991. Three additional composite samples were collected from the seep at LE-05 during April 1992, to supplement ecological toxicity testing. Samples were analyzed for the following parameters:

- Volatile organics
- Semivolatile organics
- Water-soluble organics (April 1992 only)
- Pesticides and PCBs
- Metals (unfiltered and filtered)
- Cyanide
- Sulfide (June 1991 only)
- Ammonia (April 1992 only)
- Total organic carbon (TOC)
- Biochemical oxygen demand (BOD)

The analytes detected in leachate are presented in Tables 4-9 and 4-10. A summary of the organic compounds and metals detected in leachate samples is presented in Figures 4-4 and 4-5. The analytes detected in each of the different areas (Table 4-4) are discussed in the following sections.

4.2.4.1 Saugatucket River. Five leachate seeps (LE-02 through LE-06) were sampled along the western bank of the Saugatucket River. Several large outbreaks of leachate were obvious because of orange-colored puddles of water and orange-stained soil and vegetation. The size of the seeps varied, with LE-03, LE-05, and LE-06 comprising the largest areas. Large clumps of orange floc were also observed near the seeps. It was reported that gravel-filled trenches were embedded along the eastern perimeter of the bulky waste area to facilitate drainage from this disposal area (RIDEM 1992a).

June 1991. The analytes detected in leachate samples during June 1991 are summarized in Table 4-9. A summary of the organic compounds and metals detected in leachate is presented in Figures 4-4 and 4-5. Pesticides and PCBs were not detected in any of the samples.

Chlorinated and aromatic volatiles were detected in three of the five leachates seeps near the bulky waste area. Chlorinated volatiles, 1,1-DCA and chloroethane, were each found at LE-03, LE-04, and LE-05 at concentrations below sample quantitation limits (2 to 8 μg/L). Aromatic volatiles, toluene, and chlorobenzene were also detected in these samples, although toluene was the only chemical detected above sample quantitation limits (27 to 50 μg/L). The highest toluene concentration occurred at LE-03. Each of these leachate seeps was approximately 50 feet downgradient of the bulky waste area and within a few feet of the Saugatucket River. Although volatile organic concentrations were relatively low in leachate, elevated concentrations of chlorinated and aromatic volatiles were found in landfill gas in the bulky waste area (section 4.2.8). Similar types of volatile organics have also been detected in soil and groundwater downgradient of this disposal area.

Carbon disulfide was the only organic detected in LE-02 (3 μg/L), located south of LE-05 and the bulky waste area. The most northern leachate sampling location, LE-06, had no detectable concentrations of volatile organics, yet bis(2-ethylhexyl)phthalate was detected at 230 μg/L. Organic compounds, at similar concentrations, were found periodically in surface water and sediment in the Saugatucket River during the study period.

Metals detected in the highest concentrations in unfiltered samples were the major-metal ions [aluminum (184 to 9,220 μg/L), iron (15,200 to 1,370,000 μg/L), calcium (10,000 to 59,000 μg/L), magnesium (2,420 to 16,100 μg/L), sodium (5,560 to 55,400 μg/L), and potassium (2,000 to 44,800 μg/L)]. Other metals detected in all of the samples consist of barium (22.2 to 2,120 μg/L) and manganese (2,490 to 14,700 μg/L). Cobalt (5.6 to 295 μg/L) was detected in four samples (LE-02, LE-04, LE-05, and LE-06). Vanadium (22.2 to 65.2 μg/L) and zinc (34.4 to 133 μg/L) were each found in two samples (LE-02 and LE-05, and LE-02 and LE-03, respectively). Beryllium and lead were detected in only one sample, LE-02,

at 8.7 and 174 μg/L, respectively. Metals were usually detected more often and at higher concentrations at LE-02 than in any of the other unfiltered leachate samples. This sample was collected in an orange-stained muddy area along seismic line S-5.

Fewer metals were detected in filtered samples. Again major-metal ions were found in all samples in the highest concentrations. Barium and manganese were also detected, and cobalt was found at LE-04. Because of the smaller number of metals and the lower concentrations found in filtered samples, the largest fraction of the metals are likely adsorbed onto soil or other particles, are in a colloidal phase or floc, or are present in less soluble or insoluble forms.

Metals detected in the unfiltered leachate samples were compared to those detected in the shallow overburden background well (MW-01-01) over the study period. Though metals detected in leachate were also found in this background well, concentrations in leachate generally exceeded those in the background well. In particular, concentrations were as much as 10 times greater for potassium, cobalt, and manganese; 20 times greater for barium; 35 times greater for lead; and 100 times greater for iron. The orange coloration seen in the leachate seeps is characteristic of high iron content. Elevated levels of metals such as iron and lead is a characteristic of landfill leachates.

Cyanide was detected in the most northern (LE-06) and the most southern (LE-02) leachate seeps at 41.7 and 36.1 μg/L, respectively. Sulfides were not found in any samples. Biochemical oxygen demand was measured in LE-06 and LE-02 at 7.5 and 51 mg/L, respectively. High BOD indicates organic contamination. The BOD measured in these samples is consistent with the levels of organics found.

Total organic content was measured in three samples at concentrations ranging from 18 to 48 mg/L. Values for pH ranged from 6.2 to 7.1. Hardness was calculated from 35 to 214 mg/L $CaCO_3$, while conductivities ranged from 250 to 1,800 μmhos/cm, with the highest at LE-05, which was the largest and most orange-stained leachate outbreak.

Conductivity is a function of the concentration of ions in water. For this reason, conductivity is a good indicator of metal-laden leachate and is a tool commonly used to evaluate landfill contamination. Conductivities measured in these leachate seeps are similar to those in the background overburden well and surface water. Conductivity results from an EM line located near the leachate seeps did not exhibit any large variances either.

April 1992. In April 1992, the leachate seep at LE-05 was sampled on three consecutive days to supplement ecological toxicity testing. As mentioned previously, the leachate seep at LE-05 was large and was present throughout the study period. The analytes detected in April 1992 are summarized in Table 4-10. Water-soluble organics, pesticides, and PCBs were not detected at this location. Although slightly different sampling methods were used to collect samples during this round, analytical data between the two rounds were fairly similar and are therefore comparable.

The types of organic compounds detected during this sampling round were similar to those found at LE-05 in June 1991. Likewise, concentrations were less than sample quantitation limits. Ethylbenzene (1 to 2 μg/L) was found on all three days and xylenes on two days (2 to 3 μg/L). Chloroethane and 1,2-DCE were each detected once at 2 and 1 μg/L, respectively. Naphthalene and diethylphthalate were each detected on all three days at concentrations ranging from 0.7 to 0.9 μg/L and 4 to 11 μg/L, respectively.

In unfiltered samples, major-metal ions consisting of aluminum (239 to 623 μg/L), iron (49,000 to 283,000 μg/L), calcium (16,700 to 23,000 μg/L), magnesium (5,710 to 7,220 μg/L), sodium (20,800 to 24,700 μg/L), and potassium (12,000 to 15,200 μg/L) were found, all three days, at concentrations elevated above other metals. Barium (97.4 to 293 μg/L) and manganese (1,490 to 2,410 μg/L) were also detected each day. Chromium, lead, mercury, and zinc were each detected once at 5, 10.5, 0.2, and 8.1 μg/L, respectively. In filtered samples, major-metal ions, barium, and manganese were also detected daily. Concentrations were generally highest on the second day of sampling. In addition, vanadium and cobalt were not detected during this sampling round, though they were found at this leachate location in June 1991.

Cyanide was not found. Ammonia was detected from 5.06 to 22.6 μg/L. Total organic carbon ranged from 30.9 to 49.9 mg/L, levels that were higher than in June 1991. Likewise, BOD values ranged from 1.5 to 4.2 mg/L, though BOD wasn't detected in June 1991. A pH of 6.5 and conductivity of 412 were recorded, and hardness varied between 65 and 87 mg/L $CaCO_3$.

Differences in chemical composition of leachate from June 1991 to April 1992 are evident, but for the most part, these differences appeared to be minor. Chlorinated and aromatic volatiles and phthalates were detected in both sampling rounds, although the individual chemicals sometimes varied. Similar types of metals were generally found, and there was no noticeably consistent difference in concentrations. In contrast, the physical character of the seeps varied. In June 1991, large quantities of floc and water volume emerging from the seeps were evident in the Saugatucket River area. In April 1992, this was less evident. This could have resulted from changes in precipitation, as groundwater and surface water levels were higher in April 1992 than in June 1991.

4.2.4.2 Mitchell Brook. A small leachate seep, LE-01, located along the northern slope of the solid waste area, was sampled in June 1991. Orange-staining of ground material was present at the sampling location. The analytes detected in this sample are presented in Table 4-9. A summary of the organics and metals detected is presented in Figures 4-4 and 4-5.

Four chlorinated volatiles were detected: 1,2-DCE (44 μg/L), TCE (4 μg/L), and vinyl chloride (1 μg/L). Carbon disulfide was also detected at 12 μg/L. Semivolatile organics, pesticides, and PCBs were not found at LE-01.

In the unfiltered sample, all of the major-metal ions (aluminum, iron, calcium, magnesium, sodium, and potassium) were detected. Aluminum and iron concentrations were 60,500 and 133,000 μg/L. Basic cations ranged from 3,620 to 14,900 μg/L. Barium, beryllium (328 and 11.2 μg/L, respectively), and eight heavy metals were detected. Concentrations ranged from 3.7 to 49.8 μg/L for beryllium, arsenic, chromium, copper, nickel, and vanadium. For lead, manganese, and zinc, concentrations ranged from 150 to 814 μg/L. In the filtered samples, all

major-metal ions except for aluminum were detected, as were barium and manganese. All of these metals, with the exception of arsenic, were found in groundwater from the shallow overburden background well. In comparison, concentrations were as much as three times greater for barium and beryllium, five times greater for aluminum, 10 times greater for iron, and 30 times greater for lead.

Ammonia, sulfide, cyanide, and BOD were not detected. Total organic content was measured at 8.4 mg/L. A conductivity of 100 μmhos/cm and a pH of 5.4 were measured.

4.2.4.3 Summary of Leachate Findings. As indicated by subsurface soil and landfill gas data (sections 4.2.2. and 4.2.8), the bulky waste and solid waste areas still serve as a viable source of organic compounds and metals. The same types of chlorinated and aromatic volatile organics were found at relatively low concentrations in leachate as in other media in the vicinity of the disposal areas. The leachate seeps were also characterized by large amounts of orange floc and stained ground cover, which is indicative of metals (i.e., iron), precipitating/coagulating such as iron hydroxide under oxidizing conditions. Concentrations of several metals, including barium, lead, manganese, and iron, were found to be significantly elevated in leachate in comparison to levels in the shallow overburden groundwater at the background well (Appendix D). This is important since surface water bodies (Mitchell Brook and Saugatucket River) are within a few feet of the seeps.

4.2.5 Groundwater

Groundwater was collected from shallow and deep overburden and bedrock monitoring wells along with residential wells in the vicinity of the site study area. Eight existing monitoring wells and nine residential wells were sampled during June 1991. M&E installed 28 additional monitoring wells from July to September 1991. These were selectively sampled along with existing monitoring wells and residential wells during September/October 1991, January/February 1992, and April 1992. Samples submitted during these four rounds of sampling were analyzed for the following parameters:

- Volatile organics
- Semivolatile organics
- Water-soluble organics (only September/October 1991, January/February 1992, and April 1992)
- Pesticides and PCBs
- Metals (unfiltered and filtered)
- Cyanide
- Sulfide (only June 1991, September/October 1991, and January/February 1992)
- Ammonia (only April 1992)
- Total organic carbon (TOC)
- Biochemical oxygen demand (BOD)

In this section, chemical data are summarized according to groundwater flow zones. Three flow zones were defined in the site study area based on preferential groundwater flowpaths as discussed in section 3: shallow overburden, deep overburden, and bedrock. Preferential groundwater flow is related to the different types of strata encountered, the depths at which the strata occur, and similar hydrogeologic characteristics (i.e., hydraulic conductivity). The different flow zones that the monitoring wells are grouped into are shown in Table 4-4.

Four wells sampled during this investigation were known to be in waste material in one of the disposal areas. Three of the wells are located in the solid waste area (MW-14-01, OW-25, and OW-27); the fourth well, MW-02-01, is located in the sewage sludge area. A fifth well, MW-V, appears to be located within the boundaries of the bulky waste area; however, drilling logs for this well were not available to confirm this. For this reason, MW-V is not considered to be in waste material. All of the other monitoring wells were installed outside of the disposal area boundaries.

To better discuss the aerial distribution of data, well clusters were grouped, according to predominant downgradient flowpaths, in relation to the three disposal areas, as shown in Figure 4-6. However, it should be noted that these groupings are used only to help present

chemical data. As discussed in section 3, most monitoring wells are potentially influenced by groundwater flowpaths across several portions of the site study area.

In addition, chemical data are presented for background wells (MW-01-01 and MW-01-02). Chemical data from these monitoring wells were used to evaluate chemical data from other monitoring wells.

The analytes detected in groundwater are presented in Tables 4-11 through 4-17. A summary of the organic compounds and metals detected in groundwater samples is presented in Figures 4-7 through 4-17. The analytes detected in each of the different areas (Table 4-4) are discussed in the following sections.

4.2.5.1 Background. Two background wells were installed by M&E in the northern portion of the site study area. This area is considered to be hydrogeologically upgradient of the three disposal areas. As discussed in section 3, these wells were advanced in an area of natural material. One of the wells is screened in the shallow overburden (MW-01-01) and the other in bedrock (MW-01-02). The background wells were sampled during September/October 1991, January/February 1992, and April 1992.

September/October 1991. Analytes detected in background groundwater samples during September/October 1991 are summarized in Table 4-12. Only one volatile organic, TCE (3 μg/L), was detected in the shallow overburden background well, MW-01-01. Water-soluble organics, semivolatiles organics, pesticides, and PCBs were not detected.

Major-metal ions (aluminum, calcium, iron, magnesium, potassium, and sodium) were detected in unfiltered and filtered samples from both background wells. As shown on Table 4-12, concentrations of these metals were generally higher in the shallow overburden (3,770 to 31,500 μg/L) than in the bedrock (201 to 17,200 μg/L). In addition, barium (113 μg/L) and five heavy metals [arsenic (1.1 μg/L), cobalt (27.7 μg/L), lead (23.6 μg/L), nickel (23.3 μg/L), and vanadium (15.9 μg/L)] were found in unfiltered groundwater from the shallow overburden

well, while manganese was detected in unfiltered groundwater from both the overburden (4,080 μg/L) and bedrock (54.5 μg/L) wells. Barium, cobalt, and manganese were detected in filtered groundwater from the shallow overburden well at 15.9, 12.8, and 3,560 μg/L, respectively. Copper (11.6 μg/L) was found in the filtered groundwater from the bedrock well.

Sulfide, cyanide, and BOD were not found in either of the background wells. Total organic carbon was only found in the shallow overburden well (19 mg/L). These values are characteristic of groundwater in contact with low organic content in soil. The groundwater in both background wells had pH values ranging from 6.2 to 7.1 and conductivities less than 300 μmhos/cm.

January/February 1992. Analytes detected in background groundwater samples during January/February 1992 are summarized in Table 4-13. Volatile, semivolatile, and water-soluble organics were not detected in either of the background wells. One pesticide, heptachlor, was detected in the bedrock well at 0.0023 μg/L.

Aluminum (96.9 to 43,300 μg/L), iron (45.7 to 71,200 μg/L), and basic cations (1,570 to 17,200 μg/L) were detected in background wells in both unfiltered and filtered samples. Higher concentrations were usually found in the shallow overburden well (Table 4-13). Manganese was detected in both unfiltered and filtered samples in the shallow overburden (1,600 and 159 μg/L, respectively) and bedrock (113 and 31.2 μg/L, respectively) wells. Barium, beryllium, and heavy metals, including chromium, cobalt, copper, lead, nickel, vanadium, and zinc, were also detected at concentrations from 5.1 to 113 μg/L in the unfiltered shallow overburden sample. These metals were not detected in the filtered samples.

Sulfide, cyanide, and BOD were not measured in either background well during this sampling round. Total organic carbon was measured in both of the background wells. The highest concentration was in the shallow overburden well (15 mg/L). The pH values of both background wells were in a neutral range (6.3 to 7.8), and conductivities ranged from 68 μmhos/cm in the shallow overburden well to 150 μmhos/cm in the bedrock well.

April 1992. Analytes detected in background groundwater samples during April 1992 are summarized in Table 4-14. One volatile organic and one semivolatile organic were detected in background groundwater samples during April 1992. Carbon disulfide was found in the bedrock well (11 μg/L) and the shallow overburden well (1 μg/L). Phenol (7 μg/L) was also found in the bedrock well. Water-soluble organics, pesticides, and PCBs were not detected in background wells.

Major-metal ions were detected at concentrations of up to 10,800 μg/L for aluminum, 12,100 to 30,900 μg/L for iron, and 2,590 to 14,100 μg/L for basic cations in unfiltered samples (Table 4-14). Beryllium (1.4 μg/L) and five heavy metals [chromium, cobalt, copper, lead, and zinc (11.5, 31.6, 24.4, 22.1, and 28.2 μg/L, respectively)] were also detected in the unfiltered sample from the shallow overburden well. Barium (18.6 and 79.8 μg/L), manganese (330 and 444 μg/L), and nickel (4.8 and 9.3 μg/L) were detected in unfiltered samples from both background wells, with the highest concentrations detected in the shallow overburden. Manganese was also found in both filtered samples at 47.4 and 64.8 μg/L in the shallow overburden well and the bedrock well, respectively.

Sulfide and cyanide were not detected in the background wells during this round. Ammonia and BOD were measured in the bedrock well at 0.0750 and 2.2 mg/L, respectively. Total organic carbon was measured at higher concentrations in the bedrock well (12.7 mg/L) than in the overburden well (9.3 mg/L). Both background wells had pH values ranging from 7.7 to 8.4 and conductivities below 150 μmhos/cm.

Distribution and Significance. During the study period, one volatile organic, TCE, was detected once in shallow overburden groundwater, and one pesticide, heptachlor, was detected once in bedrock groundwater at relatively low concentrations. Neither hydrogeologic data nor geologic data suggest that these chemicals could have been transported to these background wells from the disposal areas. Because these wells are located in a relatively undisturbed setting upgradient of the disposal areas, these chemicals appear to be related to sources upgradient of the site study area. The absence of measurable BOD and low TOC is consistent with this.

Aluminum and iron concentrations tended to be the most elevated metals in unfiltered samples in both the shallow overburden and bedrock background wells throughout the study period. Basic cations consisting of calcium, magnesium, sodium, and potassium were usually the predominant metals detected in filtered samples. Based on the reduction in both the number of metals detected and the concentrations of the detected metals in filtered samples, it appears that a large fraction of the metals are in a less soluble form (i.e., colloidal, adsorbed). This occurs to a lesser extent for basic cations. In addition, metal concentrations in the shallow overburden well were consistently elevated above the concentrations found in the bedrock well throughout the study period. An overall comparison of the unfiltered metals for the three sampling periods indicates that metal concentrations were higher in both the overburden and bedrock background wells during January/February 1992 than in either September/October 1991 or April 1992. This coincides with the higher groundwater levels during the same period.

Similarly, pH values were about an order of magnitude greater in the bedrock well than in the shallow overburden well. In addition, pH values tended to increase over the study period, yet were within ranges typically found in natural waters (5 to 8). Conductivity, TOC, and hardness also varied, although discernable trends were not evident. Biochemical oxygen demand, which is an indicator of organic contamination, was usually not detected.

4.2.5.2 Shallow Overburden. During the study period, 13 wells in the shallow overburden were sampled. Four existing wells, MW-I through MW-IV, are located outside the eastern boundaries of the sewage sludge area. Another well, MW-02-01, is located within the boundaries of the sewage sludge area. A fifth existing well, MW-V, is located along the northern boundary of the bulky waste, and MW-03-01 and MW-12-01 are east and south of the bulky waste area. Further south of this disposal area is MW-05-01. Five shallow overburden wells are located in the vicinity of the solid waste area: MW-03-01 is to the north, and MW-04-01, MW-06-01, and MW-11-01 are to the east and southeast. The distribution of organic compounds and metals detected in shallow overburden wells are summarized in Figures 4-7, 4-8, and 4-9.

June 1991. During June 1991, the five existing shallow overburden wells (MW-I through MW-V) were sampled. The analytes detected in shallow overburden wells during June 1991 are summarized in Table 4-11. A summary of organic compounds and metals detected is presented in Figures 4-7 and 4-8.

Three volatile organics and two semivolatile organics were detected in shallow overburden groundwater during June 1991. Neither pesticides or PCBs were detected during this sampling round.

Toluene (64 μg/L) was detected in MW-II, which is downgradient of the sewage sludge area. Toluene was also detected in subsurface soil (with sludge material present) from a boring in the northeastern section of the area. Carbon disulfide was detected in all four of the wells east of the sewage sludge area (MW-I, MW-II, MW-III, and MW-IV) in concentrations ranging from 2 to 50 μg/L. This chemical is commonly released during treatment of sewage and is found in sludges (Howard 1990b, ATSDR 1990c). It is also a common product of decomposition processes occurring in landfills, particularly under reducing conditions and in the presence of sulfur. Three organic compounds were detected at concentrations below sample quantitation limits in MW-V, near the northern portion of the bulky waste area: 1,1-DCE (2 μg/L), 2-methylnaphthalene (2 μg/L), and 4-methylphenol (7 μg/L).

Major-metal ions were found in all unfiltered samples: aluminum (627 to 20,650 μg/L), iron (794 to 73,600 μg/L), calcium (1,020 to 8,460 μg/L), magnesium (887 to 6,620 μg/L), sodium (3,040 to 6,790 μg/L), and potassium (499 to 4,970 μg/L). Manganese was also detected in all unfiltered samples at concentrations of 44 to 4,340 μg/L. In addition, barium, beryllium, and eight other heavy metals were detected. Barium and nickel were found in four of five samples at concentrations ranging from 19.5 to 105.7 μg/L and 5.4 to 23.5 μg/L, respectively, while zinc concentrations ranged from 32.5 to 210 μg/L in three samples. Beryllium (2.6 μg/L), cadmium (19.4 μg/L), chromium (23.0 μg/L), cobalt (16.1 to 21.0 μg/L), copper (45.5 to 75.5 μg/L), lead (71.9 μg/L), and vanadium (27.9 μg/L) were found in either one or two samples. All of these metals were reported at least once, during the study period, in the

background shallow overburden well. In relation to the highest concentrations detected in the background shallow overburden well during the study period, concentrations of all of the metals detected in these wells were generally near or below background concentrations.

With the exception of aluminum, major-metal ions were found more often and in higher concentrations than other metals detected in filtered samples. For the most part, the concentrations of major-metal ions in filtered samples constituted a large fraction of the concentrations detected in unfiltered samples, indicating that these metals are in a more soluble form. Barium, cobalt, manganese, and zinc were also detected in filtered samples generally in smaller concentrations.

Sulfide was detected in all five shallow overburden wells at concentrations ranging from 0.64 to 2.7 mg/L and is likely associated with the detection of carbon disulfide in the wells. Biochemical oxygen demand was measured at 8.0 mg/L in one well, MW-II, which corresponds to the detection of organic compounds in this well. Total organic carbon and cyanide were not detected in any of the wells. pH values were near neutral (6.1 to 7.1) and conductivities ranged from 21 to 260 μmhos/cm, with the highest conductivity occurring at MW-II. Hardness was calculated and ranged from 6 to 48 mg/L $CaCO_3$.

September/October 1991. Thirteen shallow overburden wells were sampled during the September/October 1991 sampling round: MW-I, MW-II, MW-III, MW-IV, MW-V, MW-02-01, MW-03-01, MW-04-01, MW-05-01, MW-06-01, MW-11-01, MW-12-01, and MW-13-01.

A summary of the analytes detected in shallow overburden groundwater wells during September/October 1991 is presented in Table 4-12. Figures 4-7, 4-8, and 4-9 summarize the distribution of organic compounds and metals in shallow overburden groundwater.

Chlorinated and aromatic volatiles were detected in 3 of the 13 wells sampled, generally at concentrations below sample quantitation limits. These chemicals were most frequently detected

in MW-11-01, which is south of the Transfer Station Road. All four of the chlorinated volatiles detected were found in MW-11-01: 1,1-DCA and 1,2-DCE at 3 μg/L, chloroethane at 27 μg/L, and vinyl chloride at 5 μg/L. 1,2-Dichloroethene and 1,1-DCA were also found at MW-12-01 (3 μg/L) and MW-03-01 (1 μg/L). These wells are downgradient of the bulky waste area.

The aromatic volatiles detected consist of BTEX compounds. Of these, benzene and ethylbenzene were detected at concentrations above sample quantitation limits in MW-11-01 (13 and 16 μg/L, respectively). Toluene and xylene were also detected in MW-11-01 at 1 and 5 μg/L, respectively. Ethylbenzene and xylenes were detected at MW-03-01 (up to 4 μg/L), while toluene was found at MW-13-01 (2 μg/L), which is north of the solid waste area.

One water soluble organic was detected during this sampling round. *N,N*-Dimethylformamide (*N,N*-DMF) was detected at MW-03-01 (183 μg/L) and MW-13-01 (50 μg/L). This chemical, along with ketones and chlorinated and aromatic volatiles, was a component of solvent and glue-like waste material known to have been disposed of in industrial waste during landfill operations. Unlike other organic compounds detected, *N,N*-DMF has specific industrial uses and is not a chemical typically found in municipal waste.

Five semivolatile organics were each detected once at concentrations below sample quantitation limits in several shallow overburden wells. Three of these chemicals were detected from 2 to 3 μg/L in MW-11-01: naphthalene, 1,2-dichlorobenzene, and 1,4-dichlorobenzene. Pentachlorophenol was detected at MW-13-01 at 3 μg/L. Volatile organics were also detected in these wells. In addition, di-n-butylphthalate (0.5 μg/L) was found in MW-I, which is located near the northeast perimeter of the sewage sludge area.

One pesticide, *alpha*-chlordane, was detected in MW-02-01 (0.003 μg/L). This well, which is screened across sewage sludge material, is located in the northern portion of the sewage sludge area near where *alpha*-chlordane was detected in surface and subsurface soil. One PCB, aroclor-1260 (0.24 μg/L), was found in MW-05-01, located southeast of the bulky waste area.

Since PCBs are relatively insoluble and the sample was not filtered, the PCB was probably adsorbed onto a soil particle. Aroclor-1254 was detected in subsurface soil in the southern end of the solid waste area, and groundwater flow from the solid waste area to this location is possible.

Major-metal ions and manganese were detected at higher concentrations than other metals in unfiltered samples. Aluminum concentrations were 1,010 to 55,600 μg/L, iron concentrations were 3,640 to 118,000 μg/L, basic cation concentrations were 1,480 to 75,100 μg/L, and manganese concentrations were 201 to 9,790 μg/L. Barium was also found in all wells at concentrations ranging from 19.3 to 290 μg/L. Ten additional heavy metals, including antimony (74.2 μg/L), arsenic (1.7 to 5.5 μg/L), chromium (22.2 to 54.5 μg/L), cobalt (10.2 to 45 μg/L), copper (12.4 to 104 μg/L), lead (25.7 to 82.4 μg/L), mercury (0.22 μg/L), nickel (19 to 71.3 μg/L), vanadium (6.5 to 101 μg/L), and zinc (133 to 362 μg/L), were also detected. Four of these metals (antimony, copper, mercury, and zinc) were not found in the background shallow overburden well during this sampling round but were detected in other rounds.

In filtered samples, major-metal ions, barium, and eight heavy metals (antimony, arsenic, cobalt, copper, manganese, nickel, and zinc) were found. These metals were detected less often than in unfiltered samples. When found, metal concentrations were generally not much lower than in unfiltered samples, indicating that these metals (i.e., iron, basic cations, cobalt, copper, manganese, and zinc) were present in a more soluble form than some of the other metals.

In unfiltered samples, metal concentrations in several wells were higher in comparison to concentrations in the shallow overburden background well for this period, although most concentrations were less than two times higher. In MW-02-01, which is located in the sewage sludge area, concentrations were greater than two times higher than background for three metals: barium, lead, and vanadium. Barium and lead were also elevated at similar levels in two wells downgradient of this area, MW-I and MW-II, respectively. Besides basic cations, arsenic and barium were more than two times greater at MW-03-01, directly downgradient of the bulky waste area. Nickel concentrations were greater than three times higher in MW-12-01, which

is also downgradient of this area. Arsenic and barium were also elevated by more than twice the background concentration at MW-11-01 and MW-04-01, which are south of the Transfer Station Road and downgradient of the solid waste area, respectively. Iron and manganese were also elevated at MW-11-01 and MW-04-01, respectively.

Cyanide was detected once in MW-V (11.1 μg/L), and sulfide was not detected in any samples. Total organic carbon was measured in nine wells ranging from 7.3 to 63.9 mg/L. Biochemical oxygen demand was measured in four wells (MW-12-01, MW-06-01, MW-11-01, and MW-13-01) at levels ranging from 4.0 to 12.7 mg/L. During this sampling round, pH values ranged from 5.8 to 8.2, while conductivities and hardness were between 26 and 440 μmhos/cm and 14 and 237 mg/L $CaCO_3$, respectively. With the exception of MW-11-01, conductivities were similar to or below those measured in the shallow overburden background well.

January/February 1992. The four shallow overburden wells sampled during January/February 1992 include MW-02-01, MW-03-01, MW-04-01, and MW-11-01. Analytes detected in these wells during January/February 1992 are summarized in Table 4-13 and are shown in Figures 4-7, 4-8, and 4-9. During this sampling round, volatile and semivolatile organics and pesticides were detected in up to two wells at concentrations near or below sample quantitation limits. Water-soluble organics and PCBs were not found in any wells.

Aromatic volatiles consisting of benzene (11 μg/L), ethylbenzene (13 μg/L), xylenes (5 μg/L), and chlorobenzene (2 μg/L) were detected at MW-11-01. In addition, four chlorinated volatiles (1,2-DCE, 1,1-DCA, and 1,2-dichloropropane) were detected in MW-11-01 at concentrations up to 3 μg/L, and chloroethane was detected at 27 μg/L. Chloroethane was also detected in MW-04-01 at 9 μg/L. Toluene and chlorobenzene (up to 2 μg/L) were detected at MW-02-01, located in the sewage sludge area. Ethylbenzene and xylene were found in MW-03-01 (up to 2 μg//L), which is downgradient of the bulky waste area. Similar to September/October 1991, volatile organics were detected most often at MW-11-01, which is downgradient of the solid waste area and south of the Transfer Station Road.

Three semivolatile organics were detected in the shallow overburden. Naphthalene (4 μg/L), 1,2-dichlorobenzene (3 μg/L), and 1,4-dichlorobenzene (5 μg/L) were detected in MW-11-01. Diethylphthalate (7 μg/L) was detected in MW-03-01, located south of the bulky waste area.

Two pesticides were detected during this sampling round. 4,4'-DDD (0.0050 μg/L) was detected in MW-02-01, located in the sewage sludge area. While this pesticide was not found in other subsurface media in the sewage sludge area, it has been found frequently in different media throughout the site study area. Endrin ketone (0.0028 μg/L) was detected in MW-11-01 and was also detected in OW-27, a lower overburden well located in the solid waste area.

Major-metal ions, including aluminum, iron, calcium, magnesium, sodium, and potassium, were detected in all unfiltered (6,145 to 114,000 μg/L) and filtered (764 to 68,400 μg/L) samples. Highest concentrations were usually found at MW-11-01, except for aluminum, for which higher concentrations occurred at MW-04-01. Barium, beryllium (2.6 to 9.2 μg/L), and five heavy metals were also detected in most unfiltered samples: cobalt (up to 31.6 μg/L), copper (up to 73.3 μg/L), lead (up to 53 μg/L), manganese (up to 9,130 μg/L), nickel (up to 34.2 μg/L), vanadium (up to 67.2 μg/L), and zinc (up to 210 μg/L). In unfiltered samples, concentrations of these metals were generally highest in MW-04-01. Only a few metals had elevated concentrations relative to the shallow overburden background well. Besides basic cations, which were as much as two times greater at MW-11-01, manganese at MW-04-01 was more than four times greater.

In filtered samples, barium and manganese were detected in most wells with concentrations ranging from 39.9 to 222 μg/L and 1,335 to 5,290 μg/L, respectively. Also detected were cobalt (9.9 μg/L) and zinc (13.7 μg/L) at MW-04-01 and vanadium (3.7 μg/L) at MW-11-01.

Sulfide and cyanide were not detected in any samples. Total organic carbon was measured in all wells ranging from 28 to 105 mg/L, with the highest concentration found at MW-11-01. Biochemical oxygen demand was also measured in MW-11-01 (19 mg/L). Values from 6 to 6.8 were measured for pH, and conductivities ranged from 280 to 1,300 μmhos/cm; the highest of

these occurred at MW-11-01. Conductivities at all wells were comparable to those measured in the background well. Hardnesses of 51 to 249 mg/L $CaCO_3$ were also calculated.

April 1992. During this round, the four shallow overburden wells were sampled: MW-05-01, MW-06-01, MW-12-01, and MW-II. Analytes detected in these wells during April 1992 are summarized in Table 4-14 and Figures 4-7 through 4-9.

With the exception of carbon disulfide (3 μg/L) at MW-06-01, organic compounds were not detected in this well or MW-05-01 during this round. Several volatile and semivolatile organics as well as one pesticide were detected in MW-12-01 and MW-II. Water-soluble organics and PCBs were not identified in any wells.

The types of volatile organics detected consist of ketones, carbon disulfide, and chlorinated and aromatic volatiles. Acetone was detected in MW-II at 300 μg/L. Toluene and chlorobenzene were also found in MW-II at 110 μg/L and 1 μg/L, respectively. Similar types of chemicals were found during other sampling rounds at this well, which is downgradient of the sewage sludge area. The volatile organics detected at MW-12-01 (downgradient of the bulky waste area) included all four BTEX compounds, chlorobenzene, and two chlorinated volatiles (1,1-DCA and chloroethane). Concentrations ranged from 1 to 11 μg/L.

In addition to volatile organics, five semivolatiles were detected in MW-II and MW-12-01. Naphthalene and 1,4-dichlorobenzene were detected in MW-12-01. Two phenols (4-methylphenol and 2-methylphenol) and 4-chloroaniline were also detected in MW-II. Except for 4-methylphenol (60 μg/L), concentrations were below sample quantitation limits (0.8 to 3 μg/L). One pesticide, *delta*-BHC was also detected from 0.0087 to 0.010 μg/L (below sample quantitation limits) in both wells.

The metals detected the most often include major-metal ions (aluminum, iron, calcium, magnesium, sodium, and potassium) at 2,400 to 114,000 μg/L in unfiltered samples and 747 to 80,300 μg/L in filtered samples, barium at 60.8 to 146 μg/L in unfiltered samples and 29.2 to

76.2 μg/L in filtered samples, and manganese at 220 to 6,960 μg/L in unfiltered samples and 264 to 6,770 μg/L in filtered samples. Other metals detected in unfiltered samples include beryllium and seven heavy metals (chromium, cobalt, copper, lead, nickel, vanadium, and zinc). None of these metals were found in filtered samples. As discussed previously, most metals detected in both unfiltered and filtered samples were generally in a more soluble form. Only one well (MW-II) had concentrations greater than the shallow overburden background well during this sampling round. In comparison, metals with concentrations more than two times higher were aluminum, magnesium, beryllium (24,200, 7,100, and 3.4, respectively); metals more than four times higher were chromium and nickel (54.3 and 49.4 μg/L, respectively); and metals more than six times higher were iron, manganese, and zinc (114,000, 4,290, and 192 μg/L, respectively).

Cyanide was not detected during this sampling round. Ammonia was detected in three samples ranging from 0.32 to 17.1 mg/L with the maximum concentration at MW-II. Total organic carbon was measured in all groundwater samples, with concentrations ranging from 7.9 to 55 mg/L. Biochemical oxygen demand was measured in two wells, MW-06-01 (4.9 mg/L) and MW-II (13.4 mg/L). pH values were in the neutral (5.8 to 6.6) range, and conductivities ranged from 78 to 2,500 μmhos/cm, with the highest in MW-06-01.

Distribution and Significance. All of the organic compounds and metals detected in shallow overburden groundwater were also found in other media (i.e., soil, landfill gas, leachate) in the site study area. Most were generally related to wastes deposited in the disposal areas. In addition, *N,N*-DMF was detected in two wells. This compound is a solvent that is widely used in the formation process of many acrylic and polymeric materials (i.e., polyurethanes). Unlike most of the other organic compounds, *N,N*-DMF is not typically used for purposes other than industrial applications. This compound, along with other solvents (i.e, TCE, toluene) and adhesive wastes, are known to have been disposed of during landfill operations.

Volatile organics were the most prevalent organic compounds in shallow overburden groundwater, since these chemicals were detected at least once in 11 of 12 wells in this flow

zone (Figure 4-7). Of these, chlorinated and aromatic volatiles were the primary types of volatile organics detected. The most frequently detected chlorinated volatiles were chloroethane, 1,2-DCE, and 1,1-DCA, while BTEX compounds and chlorobenzene were the most frequently detected aromatic volatiles. Vinyl chloride, 1,2-DCA, and 1,2-dichloropropane were each identified once. Total chlorinated volatile concentrations for each well ranged from 1 to 38 μg/L. The highest concentration occurred at MW-11-01. Total aromatic volatile concentrations for each well ranged from 2 to 110 μg/L, with the largest concentration associated with toluene at MW-II. Acetone was the only ketone detected and it was found only once. Carbon disulfide was also identified a few times.

Semivolatile organics, pesticides, and PCBs were also detected in groundwater but less often than volatile organics. In part this is related to the fact that these compounds are less mobile than volatiles in aqueous systems. Phenols, phthalates, PAHs, and dichlorobenzenes were the types of semivolatiles detected. These compounds were found in six shallow overburden wells at total concentrations ranging from 2.7 to 64 μg/L. Four pesticides (*gamma*-BHC, *alpha*-chlordane, 4,4'-DDT, and endrin ketone) were each detected once during the study period, at concentrations of 0.0028 to 0.009 μg/L. One PCB, aroclor-1260, was identified in one well at 0.24 μg/L. These compounds were found more often and in higher concentrations in soil than in groundwater because they are less soluble and readily adsorb to mineral and organic soil, including unfiltered particulates in groundwater.

The aerial distribution of organic compounds varied widely; however, some broad patterns occurred. In the vicinity of the sewage sludge area, aromatic volatiles and carbon disulfide were the primary compounds detected. Carbon disulfide was found in all of the wells downgradient of this disposal area (MW-I, MW-II, MW-III, and MW-IV), and aromatic volatiles were detected in MW-02-01, which is located in the sewage sludge area, and at more elevated concentrations at MW-II, which is immediately downgradient of MW-02-01. Ketones and several semivolatile organics and pesticides were sporadically found. All of these compounds were also detected in soil in that area.

Chlorinated and aromatic volatiles were inconsistently detected in wells in the immediate vicinity of the bulky waste area (MW-V, MW-03-01, and MW-12-01). Several semivolatiles and a pesticide were also found. The presence of *N,N*-DMF in MW-03-01 suggests that either related wastes were disposed of in the bulky waste area or some component of groundwater flow from the solid waste area, where these types of wastes were found in soil, is in this direction.

One PCB aroclor was the only compound detected at MW-05-01, which lies southeast of the bulky waste and solid waste areas.

Located southeast of the southern end of the solid waste area, MW-11-01, which is also east of Mitchell Brook and south of the Transfer Station Road, had the most types of and highest concentrations of volatile organics (aromatic and chlorinated) detected in shallow overburden groundwater. Semivolatile organics and *delta*-BHC were also detected here. However, in MW-06-01, which is further north but also east of Mitchell Brook and the solid waste area, no organic compounds were detected. Chloroethane is the only organic compound that was detected in MW-04-01, which is directly east and downgradient of the solid waste area.

At MW-13-01, which is north of Mitchell Brook and the northern section of the solid waste area, *N,N*-DMF, toluene, and a semivolatile were detected. The detection of *N,N*-DMF at this well indicates that groundwater flow to this area is occurring. It is thought that mounding effects in the shallow overburden in the northern portion of the solid waste area are occurring.

Major-metal ions, defined as aluminum, iron, and basic cations (calcium, magnesium, sodium, and potassium), were found more frequently and in higher concentrations than other metals. This is expected because of the natural abundance of these metals in soil and geologic material. Barium and manganese were detected as often. Other metals detected include beryllium, antimony, arsenic, chromium, cobalt, copper, lead, nickel, mercury, vanadium, and zinc. All of these metals were also detected in the shallow overburden background well during the study period. Concentrations were more than two times higher in comparison to the background well for several of the metals during each sampling round. Basic cations, iron, barium, and

manganese usually exceeded background concentrations in each round. Arsenic, lead, nickel, vanadium, and zinc were higher a few times. Wells in which exceedances most often occurred include MW-II, MW-11-01, MW-04-01, and MW-02-01. There were no obvious patterns of distribution or seasonal trends for any of the metals detected. When statistically compared with background concentrations, there was no significant difference based on the available data (Appendix D).

A comparison of metal concentrations in unfiltered and filtered samples indicates that the more soluble forms of major-metal ions, barium, and manganese were generally present in shallow overburden groundwater. Because many of the other metals detected in unfiltered samples were either not detected or were detected in smaller quantities in filtered samples, these metals are probably present in less soluble forms. This is important because the more soluble metals have greater mobility in groundwater.

4.2.5.3 Deep Overburden. A total of 16 wells in the deep overburden were sampled. One well, MW-02-02, was located directly in the sewage sludge area. MW-03-02 and MW-12-02 are located east and southeast of the bulky waste area and further south of this area is MW-05-02. Two wells, MW-09-01 and MW-10-01, are located east of the Saugatucket River. Two existing wells, OW-25 and OW-27, and one new well, MW-14-01, are located directly in the solid waste area. In addition, seven wells are outside the perimeter of the solid waste area: MW-13-02 to the north; MW-07-01 and MW-08-01 to the west; OW-30, MW-04-02, and MW-06-02 to the east; and MW-11-02 to the southeast. Organic compounds and metals detected in deep overburden wells are summarized in Figures 4-10, 4-11, and 4-12.

June 1991. During June 1991, three existing deep overburden wells were sampled: OW-25, OW-27, and OW-30. The analytes detected are presented on Table 4-11. A summary of organic compounds and metals detected are presented in Figures 4-10, 4-11, and 4-12.

Chlorinated and aromatic volatiles, ketones, and carbon disulfide were detected during this sampling round. Aromatic volatiles were found in all of the wells. Benzene, ethylbenzene, and

xylenes were found in all three wells at concentrations of 7 to 28 μg/L, 17 to 72 μg/L, and 39 to 210 μg/L, respectively, with the highest concentrations in OW-25. Toluene (120 to 150 μg/L) and chlorobenzene (2 to 13 μg/L) were each detected in OW-30 and OW-25. The highest total aromatic concentrations occurred at OW-25, which is in the southern portion of the landfill.

Vinyl chloride and 1,2-DCE were detected in all of the wells at concentrations ranging from 3 to 690 μg/L and 3 to 730 μg/L, respectively. Chloroethane (4 to 86 μg/L) and 1,1-DCA (1 to 220 μg/L) were found in OW-27 and OW-30, while 1,2-dichloropropane was found in OW-25 and OW-30 from 2 to 3 μg/L. In addition, 1,1,1-TCA was found in OW-30 at 34 μg/L. Concentrations and the number of chlorinated volatiles tended to be higher in wells from the northern portion of the disposal area (OW-27 and OW-30), with the highest and largest number of these compounds detected downgradient of the area at OW-30.

Two ketones, MEK and 4-methyl-2-pentanone, were also detected at OW-30 at 31 to 140 μg/L, respectively. Carbon disulfide ranged from 3 to 87 μg/L in all three wells. Similar types of volatile organics were found in other media at the solid waste area including soil and landfill gas. In particular, the findings of elevated aromatic volatiles in the southern portion of the area and elevated chlorinated volatiles in the northern portion of the area concur with trends found in landfill gas (section 4.2.8). It is believed that drums, possibly filled with solvents, are buried in the northwest corner of the solid waste area near where OW-27 is located.

Naphthalene and 1,4-dichlorobenzene were detected from 10 and 25 μg/L in OW-25, located in the southern portion of the solid waste area. In OW-30, which is downgradient of the northern portion of this disposal area, 4-methylphenol, benzoic acid, and n-nitroso-di-n-propylamine were found from 10 to 51 μg/L. Pesticides and PCBs were not detected in any of the wells.

Aluminum was detected only in the unfiltered samples (917 to 22,700 μg/L). Other major-metal ions (iron, calcium, magnesium, sodium, and potassium) were detected in both unfiltered and filtered samples. In unfiltered samples, iron and basic cation concentrations ranged from

114,000 to 157,000 μg/L and 5,990 to 501,000 μg/L, respectively. In filtered samples, concentrations ranged from 20,800 to 115,000 μg/L for iron and 3,070 to 540,000 μg/L for basic cations. For the most part, iron concentrations were generally higher than other major-metal ions in unfiltered and filtered samples, except for sodium at OW-25. Barium and manganese were also detected as often as major-metal ions in both unfiltered (52.6 and 2,970 μg/L, respectively) and filtered (47.5 and 2,850 μg/L, respectively) samples. As found in shallow overburden groundwater, these metals are primarily associated with the more soluble forms, since the filtered concentrations account for a large fraction of the total concentrations.

Seven other heavy metals were detected in unfiltered samples at OW-25 and OW-27. Arsenic at 4.8 to 8.6 μg/L, chromium at 44.8 to 62.5 μg/L, cobalt at 29.4 to 33.1 μg/L, lead at 173 to 181 μg/L, nickel at 67.9 to 79 μg/L, vanadium at 36.7 to 45.2 μg/L, and zinc at 645 to 5,980 μg/L were present in both wells. Cadmium was also found in OW-27 at 40 μg/L and copper was found in OW-25 at 107 μg/L. Nickel and zinc were also detected at lower concentrations in filtered samples (9.2 and 19.2 to 43.9 μg/L, respectively). Antimony and mercury were each detected in OW-25 at 19.4 and 0.63 μg/L. These results indicate that heavy metals are in a predominantly insoluble form.

Sulfide was measured from 1.7 to 3.3 mg/L in the three wells, whereas cyanide was not detected in any samples. A BOD of 120 mg/L was measured in OW-30, and TOC ranged from 24 to 65 mg/L. Values for pH, conductivity, and hardness ranged from 6.6 to 6.8, 750 to 5,600 μmhos/cm, and 167 to 675 mg/L $CaCO_3$, respectively.

September/October 1991. Fifteen deep overburden wells were sampled during this round. Wells considered to be primarily downgradient of the sewage sludge area are MW-02-02 and MW-09-01 (Figure 4-6), and wells located primarily downgradient of the bulky waste are MW-03-02, MW-05-02, MW-10-01, MW-12-02, and MW-13-02. Six of the wells are considered to be primarily downgradient of the solid waste area: MW-04-02, MW-06-02, MW-07-01, MW-08-01, MW-11-02, MW-14-01, OW-27, and OW-30. These groupings were developed to consolidate wells where the predominant flow component is from one of the three

disposal areas; however, in reality many of these wells are also downgradient of more than one disposal area as well as nondisposal areas.

A summary of analytes detected in deep overburden samples during September/October 1991 is presented on Table 4-12. Figures 4-10 through 4-12 summarize the distribution of organic compounds and metals detected in deep overburden groundwater.

The types of volatile organics detected consist of chlorinated and aromatic volatiles, ketones, and carbon disulfide. Toluene, ethylbenzene, xylenes, and chlorobenzene were found at concentrations up to 20 μg/L in MW-12-02, which is downgradient of the bulky waste area. In addition to acetone (130 μg/L), chlorinated volatile concentrations in this well ranged from 4 to 16 μg/L for 1,2-DCE, 1,1-DCE, and chloroethane. 1,1-Dichloroethene was also found at 1 μg/L in MW-05-02, which is southeast of the bulky waste and solid waste areas. These compounds, which were also identified in surface and subsurface soil as well as landfill gas (section 4.2.8) in the bulky waste area, are typical degradation products of more chlorinated compounds. Volatile organics were not found in MW-03-02, which is about 100 feet south of MW-12-02, or in MW-10-01, which is east of the Saugatucket River and further downgradient of the bulky waste area.

Chlorinated and aromatic volatiles were identified in a number of wells in the vicinity of the solid waste area. In three of the four wells (OW-27, OW-30, MW-14-01) directly located in this disposal area, concentrations of BTEX compounds ranged from 1 to 170 μg/L, with toluene accounting for the highest concentrations. Concentrations of these compounds tended to be elevated at MW-14-01 in comparison to the other wells. Chloroethane and 1,1-DCA were found from 2 to 62 μg/L in these wells. Trichloroethene and 1,2-DCE were found in OW-27 and MW-14-01 from 2 to 41 μg/L. Vinyl chloride was also detected at OW-27 at 19 μg/L. Both chlorinated and aromatic volatile concentrations had decreased since June 1991 in these wells, and unlike June 1991, no volatile organics were identified at OW-25 (in the southern portion of the area) during this sampling round. In addition, *N,N*-DMF was found at 78 μg/L in OW-30

and at 596 μg/L in MW-14-01. This chemical is specifically associated with industrial wastes that were disposed of in the solid waste area.

The water-soluble *N,N*-DMF was also detected at MW-07-01, which is west of Rose Hill Road. Groundwater flow from the solid waste area to this well and MW-13-02 appears to result from mounding effects (section 3). Leachate outbreaks (section 4.2.3) and the detection of elevated chlorinated and aromatic volatiles in landfill gas have also been found near MW-07-01. In both of these wells, BTEX compounds were found at individual concentrations ranging from 4 to 49 μg/L. Four chlorinated volatiles were detected at MW-07-01: 1,2-DCE (5 μg/L), 1,1-DCA (16 μg/L), chloroethane (13 μg/L), and vinyl chloride (8 μg/L). 1,1-Dichloroethane was detected at MW-13-02 at 6 μg/L as were two ketones, MEK (9 μg/L) and 4-methyl-2-pentanone (5 μg/L).

Chlorinated and aromatic volatiles were also identified in MW-04-02, MW-06-02, and MW-11-02, which are downgradient of the solid waste area. Benzene, ethylbenzene, and xylenes were found in each of these wells at concentrations up to 11 μg/L. In addition, toluene and chlorobenzene were detected in MW-11-02 at 1 and 5 μg/L, respectively. Three chlorinated volatiles were also identified in these three wells. Chloroethane (48 to 72 μg/L) was found in the highest concentrations in all three wells. In MW-11-02 and MW-04-02, 1,1-DCA was detected at 2 μg/L, and 1,2-DCE was detected at 3 μg/L in MW-11-02. Acrylamide, a water-soluble organic, was found in MW-04-02 at 229 μg/L. Only detected once during this sampling round, 1,2-DCA was identified at 1 μg/L in MW-06-02.

Aromatic volatiles were not identified in MW-02-02. Although BTEX compounds were detected in the shallow overburden well (MW-02-01) directly in the sewage sludge area during this sampling round, other shallow overburden wells downgradient of this area (MW-I through MW-IV) also exhibited low volatile concentrations during this round relative to previous and subsequent rounds. This suggests that annual variations may affect volatile organic or other chemical concentrations.

Several semivolatile organics were detected during this sampling round. Naphthalene (up to 8 μg/L) and diethylphthalate (up to 17 μg/L) were detected the most frequently with the highest concentrations in MW-14-01 and MW-07-01, respectively. In addition, 2-methylnaphthalene and di-n-butylphthalate were also identified twice at concentrations of 0.6 to 2 μg/L. Four phenols (2-methylphenol, 4-methylphenol, 2,4-dimethylphenol, and 4-chloro-3-methylphenol) were detected from 0.9 to 17 μg/L. Two dichlorobenzenes (1,2-dichlorobenzene and 1,4-dichlorobenzene) were also detected at concentrations ranging from 2 to 5 μg/L. All of the wells in which semivolatile organics were identified are associated with the solid waste area.

In addition, *alpha*-chlordane was detected at 0.0028 μg/L in MW-09-01, which is located east of the Saugatucket River. PCB aroclor-1260 was detected at 0.16 μg/L in MW-08-01, which is located at the bottom of a quarry pit west and about 30 feet downslope of Rose Hill Road, near piles of construction and excavation debris. PCBs were also detected in subsurface soil on the southern end of the solid waste area. These were the only organic compounds detected in these two wells.

In addition to the major-metal ions, barium and manganese were found more often and in higher concentrations than other metals detected in either unfiltered or filtered samples. Major-metal ion concentrations ranged from 1,443 to 238,000 μg/L in unfiltered samples and from 132 to 139,000 μg/L in filtered samples. Barium and manganese were found at 26.6 to 454 and 489 to 9,995 μg/L, respectively, in unfiltered samples and at 25.3 to 267 and 65.8 to 7,390 μg/L, respectively, in filtered samples. Again these data indicate that a substantial portion of the detected concentrations are associated with more soluble forms of these metals. Beryllium (up to 10.9 μg/L) and 12 heavy metals were also detected in unfiltered samples. Arsenic (up to 9.7 μg/L), chromium (up to 141 μg/L), cobalt (up to 53.8 μg/L), lead (10.9 to 307 μg/L), nickel (up to 125 μg/L), vanadium (up to 127 μg/L), and zinc (103 to 7,360 μg/L) were detected in five wells. Heavy metals detected in two or fewer wells were antimony at 104.9 μg/L, cadmium at 39.9 μg/L, mercury at 0.28 μg/L, and beryllium at 10.5 and 10.9 μg/L. In addition, the only well in which cadmium and mercury were detected was OW-27. In filtered samples, these metals were found less often and in lower concentrations.

Aluminum concentrations ranged from 1,443 to 96,400 μg/L in unfiltered samples and were 132 μg/L in filtered samples. For iron, concentrations in unfiltered samples were 1,920 to 238,000 μg/L and in filtered samples were 262 to 111,000 μg/L. Concentrations from 1,560 to 139,000 μg/L and 1,460 to 139,000 μg/L were found for basic cations in unfiltered and filtered samples, respectively.

More metals and higher concentrations generally occurred at wells located in, or downgradient of, the solid waste area than in wells primarily associated with the bulky waste area. In particular, the highest concentrations were more frequently found in wells located directly in this disposal area (OW-27, OW-25, MW-14-01) and in MW-07-01, which is west of Rose Hill Road. In comparison to shallow overburden groundwater, metal concentrations were relatively similar in deep overburden groundwater. In contrast, more heavy metals (i.e., mercury) were detected in deep overburden than in shallow overburden groundwater.

During this round, cyanide was not detected in any wells sampled. Sulfide was detected in one well, MW-05-02, at 32 μg/L. In seven wells, BOD was measured from 7.0 to 35 mg/L, and TOC was measured from 15.8 to 117.5 mg/L in ten wells. Values of 6.25 to 7.26, 50 to 2,150 μmhos/cm, and 30 to 366 mg/L $CaCO_3$ were found in deep overburden wells for pH, conductivity, and hardness, respectively. The highest BOD, TOC, and conductivities were associated with MW-14-01.

January/February 1992. Eight deep overburden wells were sampled during this round: OW-27, OW-30, MW-04-02, MW-07-01, MW-10-01, MW-11-02, MW-13-02, and MW-14-01. With the exception of MW-10-01, which is east of the Saugatucket River, the wells sampled are in the vicinity of the solid waste area. The analytes detected during January/February 1992 are summarized in Table 4-13. A summary of the organic compounds and metals detected is presented in Figures 4-10, 4-11, and 4-12.

The same types of chlorinated and aromatic volatiles detected in wells associated with the solid waste area during September/October 1991 were again identified during this sampling round.

The BTEX compounds were detected from 1 to 78 μg/L in OW-27 and MW-14-01, located directly in this area; from 2 to 22 μg/L in MW-07-01 and MW-13-02, which receive groundwater flow from this area because of mounding affects; and from 4 to 13 μg/L in MW-04-02 and MW-11-02, which are downgradient and to the southeast of the area. In addition, chlorobenzene was found in MW-11-02 and OW-27 at concentrations of 4 and 5 μg/L, respectively. While BTEX compounds were detected in each of these wells the previous sampling round, there were no evident trends in concentration variations. The highest total concentrations were detected in OW-27 and MW-14-01. Total BTEX concentrations increased in some wells (i.e., OW-27, MW-13-02), decreased in other wells (i.e., MW-07-01, MW-14-01, MW-11-02), and did not substantially change in other wells (i.e., MW-04-02). Unlike September/October 1991, BTEX compounds were not identified in OW-30.

The three chlorinated volatiles detected in up to five of these wells were 1,2-DCE, 1,1-DCA, and chloroethane. Chloroethane was detected more often and in higher concentrations than the other chlorinated volatiles. All three chlorinated volatiles were detected in MW-11-02 and MW-07-01 at concentrations of 1 to 62 and 5 to 11 μg/L, respectively. In OW-30, chloroethane and 1,1-DCA were both detected at 12 μg/L. Chloroethane was the only chlorinated volatile found at MW-04-02 (43 μg/L), and 1,1-DCA was found only at OW-27 (2 μg/L) and MW-13-02 (8 μg/L).

Other volatile organics detected include 4-methyl-2-pentanone in MW-13-02 (8 μg/L). Ketones were previously detected in this well during September/October 1991. Carbon disulfide (1 μg/L) was the only organic compound detected at MW-10-01.

During this sampling round, *N,N*-DMF was detected in the same two wells as in September/October 1991. In MW-13-02, 254 μg/L of *N,N*-DMF was found, and in MW-14-01 495 μg/L was found. Although *N,N*-DMF was detected previously in OW-30, it was not found during this round.

The same types of semivolatile organics detected in September/October 1991 (PAHs, phthalates, dichlorobenzenes, and phenols) were found during this round. Semivolatile organics were detected in all but two wells in this area (MW-04-02 and OW-30). These compounds were also not found at MW-10-01. Naphthalene, diethylphthalate, and 1,4-dichlorobenzene were detected the most often at concentrations ranging from 2 to 9 μg/L, 1 to 16 μg/L, and 1 to 3 μg/L, respectively. The highest concentration detected was for 2-methylphenol at 72 μg/L in MW-13-02. Concentrations less than 5 μg/L were reported for 2-methylnaphthalene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 2,4-dimethylphenol, and di-n-butylphthalate. Each of these compounds was detected in one or two wells. In comparison to September/October 1991, concentrations were not substantially different during this sampling round.

Pesticides were detected in four wells. With the exception of endrin ketone, nine pesticides were each detected once during this sampling round. Endrin ketone was found in two wells, OW-27 and MW-11-02, from 0.0032 to 0.0066 μg/L. Six of the pesticides were detected in MW-14-01 at concentrations ranging from 0.0036 to 0.094 μg/L: *beta*-BHC, methoxychlor, heptachlor epoxide, endosulfan II, aldrin, and *alpha*-chlordane. This well is located at the southern end of the solid waste area. Several of these pesticides were also found in subsurface soil at this location. In addition, methoxychlor was found at MW-11-02 (0.013 μg/L), and *gamma*-BHC was detected at MW-07-01 (0.0051 μg/L).

Metals detected in all unfiltered samples include major-metal ions, barium, manganese, and vanadium. With the exception of aluminum and vanadium, these metals were also found in most of the filtered samples. In unfiltered samples, concentrations ranged from 3,050 to 110,000 μg/L for aluminum, 13,000 to 268,000 μg/L for iron, 3,260 to 119,000 μg/L for basic cations, 48.9 to 508 μg/L for barium, 290 to 5,610 μg/L for manganese, and 3.7 to 142 μg/L for vanadium. In filtered samples, concentrations up to 101,000 μg/L for iron, 600 to 116,000 μg/L for basic cations, up to 246 μg/L for barium, and up to 3,855 μg/L for manganese were measured. Aluminum and vanadium were each detected once at 131 and 12 μg/L, respectively.

Other metals detected in more than one sample include beryllium (up to 13.7 μg/L), chromium (5.6 to 154 μg/L), cobalt (5.3 to 53.8 μg/L), copper (19.5 to 367 μg/L), lead (15.9 to 148 μg/L), nickel (6 to 99.4 μg/L), and zinc (25.7 to 6,320 μg/L). Mercury and cadmium were each detected in one well (OW-27) at 0.29 and 33.8 μg/L, respectively. Except for mercury, all of these metals were also found in filtered samples, though less frequently and at lower concentrations.

Similar to September/October 1991, higher concentrations for metals tended to occur in wells associated with the solid waste area, particularly those within the boundaries. Also, most metals were usually present in higher concentrations during this round than during the previous round.

During this sampling round, cyanide was not detected in any wells. Sulfide was detected in MW-14-01 at 4.94 mg/L. Total organic carbon was reported in all wells. The highest concentration reported was 220 mg/L in MW-14-01. Biochemical oxygen demand was measured in four wells (8.7 to 39 mg/L). pH values ranged from 6.4 to 6.9, and conductivities ranged from 125 to 1,800 μmhos/cm. A hardness of 35 to 329 mg/L $CaCO_3$ was calculated for the wells.

April 1992. The seven deep overburden wells sampled during April 1992 were OW-27, which is located in the solid waste area; OW-30, MW-06-02, MW-07-01, and MW-08-01, which are considered downgradient of the solid waste area; and MW-05-02 and MW-12-02, which are downgradient of the bulky waste area. The analytes detected in deep overburden groundwater samples are summarized on Table 4-14, and a summary of the organic compounds and metals is shown on Figures 4-10 through 4-12.

Five aromatic volatiles, including BTEX compounds, chlorobenzene, and styrene, were detected during this sampling round. The BTEX compounds were detected in four wells: OW-30, OW-27, MW-06-02, and MW-07-01. Benzene concentrations ranged from 3 to 8 μg/L, toluene from 26 to 47 μg/L, ethylbenzene from 3 to 22 μg/L, and xylenes from 6 to 51 μg/L.

Chlorobenzene was also detected at up to 4.5 μg/L in OW-27 and MW-06-02, and styrene was found in OW-27 at 10 μg/L.

Chlorinated volatiles consisting of 1,2-DCE, 1,1-DCA, and chloroethane were again found during this sampling round. Each of these chemicals was detected at OW-27 (2 to 6 μg/L), OW-30 (42 to 100 μg/L), and MW-07-01 (15 to 120 μg/L). The highest concentrations in these wells correspond to 1,2-DCE. Chloroethane and 1,2-DCE were also found in MW-06-02 at 58 and 1 μg/L, respectively. In addition vinyl chloride was detected at 8 μg/L in OW-27, and at more elevated concentrations (170 and 340 μg/L) in MW-07-01 and OW-30, respectively. The highest total chlorinated concentrations occurred at OW-30 and MW-07-01.

Acetone was detected in one well, OW-27, at 470 μg/L. While detected in other wells during different sampling rounds, this is the first time a ketone was found in OW-27. *N,N*-Dimethylformamide was detected at 142 μg/L in OW-30. This compound was also found in this well during September/October 1991.

The types of semivolatile organics detected are the same as during the previous two rounds: PAHs, phthalates, dichlorobenzenes, and phenols. Naphthalene and diethylphthalate were each detected in three wells at concentrations from 2 to 11.5 μg/L. Di-n-butylphthalate, bis(2-ethylhexyl)phthalate, and 4-methylphenol were each detected once at 0.9 to 25 μg/L. Two dichlorobenzenes (1,2-dichlorobenzene and 1,4-dichlorobenzene) and two phenols (4-methylphenol and 2,4-dimethylphenol) were each detected in two wells at 1 to 25 μg/L. The four wells that these compounds were detected include: OW-27, OW-30, MW-06-02, and MW-07-01.

The only pesticide detected during this sampling round was *delta*-BHC at 0.006 μg/L in MW-07-01. PCBs were not detected in any of the wells.

For metals, unfiltered concentrations ranged from 3,460 to 25,850 μg/L for aluminum, from 8,830 to 114,500 μg/L for iron, from 1,140 to 101,000 μg/L for basic cations, from 27.6 to

232 μg/L for barium, and from 338 to 1,760 μg/L for manganese. Other metals detected in all but one well include copper (16.35 to 68.75 μg/L) and zinc (18.8 to 2750 μg/L). Beryllium, chromium, lead, nickel, and vanadium were also found at concentrations ranging from 1.1 to 69.85 μg/L. Also detected at OW-27 were cadmium and mercury (19.55 and 0.3 μg/L, respectively). With the exception of major-metal ions and manganese, which were found in most wells in concentrations similar to those in unfiltered samples, other metals were found less often and in fewer concentrations than in unfiltered samples. Lead, nickel, and zinc were the only heavy metals detected during this sampling round. Metal concentrations generally decreased in comparison to the previous sampling round and were similar to those found during September/October 1991.

Cyanide was not detected in any wells during this sampling round. Ammonia was detected from 0.034 to 51.7 mg/L in six wells. Total organic carbon was measured in seven wells from 9.7 to 99.5 mg/L, and BOD was measured in five wells from 1.0 to 31.5 mg/L. Values of 6.2 to 6.7 were measured for pH. Conductivities ranged from 77 to 730 μmhos/cm, and hardness was calculated from 18 to 257 mg/L $CaCO_3$.

Distribution and Significance. The organic compounds and metals detected in deep overburden groundwater were also found in other media (i.e., soil, landfill gas, leachate, and shallow overburden groundwater). Two water-soluble organics (*N,N*-DMF and acrylamide) that are related to adhesive and industrial wastes known to have been deposited in the disposal areas were also detected.

As was true for shallow overburden groundwater, the other types of chemical groups detected include volatile and semivolatile organics, pesticides, and PCBs. In comparison, more organic compounds with higher concentrations were generally exhibited in the deep overburden groundwater. However, three wells did not follow this trend (MW-02-02, MW-03-02, and MW-12-02), as concentrations in these wells were higher in the shallow overburden. The higher concentrations detected in the shallow overburden may be attributed to the proximity of these wells to leachate seeps or disposal areas. Some of the factors that influence these differences

include groundwater movement or restriction (lacustrine layer) between the two flow zones as well as the bedrock flow zone, lateral groundwater flow from the disposal areas, proximity to the disposal areas, and chemical behavior and mobility in subsurface media. These processes are further discussed in section 5.

The chemical group detected the most often and in the highest concentrations in deep overburden groundwater was volatile organics. Chlorinated and aromatic volatiles, ketones, and carbon disulfide were consistently found throughout the study period. Dichlorinated volatiles (1,1-DCA and 1,2-DCA), vinyl chloride, and chloroethane were usually detected in most of the wells, regardless of the sampling round. The highest concentrations detected during each sampling round ranged from 16 to 730 μg/L. On the other hand, TCE and 1,1,1-TCA (more chlorinated volatiles) were each detected during one sampling round in fewer samples (up to two) and at considerably lower concentrations (5 to 34 μg/L). This demonstrates that a substantial amount of degradation has occurred in the disposal areas, which is likely since landfill operations ceased about 10 years ago and for the most part, dichlorinated volatiles, vinyl chloride, and chloroethane are considered to be degradation products. However, these compounds are also solvents. The most common use of these compounds is in industrial applications, although they also found in household products. Industrial disposal of these compounds has not been documented, although vinyl chloride is associated with adhesive and polymer production. Release of these compounds is expected to continue until the source is depleted. As indicated by subsurface soil and landfill gas, a readily available source of chlorinated volatiles currently exists.

Aromatic volatiles regularly detected in most wells include BTEX compounds and chlorobenzene. Styrene was also found in one well (OW-27) during April 1992. Higher concentrations over the study period were usually associated with BTEX compounds (8 to 210 μg/L) than with chlorobenzene (2 to 13 μg/L).

Ketones (acetone, 2-methyl-4-pentanone, and MEK) and carbon disulfide were also detected in a few wells during each of the sampling rounds. Concentrations of ketones ranging from 3 to 140 μg/L and carbon disulfide concentrations of up to 3 μg/L were measured.

Numerous semivolatile organics, including three phthalates, two PAHs, three dichlorobenzenes, and five phenols, were found in deep overburden groundwater during the study period. Compounds from each of the chemical groups were found during each sampling round. These compounds were infrequently detected at concentrations that were generally less than 25 μg/L.

Several pesticides were identified at concentrations less than 0.1 μg/L. Most of the pesticides were each detected in only one well during January/February 1992 and included *alpha*- and *gamma*-BHC, 4,4'-DDT, methoxychlor, heptachlor epoxide, endosulfan II, aldrin, endrin ketone, and *alpha*-chlordane. *alpha*-Chlordane and *beta*-BHC were also each detected once during the study period. The only detection of PCB aroclor-1260 was at MW-08-01 (0.16 μg/L) in September/October 1991.

Volatile organics were more widely distributed than other organic compounds in deep overburden groundwater. Elevated concentrations usually corresponded to wells located within the boundaries of the solid waste area (OW-27, OW-25, and MW-14-01). In this disposal area, higher aromatic volatile concentrations tended to occur in the southern portion, as total concentrations ranged from 160 to 470 μg/L in MW-14-01 and OW-25 compared to 46 to 120 μg/L in OW-27, which is located in the northern portion. Furthermore, total chlorinated volatile concentrations were somewhat lower in the southern portion of the disposal area (up to 47 μg/L in MW-14-01 and OW-25) than in the northern portion (up to 54 μg/L in OW-27). Similar trends were exhibited in surface soil and landfill gas. Ketones and other less soluble organic compounds (i.e., semivolatiles, pesticides) were also detected in these wells.

Even more elevated chlorinated volatile concentrations were found in wells within the immediate vicinity of the northern portion of the solid waste area. Total concentrations of chlorinated volatiles ranged from 76 to 1,800 μg/L in OW-30, which is directly east of and downgradient

of this disposal area. Elevated concentrations also were present in MW-07-01 (25 to 340 μg/L), which is located near the northern portion of the solid waste area to the west of Rose Hill Road. Aromatic volatile concentrations in these wells ranged from 46 to 120 μg/L in MW-07-01 and from 39 to 230 μg/L in OW-30. Ketones and other less soluble organic compounds (i.e., semivolatiles, pesticides) were also detected in these wells.

In addition, *N,N*-DMF was detected in several of the above wells. The highest concentrations were found in MW-14-01 (500 to 600 μg/L). Less elevated concentrations of 110 to 140 μg/L were measured in OW-30. This compound was found in another well (MW-13-01 at 200 to 260 μg/L) that is to the north of the solid waste area and Mitchell Brook. *N,N*-Dimethylformamide was also found in the shallow overburden well at this location. This, coupled with the presence of the volatile organics and other organic compounds that were detected in wells in the solid waste area, provides strong support that groundwater flow in this direction is occurring from this disposal area.

In other wells to the southeast of and downgradient of the solid waste area (MW-04-02, MW-06-02, and MW-11-02,), organic compounds were also found. Volatile organics were the dominant chemical group in these wells. Total chlorinated (43 to 73 μg/L) and aromatic (13 to 50 μg/L) concentrations in these wells were similar to those measured in OW-30 during the same rounds. In addition, acrylamide was also found in MW-04-02 (230 μg/L), which is about 500 feet south of OW-30. Acrylamide is used in adhesives and as a starting monomer for the synthesis of polymeric products.

The only organic compound found in MW-08-01 was PCB aroclor-1260. This well is located west of Rose Hill Road, near the southern end of the solid waste area.

In wells primarily downgradient of the bulky waste area (MW-12-02, MW-03-02, and MW-05-01), organic compounds were less prevalent than in wells closer to the solid waste area. One volatile organic (1,2-DCE) was detected at 1 μg/L in MW-05-02. Semivolatile organics less than 7 μg/L and no volatile organics were found in MW-03-02. Volatile organics were

inconsistently detected in MW-12-02, with total concentrations of chlorinated and aromatic volatiles ranging from 1 to 40 μg/L. No other organic compounds were detected at this well. On the other hand, volatile organics were more frequently detected and were detected in higher concentrations in shallow overburden groundwater immediately downgradient of the bulky waste area (MW-03-01 and MW-12-01).

Organic compounds were not detected in MW-02-02, which is located in the sewage sludge area, although some volatile organics were detected in the shallow overburden well at this location (MW-02-01).

The metals detected in deep overburden groundwater were the same as those found in shallow overburden groundwater. Likewise, concentrations were relatively similar. As would be expected, major-metal ions, barium, and manganese were the predominant metals present. Other metals found include beryllium, antimony, arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc. The metals in more soluble forms were typically associated with basic cations and, to a lesser extent, aluminum, iron, manganese, and barium. Some general patterns of distribution were evident. Elevated concentrations and more heavy metals were found in wells directly in the solid waste area (MW-14-01, OW-25, and OW-27) and also in MW-07-01. In particular, mercury and cadmium were detected only in OW-27. Although concentrations tended to vary over the study period, seasonal trends were not apparent.

4.2.5.4 Bedrock. Organic compounds and metals detected in bedrock wells are summarized in Figures 4-13, 4-14, and 4-15. All of the bedrock monitoring wells sampled during the RI field investigation were installed by M&E in July 1991 but were not sampled then. One of the wells (MW-03-03) is directly downgradient of the bulky waste area, and the other four wells are effected by groundwater flow from the solid waste area (MW-04-02, MW-07-02, MW-08-02, and MW-11-03). Each of the wells was sampled during September/October 1991, January/February 1992, and April 1992.

September/October 1991. All five bedrock wells were sampled during this round. A summary of the analytes detected in bedrock groundwater samples is presented on Table 4-12.

Organic compounds were detected frequently in MW-04-03 and MW-07-02 during this sampling round. Toluene and xylenes were found in both wells from 1 to 10 μg/L, while ethylbenzene was detected at 1 μg/L in MW-04-03. The highest total aromatic concentrations occurred at MW-04-03. In addition, PCE, TCE, 1,1-DCA, 1,2-DCE, and chloroethane were found at concentrations ranging from 1 to 10 μg/L in this well. Chlorinated volatiles were also detected in MW-07-02 from 1 to 3 μg/L for 1,1,1-TCA and 1,1-DCE, and at 79 and 24 μg/L for 1,2-DCE and 1,1-DCA, respectively. Carbon disulfide (3 μg/L) was also detected in this well. Total chlorinated volatile concentrations were highest at MW-07-02.

Ketones were detected in MW-04-03 and in MW-03-03, which is directly downgradient of the bulky waste area. In MW-04-03, acetone and MEK (120 and 130 μg/L, respectively) were more elevated than 4-methyl-2-pentanone (3 μg/L). In MW-03-03, acetone was detected at 16 μg/L. Toluene (1 μg/L) was the only other organic compound detected in this well.

The water-soluble organic *N,N*-DMF was also detected in MW-04-03 and MW-07-02 at 537 and 1,390 μg/L, respectively. Elevated concentrations of volatile organics and *N,N*-DMF were also found in overburden groundwater at these locations.

Semivolatile organics detected consist of phenol, 4-methylphenol, and bis(2-ethylhexyl) phthalate (5.1, and 36 μg/L, respectively) in MW-04-03 and diethylphthalate at 0.7 μg/L in MW-11-03. The four pesticides detected during this sampling round include *gamma*-BHC in MW-04-03 (0.0057 μg/L) and MW-07-02 (0.011 μg/L). Aldrin was also found at 0.003 μg/L in MW-07-02, and dieldrin was found at 0.0035 μg/L in MW-04-03. One PCB, aroclor-1260, was detected at 0.13 μg/L in MW-08-02. This aroclor was also detected in the overburden well at this location during this sampling round.

In comparison to both shallow overburden and deep overburden groundwater, the concentrations and number of metals detected were substantially lower in bedrock groundwater. Unfiltered concentrations ranged from 1,410 to 1,570 μg/L for aluminum, from 1,270 to 5,080 μg/L for iron, from 1,140 to 102,000 μg/L for basic cations, from 9.1 to 133 μg/L for barium, and from 43.3 to 1,350 μg/L for manganese. Heavy metals detected in unfiltered samples include chromium at MW-03-03 and MW-07-02 (8.1 and 103 μg/L, respectively), vanadium at 9.8 μg/L in MW-07-02, and zinc at 88.5 μg/L in MW-03-03. These metals were not found in the background bedrock well during any sampling rounds.

In filtered samples, basic cations ranged from 404 to 104,000 μg/L, barium from 5 to 108 μg/L, and manganese from 2 to 603 μg/L. Chromium and vanadium were detected in MW-07-02 at 94.3 and 3 μg/L, respectively. Nickel was found at MW-04-03 at 5 μg/L.

Sulfide, BOD, and cyanide were not found during this sampling round. Total organic carbon was measured only in MW-04-03 at 7.8 mg/L. Conductivities and pH values ranged from 140 to 1,200 μmhos/cm and 7.5 to 12.5, respectively. Hardness was calculated at 26 to 226 mg/L $CaCO_3$.

January/February 1992. Four of the five bedrock wells were sampled during January/February 1992: MW-03-03, MW-04-03, MW-07-02, and MW-11-03. The analytes detected in bedrock groundwater samples during this round are summarized on Table 4-13. Figures 4-13 through 4-15 present the organic compounds and metals detected in these wells.

Similar to the previous round, volatile organics were primarily detected in MW-04-03 and MW-07-02. Likewise, the types of chemicals detected were nearly the same between these two sampling rounds. Benzene, toluene, and xylenes were detected from 1 to 8 μg/L. In MW-07-02, TCE and 1,1,1-TCA were both found at 3 μg/L, while 1,2-DCE, 1,1-DCA, and vinyl chloride concentrations (97 and 24 μg/L, respectively) were more elevated. Chloroethane, 1,2-DCE, and 1,1-DCA were found from 5 to 7 μg/L in MW-04-03. Also detected in MW-04-03 was MEK at 150 μg/L.

In comparison to September/October 1991, total chlorinated and aromatic volatile concentrations in these two wells were similar to concentrations found in this sampling round. *N,N*-Dimethyl formamide was again detected in MW-04-03 (469 μg/L) and MW-07-02 (1,440 μg/L), and concentrations were greater during this sampling round. Fewer semivolatile organics and pesticides were, however, identified during this round. The three semivolatile organics detected were 2-methylphenol and diethylphthalate in MW-04-03 and MW-07-02 (up to 2 μg/L) and di-n-butylphthalate (up to 3 μg/L) in MW-07-02 and MW-03-03. Pesticides found consist of endosulfan II and dieldrin at MW-04-03 (0.0026 and 0.0034 μg/L, respectively) and *gamma*-BHC in MW-07-02 (0.024 μg/L). PCBs were not detected in any of the wells. With the exception of one phthalate in MW-03-03, the organic compounds detected were only found in MW-04-03 and MW-07-02.

Major-metal ions, barium, and manganese were the predominant metals detected in both unfiltered and filtered samples. Aluminum concentrations from 28.5 to 906 μg/L, iron from 858 to 37,100 μg/L, basic cations from 1,650 to 82,500 μg/L, barium from 7 to 87.7 μg/L, and manganese from 22.8 to 651 μg/L were detected in unfiltered samples. In addition, chromium and vanadium were detected in MW-07-02 (13 and 8.6 μg/L, respectively), nickel at 8 μg/L in MW-04-03, and zinc at 13.2 μg/L in MW-11-03.

In filtered samples, concentrations of 75 μg/L, 114 to 310 μg/L, 4,050 to 79,500 μg/L, 34 to 69 μg/L, and 55.2 to 547 μg/L were found for aluminum, iron, basic cations, barium, and manganese, respectively. Chromium at 16.6 μg/L and vanadium at 2.8 μg/L were detected in the filtered sample at MW-07-02. Mercury was also detected at 0.23 and 0.29 μg/L in MW-07-02 and MW-04-03, respectively.

Sulfide and cyanide were not found in any of the wells sampled during this round. Total organic carbon, ranging from 6.3 to 34 mg/L, was measured in three wells, and BOD was measured in MW-04-03 (17 mg/L). pH values ranged from 6.2 to 11.2, while conductivity values ranged from 130 to 1,500 μmhos/cm. Hardness of 31 to 218 mg/L $CaCO_3$ were calculated.

April 1992. Two bedrock wells, MW-07-02 and MW-08-02, were sampled during April 1992. A summary of the analytes detected in these wells during April 1992 is presented in Table 4-14. The organic compounds and metals are summarized in Figures 4-13, 4-14, and 4-15.

The only organic compounds detected during this sampling round occurred at MW-07-02 and include volatile organics and *N,N*-DMF. Concentrations of benzene and xylenes were 5 and 2 μg/L, respectively. Trichloroethene, 1,1,1-TCA, and 1,1-DCA were detected at concentrations up to 2 μg/L, whereas 1,2-DCE, 1,1-DCA, and vinyl chloride were more elevated at 78, 22, and 12 μg/L, respectively. Carbon disulfide (2 μg/L) and MEK (11 μg/L) were also identified in this well. An elevated concentration of *N,N*-DMF (1,270 μg/L) was also found. The types and concentrations of volatile organics as well as *N,N*-DMF were similar to those found in this well during January/February 1992.

In unfiltered samples, concentrations ranged from 278 to 445 μg/L for aluminum, 9,430 μg/L for iron, 25,500 to 40,500 μg/L for basic cations, 25.8 to 118 μg/L for barium, and 1,700 to 3,380 μg/L for manganese. In filtered samples, concentrations up to 5,770 μg/L for iron, up to 69,400 μg/L for basic cations, up to 95.3 μg/L for barium, and up to 2,800 μg/L for manganese were measured. Aluminum was not detected at any wells. In addition, zinc was detected in the unfiltered sample at MW-07-02 (13.3 μg/L). In comparison to the background bedrock well, concentrations in unfiltered samples were as much as three times higher for basic cations, nine times higher for barium, and 10 times higher for manganese. Zinc was not detected in the background bedrock well.

Ammonia (up to 0.880 mg/L) was detected in both bedrock wells. Total organic carbon and BOD ranged from 24 to 150 mg/L and 2.6 to 3.7 mg/L, respectively. Values of 7.1 and 11.7 and 200 to 1,050 μmhos/cm were found for pH and conductivity, respectively. During all sampling rounds, pH values were greater than 11, (which are considered very alkaline for natural waters), at MW-07-02.

Distribution and Significance. Organic compounds were found in bedrock groundwater, although concentrations and the compounds detected varied considerably between locations. As seen in overburden groundwater, volatile organics (aromatic and chlorinated volatiles, ketones, and carbon disulfide) were the primary compounds detected, although concentrations were generally lower in bedrock groundwater. Fewer and lower concentrations of less volatile organics were also found in comparison to deep overburden groundwater. On the other hand, the highest concentrations of *N,N*-DMF occurred in this flow zone. *N,N*-Dimethylformamide was detected in two bedrock wells at concentrations ranging from 469 to 1,440 μg/L.

The dominant chlorinated volatiles detected were dichlorinated compounds (1,1-DCA and 1,2-DCE), vinyl chloride, and chloroethane. The highest concentrations of 1,1-DCA and 1,2-DCE ranged from 78 to 97 μg/L and 22 to 24 μg/L, respectively. For vinyl chloride, concentrations were detected up to 24 μg/L and for chloroethane up to 8 μg/L were detected. Concentrations of 3 μg/L or less were found for the more chlorinated volatiles (PCE, TCE, and 1,1,1-TCA). The aromatic volatiles detected were primarily BTEX compounds at concentrations less than 10 μg/L. Semivolatile organics included three phthalates and two phenols with concentrations generally below 7 μg/L. Pesticides (*gamma*-BHC, endosulfan II, aldrin, and dieldrin) were detected during two rounds at concentrations up to 0.011 μg/L. PCB aroclor-1260 was found at MW-08-02 (0.13 μg/L).

In MW-07-02, which is west of Rose Hill Road and the solid waste area, *N,N*-DMF was found during each round this well was sampled at relatively high concentrations of 1,200 to 1,400 μg/L. This compound was, however, not detected in the deep overburden well at this location. Aromatic and chlorinated volatiles were also consistently found at relatively high concentrations of 110 to 150 and 3 to 7 μg/L, respectively. Concentrations of chlorinated volatiles were similar to those in the deep overburden well at this location, while aromatic volatile concentrations were less. A few pesticides and semivolatile organics were also detected.

In MW-04-03, which is east of the solid waste area, *N,N*-DMF, chlorinated and aromatic volatiles, and ketones were found. *N,N*-DMF was also detected at lower concentrations in the shallow overburden well at this location, whereas volatile concentrations were somewhat higher. Pesticides and semivolatile organics were also found in this well.

Further southeast of the solid waste area, no volatile organics were detected at MW-11-03, and one semivolatile organic was found at a low concentration. More organic compounds, including aromatic and chlorinated volatiles, were found in the overburden wells at this location.

To the west of Rose Hill Road and the southwest corner of the solid waste area, PCB aroclor-1260 was found. This aroclor was also present in the deep overburden well at this location.

Southeast of the bulky waste area, a few aromatic volatiles and ketones were found.

There was a substantial decrease in the number of metals in bedrock groundwater compared to overburden groundwater. Major-metal ions, barium, and manganese were found throughout the study period. Basic cation, aluminum, barium, and manganese concentrations were found to be significantly higher in the downgradient bedrock wells than in the background bedrock well (Appendix D). In comparison to the overburden flow zones, however, concentrations of these metals and iron were significantly lower in the bedrock flow zone (Appendix D). In addition, chromium, nickel, vanadium, and zinc were detected in bedrock groundwater. These metals were, however, not detected in the background bedrock well. No seasonal trends were evident based on the available data.

4.2.5.5 Residential Groundwater. Eleven residential wells were sampled during the study period. Four of the wells are east of the Saugatucket River (Resident #7 through #10), two are north of the solid waste area (Resident #1 and #2), two between the sewage sludge and solid waste areas (Resident #3 and #4), and two are south of the disposal areas (Resident #5 and #6). In addition, Residents #5 and #11 are west of Rose Hill Road. The locations of these wells are

shown in Figure 2-24. Three of the residential wells (#4, #5, and #6) are screened in overburden. The other wells are in bedrock.

June 1991. Samples were collected from residential wells #1 through #9 during this round. The analytes detected are summarized in Table 4-15 and Figures 4-16 and 4-17.

Semivolatile organics, pesticides, and PCBs were not found in any of the wells. Volatile organics were detected in two wells, Resident #3 and #9. In Resident #3, two aromatic volatiles (ethylbenzene and *o*-xylene) and two chlorinated volatiles (1,1-DCA and chloroethane) were detected at concentrations ranging from 0.8 to 3.1 μg/L, and carbon disulfide was detected at 12 μg/L. This well is in bedrock and is located between the solid waste area and Mitchell Brook. These same compounds were found in subsurface media (i.e., overburden groundwater, surface soil, and landfill gas) directly in the solid waste area as well as in bedrock wells directly downgradient of this disposal area. While primary flow from the northern portions of the solid waste area is currently southeast of this well, secondary flow through fractures in this area is likely (section 3). In addition, past pumping of this well may have enhanced groundwater flow from the solid waste area towards this direction.

The detection of 2 μg/L of TCE in Resident #9 does not appear to be attributed to the disposal areas. Besides being over 700 feet east of the Saugatucket River, flow direction from the disposal areas to this residence is not evident (section 3). Volatile organics were not detected in Resident #9 during the September 1993 sampling round.

Major-metal ions were detected in unfiltered samples at concentrations ranging from 294 to 470 μg/L for aluminum, from 180 to 81,000 μg/L for iron, and from 619 to 31,400 μg/L for basic cations. Barium (5.8 to 44.3 μg/L), copper (11 to 58.6 μg/L), and manganese (21.4 to 3,100 μg/L) were also detected in several wells. These metals as well as antimony (8.6 to 14.1 μg/L), nickel (6.9 to 8 μg/L), and zinc (57.3 μg/L) were also detected in filtered samples. Concentrations of 175 μg/L for aluminum, 774 to 30,000 μg/L for iron, 491 to 32,500 μg/L for basic cations, 18.6 to 41.2 μg/L for barium, and 11.6 to 3,100 μg/L for manganese were

detected in filtered samples. The presence of antimony was questioned, due to the high contract required quantitation limit (CRQL). In addition, on July 17, 1992, the Maximum Contaminant Level (MCL) for antimony was lowered to 6 μg/L. To verify the presence of antimony, all residential wells used for drinking water purposes (Residential wells #5, #6, #7, #8, #9, #10, and #11) were sampled in September 1993. A Special Analytical Services (SAS) method for low concentration of antimony was written with a CRQL of 5 μg/L.

Cyanide was not found, but sulfide was detected in all wells at concentrations ranging from 0.45 to 3.70 mg/L. Total organic carbon was detected at Resident #3 at 5.6 mg/L. BOD was not found in any wells. Hardness, pH, and conductivity ranged from 17 to 63 mg/L $CaCO_3$, 5.9 to 7.8, and 95 to 520 μmhos/cm, respectively. The highest conductivities were reported at Resident #3 and #4.

September/October 1991. Residential wells #1 through #9 were again sampled during this round. The analytes detected are summarized in Table 4-16 and Figures 4-16 and 4-17. Pesticides and PCBs were not detected in any of the samples.

Two aromatic volatiles, toluene (4.1 μg/L) and ethylbenzene (0.1 μg/L), were detected at Resident #7, a bedrock well east of the Saugatucket River. There is some indication that these chemicals may be from the disposal areas, since this well is downgradient of the disposal areas and MW-03-03, a bedrock well where toluene was also detected during the same sampling round. Residential activities may also be a potential source, since these compounds are found in many readily available solvents and cleaning agents.

Other volatile organics were detected in residential wells near the solid waste area. Trichloroethene was found at 1.5 μg/L in Resident #2, which is within 100 feet of the northern boundaries of the solid waste area. Mounding of infiltrating water in the solid waste area may facilitate the flow of overburden groundwater from this area toward the north, where it is carried vertically downward into this shallow bedrock well. Bedrock fractures in this area may also provide a flowpath from the solid waste area.

Most of the chlorinated and aromatic volatiles detected during this sampling round were found in Resident #3 and #4. Benzene (0.8 μg/L), toluene (0.6 μg/L), and 1,2-DCA (1.9 μg/L) were detected in Resident #3, while TCE and *trans*-1,2-DCE were found in Resident #4 at 0.6 and 0.3 μg/L, respectively. In addition, 4-methylphenol (63 μg/L) was found in Resident #3. Both of these wells are east of the northern portion of the landfill, and groundwater flow to this area is likely because of mounding effects and flow direction. The detection of *N,N*-DMF, which is characteristic of industrial waste disposed of in the solid waste area, at 14 μg/L corresponds with the detection of other organics at Resident #3. *N,N*-DMF (1.9 μg/L) was also detected at Resident #8, however, during the September 1993 sampling round, water soluble organics were not detected.

Aluminum, iron, and basic cations were found at concentrations of 552 μg/L, 160 to 41,700 μg/L, and 708 to 23,400 μg/L, in unfiltered samples, respectively. In filtered samples, concentrations ranged from 117 to 1,050 μg/L, and 757 to 23,000 μg/L for iron and basic cations, respectively. Aluminum was not reported in filtered samples. Barium (15.2 to 20.7 μg/L), copper (51.8 to 58.4 μg/L), and manganese (2.6 to 3,100 μg/L) were also found in several unfiltered samples. In addition, antimony (28.4 to 32.4 μg/L) and arsenic (1 μg/L) were detected in a few filtered samples. However, the detection of antimony may have been attributed to an elevated sample quantitation limit. For the September 1993 sampling round, a SAS was written to lower the sample quantitation limit. During that sampling round, antimony was not detected in any filtered or unfiltered samples.

Sulfide and cyanide were not detected during this sampling round. Total organic carbon was measured in seven residential wells, with the highest concentration found at Resident #3 (17.7 μg/L). Biochemical oxygen demand was measured at Resident #3 (22 mg/L), where several organic compounds were found. Hardness values calculated as 11 to 67 mg/L $CaCO_3$, pH values of 5.8 to 7.5, and conductivities of 55 to 180 μmhos/cm were found in these samples.

January/February 1992. The three residential wells sampled during this round include Resident #7, #8, and #10. The analytes detected are summarized in Table 4-17 and Figures 4-16 and 4-17.

One volatile organic and three pesticides were detected, while semivolatile and water-soluble organics and PCBs were not detected in any of the wells. Acetone (0.6 μg/L) was the only volatile organic detected in residential wells (Resident #8). The reason for the detection of this chemical is not evident with the available data. Although acetone was found throughout the disposal areas, transport of this chemical to this distance is not expected because of transformations and miscibility.

Three pesticides (dieldrin, endrin aldehyde, and endrin ketone) were detected in Resident #7 at 0.0024, 0.10, and 0.10 μg/L, respectively. While no other organic compounds were detected in this well during this sampling round, aromatic volatiles were found here previously. This, coupled with the relatively low mobility of pesticides, suggests that another source, although not known, may be impacting this well.

In unfiltered and filtered samples, major-metal ions accounted for the largest concentrations of metals detected. Concentrations in unfiltered samples were 36.6 μg/L for aluminum, 742 μg/L for iron, and 572 to 891,000 μg/L for basic cations. Concentrations ranged from 94.2 to 149 μg/L for iron, and from 724 to 24,900 μg/L for basic cations in filtered samples. Manganese and zinc were also detected in both forms. Mercury was reported in the unfiltered samples at Resident #10 (0.46 μg/L).

Sulfide, cyanide, and BOD were not detected during this sampling round. Total organic carbon was detected in the three samples ranging from 8.3 to 12 mg/L. The highest conductivity, pH, and hardness values (220 μmhos/cm, 8.3, and 45 mg/L $CaCO_3$) were measured at Resident #10.

September 1993. For this sampling round, tap water was collected from eight residential wells (Residents #5, #6, #7, #8, #9, #10, and #11). Six residential wells (Residents #5,#6, #7, #8,

#9, and #10) were sampled for TAL metals (filtered and unfiltered); two residential wells (Residents #7 and #9) for volatile organics (method 524.2); one residential well (Resident #8) for water soluble organics; and one residential well (Resident #11) for volatile organics (524.2), TCL semivolatile organics, TCL pesticides/PCBs, water soluble organics, cyanide, TAL metals (filtered and unfiltered), and antimony (filtered and unfiltered). The analytes detected are summarized in Table 4-17a and Figures 4-16 and 4-17. Water soluble organics, semi-volatile organics, pesticides, and PCBs were not detected in any of the samples.

One volatile organic, bromodichloromethane (1 μg/L) was detected at Resident #7 a bedrock well east of the Saugatucket River.

Lead (7.0 μg/L) and zinc (10.1 μg/L) were detected in the unfiltered sample at Resident #9. Manganese was found at concentrations ranging from 1,070 to 2,120 μg/L in unfiltered samples. At Resident #5, arsenic was detected in the filtered sample at 3.6 μg/L. Manganese was detected at concentrations ranging from 1,070 to 2,070 μg/L in filtered samples. Antimony was below detection limits for all filtered and unfiltered samples indicating that antimony that was detected in other sampling rounds may have been attributed to elevated sample quantitation limits.

Distribution and Significance. Of the 11 residential wells sampled, organic compounds were detected during at least one sampling round in six wells. No organic compounds were found in the two wells south of the disposal areas (Resident #5 and #6), in one well north of the solid waste area (Resident #1), in one well east of the Saugatucket River (Resident #10) or one well west of Rose Hill Road (Resident #11).

The organic compounds detected include aromatic (BTEX compounds) and chlorinated (TCE, 1,1-DCA, 1,2-DCE, and chloroethane) organics, acetone, carbon disulfide, 4-methylphenol, and three pesticides (dieldrin, endrin aldehyde, and endrin ketone). Except for the pesticide endrin aldehyde, all of these compounds were found in monitoring wells in the site study area.

With the exception of Resident #3, none of the organic compounds were consistently detected at any residence. In Resident #3, which is a bedrock well, chlorinated and aromatic volatiles (total concentrations up to 4.1 μg/L and 2.2 μg/L) were detected the two times this well was sampled. This well is within 500 feet of the northeastern part of the solid waste area. Although this well is not directly downgradient of the solid waste area, bedrock fractures may facilitate some groundwater flow in this direction. Since this well and Resident #4, an overburden well where 1,2-DCE was detected once, were used by the residents in the past, groundwater may have been drawn in this direction during pumping, and some residual organic compounds may remain in the vicinity of these wells.

A similar situation exists at Resident #2 and may be enhanced by mounding effects in the northern section of the solid waste area. Trichloroethene (1.5 μg/L) was found in this well. The other residential wells in which organic compounds were detected were located east of the Saugatucket River. Different organic compounds were detected in each of these wells. With the exception of Resident #9, the southeast flow of groundwater from the disposal areas is in the direction of Resident #7 and #8, where acetone and two BTEX compounds (total concentration of 4.2 μg/L) were detected, respectively. For this reason it is possible that the organic compounds found in these wells were transported from the disposal areas. However, in Resident #7, the detection of pesticides, which have relatively low mobility in groundwater, as well as the detection of endrin aldehyde, which was not found in monitoring wells, indicates that there may also be another unknown source.

The one-time detection of TCE in Resident #9 may also be related to a source other than the disposal areas, since this well is not in the dominant groundwater flowpath from the disposal areas. In addition, this compound was also detected at a similar concentration in the background well (MW-01), which is north of and upgradient of the disposal areas. Volatile organics were not detected in Resident #9 during the September 1993 sampling round.

Metals detected in residential wells include major-metal ions, barium, manganese, and six heavy metals (antimony, arsenic, copper, mercury, nickel, and zinc). The heavy metals were detected

in both bedrock and overburden residential wells. Besides major-metal ions, copper, nickel, and zinc were also detected in the shallow overburden background well, but not the background bedrock well. Given the nature of soils, these differences are possible.

4.2.5.6 Summary of Groundwater Findings. Numerous organic compounds were detected in the different groundwater flow zones. The types of compounds ranged from volatile organics to compounds that were less volatile and soluble (semivolatiles, pesticides, PCBs) to compounds that were more soluble (water-soluble organics). Of these compounds, volatile organics, primarily chlorinated and aromatic volatiles, were frequently and consistently detected in groundwater throughout the study period.

The aerial and vertical extent of volatile organics in groundwater is shown in Figures 4-18 and 4-19. More elevated concentrations generally occurred in the vicinity of the solid waste area. Less elevated concentrations occurred in the vicinity of the bulky waste area, and even lower concentrations occurred in the vicinity of the sewage sludge area. The predominant groundwater flow direction through the site study area is toward the south and southeast. Immediately downgradient of the solid waste area, volatile organics were present in elevated concentrations. Further downgradient, and east of Mitchell Brook, concentrations tended to decrease. Volatile organics were still present, though at lower concentrations, south of the transfer station road. However, further south towards Saugatucket Road, volatile organics were not found in that residential well (Resident #6).

Volatile organics also occurred to the north of the solid waste area as well as to the northeast in two residential wells. These compounds were also found to the west of Rose Hill Road near the northern portion of the solid waste area, but not to the northwest in Resident #11. West of Rose Hill Road, near the southern portion of the solid waste area, volatile organics were not found. And further south of this area, volatile organics were not detected in a residential well (Resident #6). To the north, volatile organics were found as far north as the north side of Mitchell Brook, but were not detected in the most northern residential well (Resident #1).

East of the bulky waste area, concentrations decreased even more, and south of the bulky waste area, one compound was found at a low concentration during only one sampling round.

In comparison to concentrations measured in wells located in the solid waste area, volatile organic concentrations found in the sewage sludge area were relatively low. East of the sewage sludge area, volatiles were found at slightly higher concentrations, but this was not consistent.

East of the Saugatucket River, volatile organics were not detected in the lower overburden groundwater, but were found infrequently in residential wells at relatively low concentrations. The source of the volatiles in the residential wells, however, is not entirely clear.

Throughout the site study area, the chlorinated volatiles detected most often and in the highest concentrations were 1,1-DCA, 1,2-DCE, vinyl chloride, and chloroethane. In comparison, the lower concentrations of the more chlorinated volatiles (i.e., TCE, PCE, 1,1,1-TCA) suggests that degradation processes are active. While this is very likely because of degradation of landfill wastes, it is also possible that these compounds were disposed of in industrial and municipal wastes, given the elevated concentrations detected. These compounds are components of consumable products but are used in larger quantities as solvents in industrial applications. Aromatic volatiles, primarily BTEX compounds, were also found in most of the wells.

Although prevalent, volatile concentrations appear to have decreased to some extent since landfill operations ceased. During previous studies, the highest concentrations were measured between 1981 and 1982 (Table 1-2), and by 1984 concentrations had decreased by as much as several orders of magnitude. Concentrations detected during this investigation varied depending on location in the site study area. During this study, the highest concentrations detected for the organic compounds listed in Table 1-2 were generally well below the concentrations detected up to 1982, but in many wells, concentrations were higher than found in 1984.

Although variations in volatile organic concentrations occurred over the study period, specific trends were not evident with the available data. This is not unexpected, since the source of these

compounds is wastes in the disposal areas. Given the nature of landfills, with their heterogeneous deposits of wastes and decomposition and biological transformations, the types of and concentrations of compounds released to groundwater are expected to vary to some degree. Since landfill operations stopped in 1983, the decreases that have occurred are likely related to the slower release of contaminants from source materials (landfill contents).

The detection of *N,N*-DMF in wells west of Rose Hill Road and north of Mitchell Brook confirms that movement of groundwater in these directions is occurring (as discussed in sections 3.3 and 5.3). This compound and acrylamide were also found in several wells directly in and immediately downgradient of the solid waste area, where disposal of industrial wastes, primarily solvents and adhesive glue wastes, have been documented. An explanation for presence of *N,N*-DMF in Resident #8 during one sampling round is not apparent. However, the concentration detected was well below the method detection limit.

The predominant metals detected in groundwater, regardless of flow zone or location, were aluminum, iron, basic cations (calcium, magnesium, sodium, and potassium), barium, and manganese. For the most part, the more soluble forms of these metals were found in higher concentrations than insoluble forms. The types of metals and concentrations detected were similar between the shallow and deep overburden groundwater. Heavy metals found at least once in these flow zones include antimony, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, mercury, vanadium, and zinc. Beryllium was also detected. The number of metals and concentrations were significantly lower in bedrock groundwater. In this flow zone, major-metal ions along with barium and manganese were typically the only metals detected. A few heavy metals (zinc, nickel, copper) were occasionally found.

In shallow overburden groundwater in and immediately downgradient of the sewage sludge area, metals that exceeded concentrations compared to background wells were generally basic cations, iron, barium, and manganese. Occasionally other heavy metals (arsenic, lead, nickel, vanadium, and zinc) were found in higher concentrations than background. Elevated metal concentrations were also found downgradient of the solid waste area, west of Mitchell Brook. However, none

of these exceedances were found to be statistically significant based on the available data. In deep overburden groundwater, elevated concentrations and a larger number of heavy metals were exhibited by groundwater directly in and west of the solid waste area.

In bedrock groundwater, significantly elevated concentrations of basic cations, aluminum, barium, and manganese were found in relation to background groundwater. In addition, a few heavy metals (chromium, nickel, vanadium, and zinc) that were not detected in background groundwater were found. In several residential wells (overburden and bedrock) particularly to the north and northeast of the solid waste area, and east of the Saugatucket River, manganese was the metal that most often exceeded background concentrations.

4.2.6 Surface Water

Eighteen surface water locations were sampled during the study period. This includes surface water from Mitchell Brook, the Saugatucket River, the unnamed brook, and an unnamed tributary to Mitchell Brook. The unnamed brook was sampled west of Rose Hill Road at SW-10. Located north of the disposal areas, SW-01 was sampled in an unnamed tributary that feeds into Mitchell Brook. Along Mitchell Brook, seven locations were sampled: SW-07, SW-09, SW-12, SW-13, SW-14, SW-15, and SW-16. In the Saugatucket River nine locations were sampled: SW-02, SW-03, SW-04, SW-05, SW-06, SW-08, SW-11, SW-17, and SW-18. Surface water sampling locations are shown in Figure 2-27. Surface water samples were analyzed for the following parameters:

- Volatile organics
- Semivolatile organics
- Water-soluble organics (only September/October 1991, January/February 1992 and April 1992)
- Pesticides and PCBs
- Metals (unfiltered and filtered)

- Cyanide
- Sulfide (only June 1991, September/October 1991, and January/February 1992)
- Ammonia (only April 1992 and May 1992)
- Total organic carbon (TOC)
- Biochemical oxygen demand (BOD)

Other water quality parameters measured during field activities include dissolved oxygen, conductivity, and pH.

The analytes detected in surface water are presented in Tables 4-18 through 4-22. A summary of the organic compounds and metals detected in surface water samples is presented in Figures 4-20 and 4-21. The analytes detected in each of the different areas (Table 4-4) are discussed in the following sections.

4.2.6.1 Unnamed Brook. One location in the unnamed brook was sampled in June and September/October 1991 and January/February 1992 (Figure 2-27). The unnamed brook was not sampled during the other two rounds, April and May 1992. The sampling location (SW-10) is west of Rose Hill Road and southwest of the solid waste area. An active sand and gravel operation is located directly upstream of this location.

Analytes detected during the study period are summarized in Tables 4-18 through 4-22. The distribution of organic compounds and metals detected during this round is presented in Figures 4-20 and 4-21.

The only organic compounds detected at this location during the study period were one volatile organic, carbon disulfide, at 6 μg/L in January/February 1992 and one pesticide, *gamma*-BHC, at 0.002 μg/L in September/October 1991. Both of these concentrations were less than sample

quantitation limits. Semivolatile organics, water-soluble organics, and PCBs were not detected.

During the study period, major-metal ions as well as barium and manganese were generally the only metals detected. While concentrations of these metals varied slightly, a large fraction of the concentrations was associated with the more soluble forms of these metals. Aluminum was not detected in filtered samples, and was reported once at 160 μg/L in unfiltered samples. In unfiltered samples, iron concentrations ranged from 5,140 to 6,160 μg/L, basic cation concentrations ranged from 2,060 to 11,100 μg/L, barium concentrations ranged from 24.9 to 31.6 μg/L, and manganese concentrations ranged from 905 to 1,690 mg/L. Concentrations in filtered samples ranged from 3,325 to 3,660 μg/L for iron, from 2,800 to 12,100 μg/L for basic cations, from 22.7 to 30.2 μg/L for barium, and from 789 to 1,740 μg/L for manganese. In addition, zinc was found in January/February 1992 at 17.2 μg/L in the unfiltered sample and at 14.9 μg/L in the filtered sample.

Cyanide was not detected, while sulfide was measured at 1.9 mg/L in June 1991. Total organic carbon and BOD were not detected. Conductivities ranged from 26 to 146 μmhos/cm, pH values ranged from 5.9 to 7.2, and DO ranged from not detected to 8.4 mg/L during the study period.

Distribution and Significance. As discussed earlier, different pesticides (such as *gamma*-BHC) that are not necessarily related to the disposal areas were detected at low concentrations. This brook is not expected to be affected by the disposal areas, since it is upgradient and was found to be consistently losing water to groundwater during the study period. However, there is a strong likelihood that alterations of metal concentrations are occurring because of this disturbance from the nearby sand and gravel operations, which are still active. Weathering of newly exposed soil and bedrock would result in increased releases of metals (including iron and aluminum) that would enter the brook. This is important, since the brook runs through the sand and gravel operations upstream of the sampling location.

4.2.6.2. Mitchell Brook. Along Mitchell Brook, seven locations were sampled from June 1991 to May 1992. Six of the locations were sampled in June and September/October 1991 and include SW-07, SW-09, SW-12, SW-13, SW-14, and SW-15. In addition, SW-01, which is located on the unnamed tributary that feeds into Mitchell Brook upstream of the disposal areas, was sampled during these rounds. In May 1992, only SW-07, SW-09, SW-12, and a new location established as SW-16 were sampled. The location on the unnamed tributary (SW-01) was not sampled in May 1992.

The location on the unnamed tributary, SW-01, was used as a background location. Since this location is upstream of, and not known to be affected by the disposal areas, it is considered a comparable location for water quality upgradient of the disposal areas. On Mitchell Brook, SW-13, located in the brook just west of Rose Hill Road, was the most upstream location sampled. Surface water location SW-14 was sampled immediately downstream of a dammed area, to the north of the solid waste area. Established downstream of the confluence of the unnamed tributary, SW-15 is east of the northern portion of the solid waste area. Further downstream, SW-09 is located between the solid waste area and bulky waste areas. In May 1992, SW-16 was located near the southern end of the solid waste area, upstream of the transfer station road. Below the transfer station road, SW-07, and further downstream, SW-12, were sampled.

June 1991. Six locations were sampled during this round (from upstream to downstream): SW-13, SW-14, SW-15, SW-09, SW-07, and SW-12. The background location on the unnamed tributary (SW-01) was also sampled. A summary of the analytes detected during June 1991 is presented in Table 4-18 and in Figures 4-20 and 4-21.

Five volatile organics and one semivolatile organic were each detected at concentrations below sample quantitation limits at one location in Mitchell Brook during this sampling round. Pesticides and PCBs were not detected at any location. The types of volatiles detected include aromatic volatiles, benzene, and chlorobenzene up to 3 μg/L, in SW-12, and xylene at 8 μg/L in SW-07. Both of these locations were south of the disposal areas and transfer station road.

Two chlorinated volatiles, chloroethane (6 μg/L) at SW-12 and 1,2-DCE (4 μg/L) at SW-14, were detected. Carbon disulfide (1 μg/L) and bis(2-ethylhexyl)phthalate (8 μg/L) were both found at SW-09.

Five of the major-metal ions (calcium, iron, magnesium, potassium, and sodium) and manganese were detected in both unfiltered and filtered samples at all locations. Aluminum was detected at all locations except SW-09 in unfiltered samples but was not found in any filtered samples (for reasons discussed in section 2.6.2). The highest concentrations tended to be found in the two furthest downstream locations (SW-12 and SW-07), where concentrations were over two times greater than they were in SW-01. Along Mitchell Brook, unfiltered concentrations ranged from 177 to 968 μg/L for aluminum, 547 to 65,000 μg/L for iron, and 650 to 35,300 μg/L for basic cations. In SW-01, concentrations were 272 μg/L for aluminum, 3,250 μg/L for iron, and 1,050 to 2,980 μg/L for basic cations. Filtered concentrations in Mitchell Brook were from 194 to 4,890 μg/L for iron and from 684 to 31,700 μg/L for basic cations. In SW-01, concentrations of 787 for iron and 1,020 to 9,010 μg/L for basic cations were measured in filtered samples. The soluble form of these metals appeared to be somewhat limited, since filtered concentrations generally accounted for less than half of unfiltered concentrations.

Other metals detected were barium in both unfiltered (SW-07, SW-12, and SW-15) and filtered samples (SW-07 and SW-12) at 10.6 to 173 μg/L and 24.1 to 92.9 μg/L, respectively. Again the highest concentrations were found in SW-12. In addition, zinc was detected at SW-12 and SW-15 in the unfiltered samples at similar concentrations (22.8 and 20.5 μg/L, respectively), but was not found in any filtered samples. Lead (3.3 μg/L) and nickel (5 μg/L) were each detected in only the filtered sample at SW-09. Nickel was also found in the unfiltered sample (5 μg/L) at SW-01.

Cyanide, TOC, and BOD were not detected in the surface water locations during this sampling round, whereas sulfide was found at all of the locations and ranged from 0.32 to 1.90 mg/L. The pH ranged from 5.5 to 6.2 and conductivity ranged from 55 to 1,200 μmhos/cm. Hardness

was calculated from 10 to 88 mg/L $CaCO_3$. Dissolved oxygen ranged from 1.85 to 8.4 mg/L.

September/October 1991. All of the locations sampled in June 1991 (SW-14, SW-15, SW-09, SW-07, and SW-12) were sampled during this round. The analytes detected during September/October 1991 are presented in Table 4-19 and Figures 4-20 and 4-21.

Carbon disulfide (2 μg/L) at SW-12 was the only volatile organic detected in Mitchell Brook during this sampling round. Acrylamide (272 μg/L), a water soluble organic, was also detected at SW-12. Semivolatile organics, pesticides, and PCBs were not detected at any locations during this sampling round.

With the exception of the unfiltered sample at SW-01 (573 μg/L), aluminum was reported as undetected in the other unfiltered and filtered samples (section 2.6.2). In unfiltered samples, iron, basic cations, and manganese were found in concentrations ranging from 292 to 5,000 μg/L, 1,210 to 18,800 μg/L, and 10.2 to 708 μg/L, respectively. In filtered samples, concentrations ranged from 1,950 to 3,160 μg/L for iron, 1,220 to 20,200 μg/L for basic cations, and 9.4 to 690 μg/L for manganese. The highest concentrations during this sampling round were again found in SW-12 and SW-07, which are located south of the transfer station road. Zinc in the unfiltered sample at SW-09 (17.9 μg/L) was the only other metal detected during this round. Except for SW-12, the soluble metal forms were more dominant than insoluble forms. In comparison to June 1991, concentrations for most of the above metals tended to be lower during this sampling round.

Cyanide and sulfide were not detected in the surface water locations during this sampling round. While TOC was detected at all locations and ranged from 3.2 to 5.4 mg/L, BOD was detected only in SW-12 at 1.1 mg/L. During this sampling round, pH values ranged from 5.3 to 7.0 and conductivity ranged from 29 to 222 μmhos/cm. The lowest pH value occurred at SW-01. Values for hardness were calculated as 14 to 38.4 mg/L $CaCO_3$. Dissolved oxygen ranged from 8 to 9.5 mg/L.

January/February 1992. The only locations sampled during this round were SW-07, SW-09, and SW-12. Presented in Table 4-20 and Figures 4-20 and 4-21 is a summary of the analytes detected during January/February 1992.

As was the case in September/October 1991, carbon disulfide (up to 9 μg/L) at SW-12 and SW-07 (1 μg/L) was the only volatile organic detected this sampling round. One semivolatile organic, di-n-butylphthalate (3 μg/L), was also detected at SW-12. Water-soluble organics, pesticides, and PCBs were not detected during this sampling round.

Major-metal ions and manganese were detected in unfiltered and filtered samples at the three locations. As previously found, the highest concentrations for these metals generally occurred at SW-12. Unfiltered and filtered concentrations, respectively, ranged from 109 to 147 and 114 to 126 μg/L for aluminum, from 280 to 1,150 and 232 to 940 μg/L for iron, 472 to 9,332 and 603 to 11,500 μg/L for basic cations, and 53.4 to 173 and 52.7 to 166 μg/L for manganese. The soluble fraction for these metals was more prominent than the insoluble fraction based on the elevated filtered concentrations. In addition, barium was detected in the unfiltered sample at SW-12 (10.8 μg/L), and zinc was detected in the filtered sample at SW-09 (17.9 μg/L).

Cyanide, sulfide, and BOD were not detected in the surface water locations during this sampling round. A range of 3.3 to 5.7 mg/L was found for TOC. Hardness was calculated as 11 to 14 mg/L $CaCO_3$. Values ranging from 5.4 to 6.4 and 80 to 90 μmhos/cm were recorded for pH and conductivity, respectively. Dissolved oxygen was not measured at any of the locations during this round.

April 1992. The three locations sampled in January/February 1992 (SW-07, SW-09, and SW-12) were also sampled during this round. A summary of the analytes detected in Mitchell Brook during April 1992 are presented in Table 4-21 and Figures 4-20 and 4-21.

None of the organics analyzed for during this round (volatile organics, water-soluble organics, semivolatile organics, pesticides, and PCBs) were detected.

For the most part, metal concentrations for major-metal ions and manganese tended to be higher than found during the January/February 1992 sampling round. For iron, concentrations ranged from 1,300 to 1,310 μg/L in unfiltered samples and from 1,050 to 1,170 μg/L in filtered samples; for basic cations, concentrations ranged from 590 to 10,400 μg/L (unfiltered) and from 654 to 12,500 μg/L (filtered); and for manganese, concentrations ranged from 51.1 to 212 μg/L in unfiltered samples and from 52.8 to 207 μg/L in filtered samples. As can be seen, the soluble form of these metals accounts for virtually all of the concentration measured at these locations. For barium, concentrations ranged from 12.6 to 15.7 μg/L in unfiltered samples, but was not detected in filtered samples. In addition, one metal not previously detected in Mitchell Brook (chromium at 3.2 μg/L) was found in the unfiltered sample at SW-12.

Cyanide was not detected, and ammonia, which was analyzed for, was found at SW-07 (0.22 mg/L) and SW-12 (0.46 mg/L). Also found at these locations was BOD at 1 mg/L (SW-07) and 1.7 mg/L (SW-12). Total organic carbon was detected at all three locations and ranged from 4.5 to 5.7 mg/L. The pH ranged from 5.8 to 6.3, and conductivity ranged from 74 to 125 μmhos/cm. The range for DO was 10.42 to 11.38 mg/L.

May 1992. During this round, surface water locations SW-07, SW-09, and SW-12 were again sampled. An additional location, SW-16, was also sampled for the first time. This location is situated north of SW-07 and the transfer station road, near the southeast corner of the solid waste area. A summary of the analytes detected during May 1992 is presented in Table 4-22 and Figures 4-20 and 4-21.

Volatile organics, semivolatile organics, pesticides, and PCBs were not detected during this sampling round.

Major-metal ions were detected in unfiltered samples at concentrations of 132 to 1,140 μg/L for aluminum, 403 to 6,760 μg/L for iron, and 1,100 to 12,500 μg/L for basic cations. In filtered samples, concentrations were generally lower ranging from 104 to 437 μg/L for aluminum, from 662 to 1,710 μg/L for iron, and from 1,060 to 13,000 μg/L for basic cations. In addition,

potassium was not detected in either unfiltered or filtered samples. Manganese was found from 58.65 to 443 μg/L in unfiltered samples, and from 54.2 to 417 μg/L in filtered samples. Barium also detected at 8.2 to 17.4 μg/L (unfiltered) and at 16.9 μg/L (filtered). Copper, lead, and zinc were also found in some unfiltered samples, while mercury and lead were detected in a few filtered samples. Maximum concentrations were found in SW-12, except for copper at SW-16.

Cyanide, TOC, and BOD were not found during this sampling round. Ammonia was detected at all four locations and ranged from 0.033 to 3.53 mg/L. The pH ranged from 5.7 to 6.3, and conductivity ranged from 68 to 141 μmhos/cm. Hardness was calculated as 12 to 25 mg/L $CaCO_3$. Dissolved oxygen ranged from 8.93 to 9.97 mg/L.

Distribution and Significance. No organic compounds were found in the background location (SW-01) on the unnamed tributary, yet a few organic compounds were detected infrequently and at low concentrations (usually less than 10 μg/L) in Mitchell Brook. Carbon disulfide was detected more frequently than other compounds at concentrations below 10 μg/L. All of the other compounds detected were found in only one location during one sampling round; and consist of chlorinated (1,2-DCE and chloroethane) and aromatic (BTEX compounds and chlorobenzene) organics, and three phthalates [bis(2-ethylhexyl)phthalate, diethylphthalate, and di-n-butylphthalate]. In addition, acrylamide was found at 272 μg/L in SW-12. All of these compounds have also been found in different media in the vicinity of the disposal areas.

Most of the organic compounds were detected at SW-12, which is the most downstream location on Mitchell Brook, prior to its confluence with the Saugatucket River. The presence of organic compounds coincides with higher BOD levels measured at this location. In particular, acrylamide, which was also found in groundwater immediately downgradient of the solid waste area and near Mitchell Brook (MW-04), was possibly disposed of with industrial waste, indicating that groundwater may be affecting water quality in this stream. Similarly, the compounds detected in SW-12 are similar to those found in MW-11, which is located near Mitchell Brook. Likewise, the xylene detected in SW-07 was similar to the types of aromatic volatiles (BTEX compounds) found at MW-11.

The predominant metals detected include major-metal ions, barium, and manganese. As shown in Figure 4-22, the highest concentrations of unfiltered metals were consistently found south of the transfer station road and downstream of the disposal areas, near SW-07, and increased near SW-12. This coincides with the extensive orange staining, precipitate, and floc covering of sediment in the brook south of the transfer station road. Insoluble forms of these metals were associated with these locations, whereas more soluble forms were dominant at upstream locations, north of the transfer station road. Conductivities also increased in a downstream direction. Concentrations of iron, manganese, basic cations, and conductivities were found to be significantly higher at these locations compared to the background location on the unnamed tributary (Appendix D). Metal concentrations and conductivity also increased, but were less pronounced, at SW-15. Other metals (zinc, antimony, copper, and lead) were occasionally found at lower concentrations in Mitchell Brook.

These trends, coupled with the organic compounds detected at SW-12, indicate that groundwater may be contributing to downgradient migration from the disposal areas to Mitchell Brook. Shallow and deep overburden groundwater exhibited elevated metal concentrations in the vicinity of the solid waste and bulky waste areas. These flow zones discharged to Mitchell Brook throughout the study period. Overland flow to Mitchell Brook may also be occurring. The metals detected and concentrations varied over the study period, but there were no recognizable seasonal trends.

4.2.6.3 Saugatucket River. Nine locations were sampled in the Saugatucket River over five sampling rounds from June 1991 to May 1992. Six locations were sampled in June 1991: SW-02, SW-03, SW-04, SW-05, SW-06, and SW-08. Surface water location SW-11 was added in September/October 1991, and locations SW-17 and SW-18 were added in May 1992.

The background location, SW-02, is upstream of the sewage sludge area and is not thought to be affected by the disposal areas. The next downstream location, SW-03, is east of the southern end of the sewage sludge area and the northern end of the bulky waste area. Two locations, SW-04 and SW-05, are directly east of the bulky waste area and downgradient of leachate seeps

(section 4.2.3) entering the Saugatucket River, with SW-05 near the largest of the leachate seeps. Further downstream are SW-16 and SW-17. Located downstream of the intersection of Mitchell Brook and the Saugatucket River is SW-06. Further downstream are SW-11 (about 50 feet upstream of the Saugatucket Road) and SW-08 (past a bend and over 200 feet downstream of Saugatucket Road).

June 1991. Locations sampled in June 1991 include SW-02 to SW-06 and SW-08. Analytes detected during June 1991 are summarized in Table 4-18. The distribution of organic compounds and metals detected during June 1991 is shown on Figures 4-20 and 4-21.

During this sampling round, xylene and carbon disulfide were the only volatile organics detected (at concentrations below sample quantitation limits). Xylene was detected in SW-05 at a concentration of 9 μg/L. Carbon disulfide was detected from 4 to 10 mg/L at the background location (SW-02) and three downgradient locations: SW-03, SW-04, and SW-08. Semivolatile organics, pesticides, and PCBs were not found in any locations.

Major-metal ions, barium, and manganese were generally detected in most unfiltered and filtered samples. Concentrations in unfiltered samples ranged from 234 to 34,600 μg/L for iron, 777 to 59,900 μg/L for basic cations, 5.3 to 279 μg/L for barium, and 22.2 to 2,030 μg/L for manganese. In filtered samples, concentrations of 361 to 1,520 μg/L for iron, 859 to 12,350 μg/L for basic cations, 6.6 μg/L for barium, and 17.6 to 550 μg/L for manganese were measured. Aluminum, which was an exception to this, was discussed in section 2.6.2. The highest unfiltered concentrations for these metals (greater than an order of magnitude) were found at SW-05, which is immediately downgradient of a large leachate seep that flows into the river at this location. Elevated concentrations were also evident at SW-04. With the exception of iron, differences in metal concentrations between the background location, SW-02, and other downstream locations was typically less than an order of magnitude. In addition, these metals were primarily associated with the more soluble forms, except for in SW-05, and SW-04 to a lesser extent, where a much smaller fraction of the metal concentrations was associated with the soluble form.

Variations in unfiltered iron concentrations from upstream to downstream locations are characteristic of the patterns exhibited by barium, manganese, and most of the other major-metal ions. Iron increased downstream from 250 and 234 mg/L at SW-02 and SW-03, respectively to 34,600 mg/L at SW-05; then decreased to 1,720 mg/L at SW-06 and 1,810 mg/L at SW-08. Several inches of orange floc and precipitate covering the bottom sediment coincide with elevated iron concentrations at SW-04 and SW-05 and became less apparent further downstream.

In addition to the metals discussed above, arsenic was detected at SW-05 at 4.1 μg/L in the unfiltered sample. In filtered samples, antimony and silver were detected at SW-08 at 1.8 and 10.7 μg/L, respectively. These metals are considered to be largely insoluble.

Sulfide was detected at each of the sampling locations at concentrations ranging from 0.64 to 2.2 mg/L; the largest concentration corresponded with the background sample at SW-02. Neither BOD nor TOC were detected during this sampling round. Hardness values were calculated from 15 to 121 mg/L $CaCO_3$. Values for pH ranged from 5.8 at SW-02 to 6.0 at SW-06. Conductivities ranged from 77 μmhos/cm at SW-03 to 133 μmhos/cm at SW-08. Dissolved oxygen was lowest (6.62 mg/L) at the most downstream location, SW-08, and highest (9.66 mg/L) at SW-03.

September/October 1991. Seven surface water locations were sampled during this round, including the six locations sampled in September/October 1991 (SW-02 to SW-06 and SW-08), plus SW-11. Analytes detected during this sampling round are presented in Table 4-19. Organic compounds and metals detected are shown on Figures 4-20 and 4-21.

Two volatile organics were detected. Toluene was found at SW-05 (2 μg/L), and carbon disulfide was detected at four locations from 3 to 14 μg/L. The highest concentration was measured at SW-03. Water-soluble organics, semivolatile organics, pesticides, and PCBs were not detected at any of the locations.

Major-metal ions and manganese were detected in most unfiltered and filtered samples. Concentrations in unfiltered samples ranged from 121 to 331 μg/L for aluminum, from 882 to 1,825 μg/L for iron, from 1,460 to 12,500 μg/L for basic cations, and from 42.3 to 470 μg/L for manganese. Concentrations of 132 to 620 μg/L for aluminum, 241 to 997 μg/L for iron, 1,480 to 14,800 μg/L for basic cations, and 136 to 547 μg/L for manganese were measured in filtered samples. Concentrations measured in filtered samples were close to those measured in unfiltered samples, indicating that the more soluble forms were predominant during this sampling period. A similar trend was also evident for barium (up to 13.2 μg/L for both filtered and unfiltered samples), although this metal was found less often than during June 1991. During this round, the same longitudinal trends as seen in unfiltered concentrations for these metals in June 1991 were evident again, although differences in concentrations (unfiltered and filtered samples) between surface water locations were not as large. Other metals found during this sampling round were antimony (25 μg/L) and copper (11.6 μg/L) in unfiltered samples at SW-04, and arsenic (1 μg/L) at SW-08. Chromium and copper were also found in filtered samples from 13.1 to 1.35 and 9.8 to 29.8 μg/L, respectively.

Cyanide was detected at SW-04 (10.2 μg/L). Narrow ranges of DO (7.7 to 10.2 mg/L) and BOD (1.1 to 1.2 mg/L) were found, and TOC of 4.9 to 7.2 mg/L was detected. Hardness was calculated at 16 to 25 mg/L $CaCO_3$, and pH ranged from 6.0 to 6.5. Conductivity ranged from 91 to 170 μmhos/cm and was more elevated at SW-05.

January/February 1992. The four surface water locations sampled in January/February 1992 were SW-04, SW-05, SW-06, and SW-11. Analytes detected during this sampling round are summarized in Table 4-20. Organic compounds and metals detected are shown on Figures 4-20 and 4-21.

During this round, one volatile organic, carbon disulfide, was detected at SW-05 (2 μg/L), while two pesticides, 4,4-'DDD (0.0047 μg/L) and methoxychlor (0.01 μg/L), were found at SW-11. Water-soluble organics, semivolatile organics, and PCBs were not detected.

Major-metal ions and manganese were found in all samples and were the only metals detected during this round. Aluminum ranged from 105 to 140 μg/L, iron ranged from 108 to 1,360 μg/L, basic cations ranged from 612 to 10,100 μg/L, and manganese ranged from 62.5 to 195 μg/L in unfiltered samples. In filtered samples, concentrations of 89.2 to 102 μg/L for aluminum, 82.1 to 702 μg/L for iron, 701 to 11,300 μg/L for basic cations, and 56 to 172 μg/L for manganese were found. With the exception of iron at SW-05, major-metal ion and manganese concentrations for unfiltered and filtered samples were not substantially different between locations. Iron at SW-05 (1,360 μg/L - unfiltered; 702 μg/L - filtered) was about an order of magnitude greater than at other locations. In comparison to the previous sampling round (September/October 1991), concentrations were not substantially different. As seen previously, the more soluble forms accounted for the predominant fraction of metal concentrations.

Cyanide and sulfide were not detected at these four locations. Total organic content ranged from 5.0 to 7.0 mg/L, and BOD was not found. The pHs ranged from 6.0 to 6.5, and conductivity ranged from 90 to 900 μmhos/cm. Dissolved oxygen was found at two locations: 12.5 mg/L at SW-06 and 13.2 mg/L at SW-05.

April 1992. Surface water samples were collected at five locations during this sampling round: SW-02, SW-04, SW-05, SW-06, and SW-11. A summary of the analytes detected is presented in Table 4-21 and Figures 4-20 and 4-21.

Carbon disulfide (1 μg/L at SW-04) was the only volatile organic reported. Water-soluble organics, semivolatile organics, pesticides, and PCBs were not detected.

In general, unfiltered and filtered concentrations of major-metal ions and manganese were somewhat less during April 1992 than during previous rounds. For iron, concentrations were from 636 to 866 μg/L in both the unfiltered and filtered samples. For basic cations, concentrations were 624 to 9,790 μg/L in unfiltered samples and 729 to 10,500 μg/L in filtered samples. Manganese concentrations were 20.6 to 237 μg/L for unfiltered samples and 20.2 to

245 μg/L for filtered samples. Aluminum was also found, but was qualified as nondetected (section 2.6.2). The highest concentrations most often occurred at SW-11, although the range of concentrations was generally small between locations for both unfiltered and filtered samples. Similar to other sampling rounds, the more soluble forms of these metals comprise a large fraction of the total concentrations measured. In addition, barium (8.6 to 8.85 μg/L) and antimony (19.8 μg/L) were detected in a few unfiltered samples, and zinc (31.3 μg/L) was found in the filtered sample at SW-05.

Ammonia was found at all locations with a range of 0.042 to 0.640 mg/L, while cyanide was not detected. Total organic carbon was detected at all of the locations and ranged from 5.4 to 7.9 mg/L. The highest BOD was found at the background location (SW-02) at 1.5 mg/L. pH was nearly the same at each location ranging from 5.7 to 6.1. Conductivity ranged from 74 to 98 μmhos/cm. Up to 18 mg/L $CaCO_3$ was calculated for hardness. Dissolved oxygen ranged from 11 to 10.21 mg/L.

May 1992. Seven surface water locations that were sampled consisted of two new locations (SW-17 and SW-18) along with SW-02, SW-04, SW-05, SW-06, and SW-11. The analytes detected during this sampling round are summarized in Table 4-21 and Figures 4-20 and 4-21. Volatile organics, semivolatile organics, pesticides, and PCBs were not detected.

Concentrations of major-metal ions and manganese were similar to those detected in April 1992. Concentrations in unfiltered samples were from 153 to 424 μg/L for aluminum, 234 to 1,640 μg/L for iron, 1,110 to 5,950 μg/L for basic cations, 21.2 to 373 μg/L for manganese. Concentrations in filtered samples ranged from 120 to 348 μg/L for aluminum, 356 to 830 μg/L for iron, 1,120 to 6,050 μg/L for basic cations, and 19 to 369 μg/L for manganese. The majority of the metal concentrations were associated with the soluble forms. As seen previously, unfiltered iron concentrations increased from 234 μg/L at SW-02 to 322 μg/L at SW-04 and to 603 mg/L at SW-05, although concentrations were even more elevated at SW-17 and SW-18 (1,270 and 1,360 μg/L, respectively). The highest concentration of iron was found further downstream at SW-06 (1,640 μg/L). Similar increases, to a lesser extent, also were seen for

the other major-metal ions and manganese. During this sampling round, barium and zinc were also detected at all of the surface water locations from 4.9 to 9.9 and 2.8 to 8.2 μg/L, respectively. In addition, copper was detected at two locations, with the highest concentration at SW-02.

Ammonia was detected at all locations, ranging from 0.070 to 1.43 mg/L. Conductivity and pH ranged from 64 to 112 μmhos/cm and 5.6 to 6.4 at SW-08 and SW-11. Dissolved oxygen ranged from 8.9 mg/L at SW-18 to 10.2 mg/L at SW-02. Biochemical oxygen demand and TOC were not measured.

Distribution and Significance. A few organic compounds were detected at low concentrations (less than 14 μg/L) in the surface water locations on Saugatucket River. Besides carbon disulfide, which was detected the most frequently, xylene and pesticides (4,4'-DDD and methoxychlor) were each detected once during the study period. Coupled with DOs above 5 mg/L and BOD values near zero, there was no indication that the disposal areas were substantially contributing to organics in this river during the study period.

On the other hand, increases in metal concentrations along the course of the river appear to be influenced by the disposal areas, especially the bulky waste area. For the most part, major-metal ions, manganese, and barium were the primary metals detected consistently throughout the study period. The largest fraction of these metals appears to be in a more soluble form based on comparisons of unfiltered and filtered sample concentrations.
Of these, iron and manganese as well as conductivities were found to be significantly elevated in leachate along the eastern perimeter of the bulky waste area and the banks of the Saugatucket River.

Figure 4-23 shows the trends from upstream to downstream for unfiltered metal concentrations along the Saugatucket River. For aluminum, there was no recognizable trend, as concentrations constantly increased and decreased between sampling locations. In contrast, iron and manganese concentrations gradually increased from the background location (SW-02) toward SW-03 and

SW-04, which are primarily downgradient of the sewage sludge and bulky waste areas, respectively. Concentrations for these metals peaked at SW-05, which is downgradient of several large leachate seeps that flow into the river at this point. Downstream concentrations then decreased to a level similar to that of SW-03 and SW-04, most likely because of dilution, and then remained near the same level or slightly increased again below the confluence of Mitchell Brook. Concentrations continued to increase beyond where the river approaches and flows past Saugatucket Road. These downstream increases are more pronounced for manganese and basic cations (calcium, magnesium, sodium, and potassium) than for iron and barium. Conductivities exhibit the same patterns. Differences were statistically confirmed for calcium, manganese, magnesium, sodium, and conductivity between several downstream locations and the background location (Appendix D). Other metals were not analyzed because the amount of available data was limited.

Elevated concentrations of similar metals were also evident, although not significantly, in shallow overburden groundwater downgradient of each of the disposal areas. Since the predominant groundwater flow direction from the disposal areas (primarily the sewage sludge and bulky waste area) is toward the Saugatucket River, groundwater discharges along with surface runoff (overland flow) to the river (section 3) are likely mechanisms that contribute to the transport of these more soluble metals from those areas.

Differences in metal concentrations also occurred between sampling rounds. Metal concentrations in June 1991 were greater than in any other round. Iron and barium concentrations were about 20 times greater in June 1991 than in September 1991. Calcium, magnesium, sodium, and manganese were also four to six times greater in June 1991 than in September. This was particularly evident at SW-05. At this location, the higher concentrations during the June 1991 sampling round corresponded with low-flow conditions (section 3) in combination with elevated metal concentrations from leachate seeps (section 4.2.3). Throughout the rest of the study period, concentrations varied, but not as substantially. Many of the mechanisms that likely contribute to these variations depend on precipitation (i.e., leachate composition, groundwater discharge, surface water volume, surface runoff).

4.2.6.4 Summary of Surface Water Findings. A few organic compounds were infrequently detected at low concentrations in the three water bodies, Mitchell Brook, Saugatucket River, and the unnamed brook. Volatile organics, primarily carbon disulfide and chlorinated and aromatic volatiles, was the major group of organic compounds found. A few semivolatiles and pesticides were also detected. Acrylamide, a water-soluble organic, likely related to the types of industrial wastes landfilled in the disposal areas, was also found. Several surface water locations also exhibited elevated metal concentrations, which tended to coincide with orange floc, precipitate, and staining of sediments.

In the unnamed brook, which is located west of Rose Hill Road near the southern end of the solid waste area, one pesticide *gamma*-BHC was detected. Since the location sampled on this brook is upgradient of the disposal areas and was found to be discharging to groundwater, the pesticides detected are not likely related to the disposal areas. Activities upstream may be the source of these pesticides.

Although the organic compounds detected in surface water in Mitchell Brook and the Saugatucket River were also found in other media in the site study area, upstream to downstream trends were not exhibited since these compounds were seldom and inconsistently detected. However, the detection of acrylamide in Mitchell Brook, prior to its intersect on with the Saugatucket River, indicates that transport of organic compounds in the site study area is occurring at least this far south. More evident were the increases in metal concentrations in the Saugatucket River, near the large leachate seeps (along the eastern perimeter of the bulky waste area), and in Mitchell Brook, south of the transfer station road. In particular, concentrations of iron, manganese, and other metals in these areas were found to be significantly elevated. Higher conductivities and the presence of orange floc were characteristic features in these areas. Below the confluence of Mitchell Brook and the Saugatucket River, metal concentrations decreased, although concentrations were higher than those found upgradient of the disposal areas.

4.2.7 Sediment

Eighteen sediment locations were sampled during the study period. This includes sediment from Mitchell Brook, the Saugatucket River, the unnamed brook, and an unnamed tributary to Mitchell Brook. The unnamed brook was sampled west of Rose Hill Road at SD-10. Located north of the disposal areas, SD-01, was sampled in an unnamed tributary that feeds into Mitchell Brook. Along Mitchell Brook seven locations were sampled: SD-07, SD-09, SD-12, SD-13, SD-14, SD-15, and SD-16. The Saugatucket River was sampled at nine locations: SD-02, SD-03, SD-04, SD-05, SD-06, SD-08, SD-11, SD-17, and SD-18. Sediment sampling locations are shown in Figure 2-27. Sediment sampling was conducted at the same time as surface water sampling (section 4.2.6). Sediment samples were analyzed for the following parameters:

- Volatile organics
- Semivolatile organics
- Pesticides and PCBs
- Metals
- Cyanide
- Sulfide (only June 1991 and September/October 1991)
- Ammonia (only May 1992)
- Total combustible organics (TCO)
- Grain size

The analytes detected in sediment are presented in Tables 4-23, 4-24, and 4-25. A summary of the organic compounds and metals detected in sediment samples are presented in Figures 4-24 and 4-25. The analytes detected in each of the different areas (Table 4-4) are discussed in the following sections.

4.2.7.1 Unnamed Brook. One location in the unnamed brook (SD-10) was sampled for sediments in June and September/October 1991. This location corresponds with SW-10, which was also sampled at the same time. The analytes detected during June 1991 and September/October 1991 are summarized in Table 4-23 and Figures 4-24 and 4-25.

In June 1991, no organic compounds, including volatile organics, semivolatile organics, pesticides, and PCBs, were detected.

Of the metals detected, iron concentrations (113,000 mg/kg) were substantially elevated above the others. Aluminum, followed by manganese and calcium (3,210, 1,150, and 1,070 mg/kg, respectively), were the next abundant. Magnesium, sodium, and potassium concentrations ranged from 2 to 415 mg/kg. Barium (64.6 mg/kg) and four heavy metals (lead at 7.4 mg/kg, nickel at 3.0 mg/kg, vanadium at 15.2 mg/kg, and zinc at 236 mg/kg) were also detected.

Sulfide was measured at 25 mg/kg, while cyanide was not detected. The sediment consisted primarily of sand (67.7%) and was intermixed with finer silt (18.8%) and clay (10.4%) grains. The organic content was 4.7%.

During September/October 1991, one volatile organic, 4-methyl-2-pentanone, was detected at 3 μg/kg. Seven pesticides were detected at concentrations below sample quantitation limits (0.23 to 2.6 μg/kg): *delta*-BHC, 4,4'-DDE, 4,4'-DDT, methoxychlor, endosulfan II, dieldrin, and *gamma*-chlordane.

Generally, the same types and concentrations of metals that were found in June 1991 were detected during September/October 1991. Major-metal ions, manganese, and barium were the predominant metals detected. Iron concentrations were measured at 85,550 mg/kg. Aluminum, basic cation, barium, and manganese concentrations were 4,000, 62.1 to 1,125, 46.8, and 530 mg/kg, respectively. Likewise in June 1991, three heavy metals: nickel, vanadium, zinc were detected at similar concentrations. However, lead concentrations were elevated by greater than 30 times (243.4 mg/kg). The reason for this is not clear but may be related to gravel pit

or other off-site sources since this brook is upgradient of the disposal areas. Several metals not detected in June 1991, but detected during this sampling round were beryllium (1.2 mg/kg), arsenic (4.6 mg/kg), cobalt (5.7 mg/kg), and copper (56.1 mg/kg).

Cyanide and sulfide were not detected during this round. Grain-size distribution was similar to June 1991 with sand comprising the largest fraction (64%), whereas the silt fraction increased to 27.4% and the clay fraction decreased to 7.8%. The organic content was 6.0%.

Distribution and Significance. The detection of several different pesticides including *delta*-BHC in September/October 1991 coincides with the detection of *gamma*-BHC in the associated surface water sample (section 4.2.6). Since these sediments are predominantly sand with little organic material, the retention of organic compounds (if present) is expected to be limited. During this same time, substantial increases in lead concentrations and the detection of other heavy metals occurred in sediment, but were not evident in surface water. This suggests that sediment transport from upgradient sources is possibly occurring. As discussed earlier, there is no hydrogeologic indication that the disposal areas are affecting this brook, which is west of Rose Hill Road. However, as discussed in Section 4.2.6.1, nearby sand and gravel operations are likely affecting metal concentrations in the brook.

4.2.7.2 Mitchell Brook. Seven locations were sampled on Mitchell Brook from June 1991 to May 1992. Six of the locations were sampled in June and September/October 1991: SD-07, SD-09, SD-12, SD-13, SD-14, and SD-15. In addition, SD-01, which is located on the unnamed tributary that feeds into Mitchell Brook and is upstream of the disposal areas, was sampled during these rounds. In May 1992 a new location established as SD-16 was sampled. The location at the unnamed tributary was not sampled in May 1992.

The location on the unnamed tributary, SD-01, was used as a background location. Since this location is upstream of and not known to be affected by the disposal areas, it is considered a comparable location for sediment quality upgradient of the disposal areas. On Mitchell Brook, SD-13, located in the brook just west of Rose Hill Road, was the most upstream location

sampled. Surface water location SD-14 was sampled immediately downstream of a dammed area, to the north of the solid waste area. Established downstream of the confluence of the unnamed tributary, SD-15 is east of the northern portion of the solid waste area. Further downstream, SD-09 is located between the solid waste and bulky waste areas. In May 1992, SD-16 was located near the southern end of the solid waste area, upstream of the transfer station road. Below the transfer station road, SD-07, and further downstream, SD-12, were sampled.

June 1991. Five locations were sampled during this round, from upstream to downstream: SD-14, SD-15, SD-09, SD-07, and SD-12. The background location on the unnamed tributary (SD-01) was also sampled. A summary of the analytes detected during June 1991 is presented in Table 4-23 and in Figures 4-24 and 4-25.

Two volatile organics were detected during this sampling round at concentrations below sample quantitation limits. Xylenes were detected at SD-07 (8 μg/kg) and at SD-09 (7 μg/kg). Trichloroethane (9 μg/kg) was detected at SD-09. Semivolatile organics, pesticides, and PCBs were not detected at any location sampled.

Major-metal ions, barium, and manganese were detected at almost all locations. Aluminum and iron were present in the most abundant concentrations. Concentrations ranged from 1,360 to 5,640 mg/kg for aluminum, 2,750 to 6,490 mg/kg for iron, 38.1 to 921 mg/kg for basic cations, 7 to 22.2 mg/kg for barium, and 36.3 to 84 mg/kg for manganese. In comparison, concentrations were generally near or below concentrations found at the background location on the tributary (SD-01): aluminum (6,050 mg/kg), iron (7,530 mg/kg), basic cations (47.1 to 1,100 mg/kg), barium (13.6 mg/kg), and manganese (74.4 mg/kg). Other metals detected at Mitchell Brook locations were beryllium at five locations (0.29 to 1.3 mg/kg), arsenic at two locations (0.52 to 11 mg/kg), chromium at three locations (2.5 to 3.6 mg/kg), copper at one location (4.2 mg/kg), lead at three locations (5.2 to 21.7 mg/kg), nickel at six locations (1.4 to 3 mg/kg), vanadium at five locations (3.5 to 7.6 mg/kg), and zinc at three locations (17.3 to 30.6 mg/kg). Six of these metals were also found at SD-01: chromium (4.4 mg/kg), copper

(3.3 mg/kg), lead (10.8 mg/kg), nickel (4.1 mg/kg), vanadium (10.8 mg/kg), and zinc (25.2 mg/kg).

Sulfide was detected at all locations and ranged from 3.7 to 34 mg/kg, whereas cyanide was not detected at any of the locations. Sand was the predominant size fraction (57.3 to 97%). Organic content ranged from 0.8 to 7.0%.

September/October 1991. During this round, the same locations as in June 1991 were again sampled: SD-14, SD-15, SD-09, SD-07, and SD-12. The analytes detected during September/October 1991 are presented in Table 4-24 and Figures 4-24 and 4-25.

Five volatile organics, consisting of chlorinated and aromatic volatiles and ketones, were detected at one or two locations during this round of sampling. These include chloroform at SD-15 (5 μg/kg), and PCE at SD-14 (3 μg/kg) and SD-09 (2 μg/kg). Benzene (1 μg/kg) was detected at SD-12. The highest concentrations were for ketones, as acetone was detected at SD-07 and SD-09 (190 μg/kg and 200 μg/kg, respectively). Also detected at SD-07 was MEK (46 μg/kg).

Three semivolatile organics and two pesticides were detected at two locations during this sampling round. PCBs were not detected at any locations. Di-n-butylphthalate (650 μg/kg) was detected at SD-09. Two PAHs, fluoranthene and pyrene, were also detected at SD-09 (34 and 40 μg/kg, respectively). Pesticides found at this location include 4,4'-DDD (8.2 μg/kg) and 4,4'-DDE (4.9 μg/kg). The same PAHs and pesticides were found at SD-15: fluoranthene (34 μg/kg), pyrene (40 μg/kg), and 4,4'-DDE (1.6 μg/kg).

Of the metals detected, aluminum and iron had the highest concentrations (1,660 to 6,080 mg/kg and 5,010 to 14,600 mg/kg, respectively). In the background location (SD-01), concentrations were 8,650 and 10,500 mg/kg for aluminum and iron, respectively. Basic cations (31,5 to 949 mg/kg), barium (9.3 to 25.6 mg/kg), and manganese (41.1 to 222 mg/kg) were also detected frequently. For these metals, concentrations were similar to those detected in June 1991. Also

detected at Mitchell Brook and the background location were arsenic (0.35 to 1.2 mg/kg), cobalt (2 to 5 mg/kg), lead (3.5 to 27.7 mg/kg), vanadium (6 to 16.8 mg/kg), and zinc (33.6 to 43.9 mg/kg). Except for lead and zinc, the highest concentrations in the Mitchell Brook locations corresponded with those in SD-01, the background location. Chromium and nickel were also detected at SD-01 (11.1 and 7.3 mg/kg, respectively), while thallium was found at 0.37 mg/kg in two locations in Mitchell Brook. The highest major-metal ion concentrations tended to occur at SD-07, while the higher concentrations for other metals generally corresponded with locations in the more upstream section of the brook.

Sulfide was detected only at SD-12 (850 mg/kg) during the September/October 1991 sampling round, and cyanide was not detected at any of the locations. Based on grain-size distributions, sand was the predominant fraction (51.2 to 97.3%), and organic content ranged from 0.8 to 7.6%.

May 1992. During this round, only three locations were sampled: SD-07, SD-09, and SD-12. An additional location, SD-16, was also sampled. This location is situated above the transfer station road and to the southeast of the solid waste area. A summary of the analytes detected in May 1992 is presented in Table 4-25 and Figures 4-24 and 4-25.

One pesticide was detected in the Mitchell Brook sediments during this round of sampling. *delta*-BHC was detected in all four locations and ranged from 0.57 to 0.73 μg/kg. The maximum concentration was detected at SD-12. There were no volatile organics, semivolatile organics, or PCBs detected during this sampling round.

Concentrations of aluminum ranged from 1,860 to 2,640 mg/kg, and iron ranged from 3,985 to 12,400 mg/kg. Lower concentrations were found for basic cations (242 to 613 μg/kg), barium (6.2 to 11.5 mg/kg), and manganese (57.8 to 241 mg/kg). Also detected at all locations were chromium (1.35 to 2.5 mg/kg), cobalt (0.59 to 1.8 mg/kg), and lead (2.3 to 4.1 mg/kg). Nickel (3.8 mg/kg) and vanadium (6.4 mg/kg) were each detected at one location (SD-12 and SD-07,

respectively). In addition, beryllium was found at three locations and ranged from 0.27 to 0.42 mg/kg. All of these metals were detected during previous sampling rounds.

Ammonia was detected at SD-12 (25.6 mg/kg) and SD-16 (4.36 mg/kg) during May 1992. Cyanide was not detected at any of the locations. The predominant grain size at the locations was sand (86.5 to 95.7%). Organic content ranged from 1.1 to 1.8%.

Distribution and Significance. More types of organic compounds were detected in sediment in Mitchell Brook than in the associated surface water. Organic compounds were not found at the background location on the unnamed tributary (SD-01). Ketones (acetone and MEK) and chlorinated volatiles (TCE, PCE, 1,2-DCE, and chloroform) and BTEX compounds were the primary types of volatile organics. Found more often and in higher concentrations were PAHs, phthalates, and pesticides (4,4'-DDE, 4,4'-DDD, and *delta*-BHC), since these compounds are less soluble and more strongly adsorb to sediment and organic material. All of these compounds were also found in other media near the disposal areas. Surface runoff (overland flow) and groundwater discharges to the brook are evident. With the exception of PAHs, which were found in several locations near roads and other areas of vehicular activity, there were no recognizable patterns of distribution.

On the other hand, metals exhibited several trends, from upstream to downstream as shown in Figure 4-26. For the most part, concentrations were not found to be significantly elevated compared to the background location on the unnamed tributary (Appendix D). For example, concentrations for aluminum and lead were highest at the most upgradient location, SD-13, which is upstream of the northern portion of the solid waste area. Concentrations steadily decreased toward SD-16 and then increased at SD-07, which is south of the transfer station road, before decreasing a short distance downstream at SD-12. Barium exhibited a somewhat similar trend as aluminum and lead. On the other hand, iron and manganese concentrations were relatively similar along the length of brook from SD-13 to SD-09. Iron concentrations began to increase at SD-16. Iron concentrations continued to increase at SD-07, as did manganese. Lower concentrations for both these metals occurred further downstream at SD-12. Elevated

concentrations south of the transfer station road correspond with elevated metal concentrations in this area as well as the presence of large amounts of orange floc and precipitate that cover the sediment. However, attenuation of concentrations to levels near those observed at the background location occurs over a short distance. In addition, concentrations were somewhat variable throughout the study period, but no obvious trends were noted.

4.2.7.3 Saugatucket River. Nine locations were sampled in the Saugatucket River from June 1991 to May 1992. Six locations were sampled in June 1991: SD-02, SD-03, SD-04, SD-05, SD-06, and SD-08. Sediment location SD-11 was added in September/October 1991, and locations SD-17 and SD-18 were added in May 1992.

June 1991. Locations sampled during this round included SD-02 through SD-06 and SD-08. A summary of the analytes detected is presented in Table 4-23, and Figures 4-24 and 4-25.

Five volatile organics, consisting of chlorinated (TCE and 1,2-DCE) and aromatic volatiles (ethylbenzene and xylenes) and carbon disulfide, were detected at three locations during this sampling round. Trichloroethene was detected at 7 μg/kg in SD-04 and increased downstream to 10 μg/kg at SD-06 and 150 μg/kg at SD-08, which is downstream of Saugatucket Road. Also detected at SD-08 was 1,2-DCE (5 μg/kg) and ethylbenzene and xylene (8 and 67 μg/kg, respectively). Xylene was also detected at 10 μg/kg in SD-03. Carbon disulfide was found at SD-08 (9 μg/kg). No volatile organics were detected at SD-02, the background location, or SD-05, which is downstream of SD-04.

Seven PAHs were detected at SD-08 (Table 4-23) at a total concentration of 1,410 μg/kg. This location is downstream of the Saugatucket Road. Another semivolatile organic, butylbenzylphthalate was detected at SD-06, also below the sample quantitation limit. Pesticides and PCBs were not detected.

Aluminum, iron, manganese, and barium were detected at all of the locations. At all of the downstream locations, concentrations of these metals were higher than in the background

location, SD-02. Concentrations for aluminum ranged from 749 to 6,280 mg/kg. Iron ranged from 780 to 1,600 mg/kg, and barium and manganese ranged from 2.7 to 26.2 mg/kg and 13.5 to 193 mg/kg, respectively. Basic cation concentrations ranged from 115 to 1,270 mg/kg. The highest concentrations for these metals usually occurred at SD-04 and SD-05.

Also detected in downstream locations were arsenic (0.79 to 2.1 mg/kg) at SD-04, SD-05, and SD-08 and chromium (1.9 to 8.7 mg/kg) and cobalt (3.4 to 4.2 mg/kg) at SD-04, SD-05, and SD-06. Higher concentrations corresponded with SD-04 and SD-05. In addition, lead and zinc were detected at SD-06 (10.9 and 20.5 mg/kg, respectively), while selenium was found at SD-05 (2.1 mg/kg). Beryllium and nickel were detected at almost all locations at concentrations ranging from 0.4 to 2 mg/kg and 1.4 to 9.5 mg/kg, respectively. With the exception of beryllium and zinc, these metals were also detected at the background location, SW-02, at least once during the study period.

Sulfide was detected in all locations while cyanide was not found at any. Sulfide ranged from 15 to 129 mg/kg and was highest at SD-06. At SD-04 and SD-05, sediments largely consisted of sand (37.7 and 54.5%, respectively) and silt (48.5 and 42.5%, respectively). At other locations, the percentage of silt decreased and sand increased. Organic content ranged from 1.0 to 14.7%.

September/October 1991. Seven surface water locations were sampled during this round, including the six locations sampled in June 1991 (SD-02 to SD-06 and SD-08) and SD-11. A summary of the analytes detected at these locations during this sampling round is presented in Table 4-24 and Figures 4-24 and 4-25.

Volatile organics were detected during this sampling round, but the compounds were somewhat different from those found in June 1991. Aromatic volatiles, ethylbenzene (3 μg/kg), and xylene (8 μg/kg) were found at SD-05. Acetone was detected at two locations: SD-03 (210 μg/kg) and SD-08 (215 μg/kg). Three other volatile organics were found at SD-08: MEK (28 μg/kg), PCE

(4 μg/kg), and carbon disulfide (22 μg/kg). In addition, pyrene was detected in SD-03 at 39 μg/kg. Pesticides and PCBs were not detected at any of the locations.

During this sampling round, major-metal ions, manganese, and barium were detected at higher concentrations downstream of the background location. In the background location, SD-01, concentrations of aluminum were 8,650 mg/kg, iron were 1,500 mg/kg, basic cations were 350 to 373 mg/kg, and barium and manganese were 21.5 and 113 mg/kg, respectively. The iron concentration at SD-06 was 8,940 mg/kg, and iron and aluminum concentrations at SD-04 (6,780 and 16,400 mg/kg, respectively) and SD-05 (8,420 and 6,170 mg/kg, respectively) were more elevated than those at the other locations (1,260 to 3,080 and 1,020 to 2,590 mg/kg, respectively). Basic cation concentrations ranged from 242 to 2,560 mg/kg, barium ranged from 3.1 to 30.5 mg/kg, and manganese ranged from 41.1 to 422 mg/kg. Concentration ranges for these metals were slightly higher than ranges in June 1991.

Other metals detected include arsenic (0.43 to 1.2 mg/kg), (chromium 11.4 to 18.1 mg/kg), cobalt (1.9 to 6.5 mg/kg), lead 4.3 to 24.2 mg/kg), nickel (12.8 to 20 .5 mg/kg), selenium (0.37 to 1.3 mg/kg), vanadium (2 to 17.7 mg/kg), and zinc (43.6 to 49.8 mg/kg). Beryllium (2.3 mg/kg) was detected at SD-04. Four of these metals were also detected at SD-02: lead at 7.2 mg/kg, selenium at 0.52 mg/kg, and vanadium at 2 mg/kg. Higher concentrations of these metals were found in at least one location downstream.

Neither sulfide or cyanide was detected during this sampling round. While sand and silt were the predominant grain sizes at SD-04, SD-05, and SD-06 (greater than 30% for both), the sand fraction was larger (greater than 80%) and the silt fraction smaller (less than 10%) at most of the other locations. Organic content was similar to the previous sampling round (1.8 to 9.3%).

May 1992. The seven sediment locations sampled consisted of two new locations (SD-17 and SD-18) along with SD-02, SD-04, SD-05, SD-06, and SD-11. The analytes detected during this sampling round are summarized in Table 4-25 and Figures 4-24 and 4-25. Volatile organics and PCBs were not detected in any samples.

Four PAHs (phenanthrene, anthracene, fluoranthene, and pyrene) were detected at a total concentration of 241 μg/kg in SD-11. Three pesticides were also detected in the sediments during this sampling round. The one detected most frequently was *delta*-BHC, which was found in all six of the downstream locations (0.46 to 1.3 μg/kg), but was not detected in the background location, SD-02. Detected at higher concentrations were 4,4'-DDE at 4.3 μg/kg and 4,4'-DDD at 8.0 μg/kg in SD-11, the location with PAHs. 4,4'-DDE was also detected at SD-18 at 1.2 μg/kg.

Major-metal ions were the predominant metals found during this sampling round. Concentrations of aluminum were 836 to 1,860 mg/kg. The most elevated iron concentrations detected during this round were at SD-05 (25,900 mg/kg) and SD-06 (12,500 mg/kg). Iron ranged from 885 to 25,900 mg/kg. Basic cation (258 to 555 mg/kg), barium (2.9 to 13.7 mg/kg), and manganese (22.6 to 200 mg/kg) concentrations were similar to those detected during June 1991. Chromium and lead were detected at all locations from 1.1 to 2.5 and 3.7 to 13.5 mg/kg, respectively. Arsenic (2 to 6.1 mg/kg), cobalt (0.91 to 1.4 mg/kg), and selenium (0.43 to 0.58 mg/kg) were also found, but less frequently (two to four locations). Nickel was detected in SD-06 at 4.7 mg/kg, while vanadium and zinc were detected at 3.4 and 11.2 mg/kg, respectively, in SD-05.

During this sampling round, cyanide was not found at any locations. Ammonia was detected in three locations with the maximum at SD-05 at 3.17 mg/kg. Sand was the predominant size fraction (64.6 to 95.8%) in sediment at each location, and organic content continued to be relatively low (1.3 to 5.6%).

Distribution and Significance. The types of organic compounds detected in Saugatucket River sediment were also detected in the disposal areas and other media during the study period and include chlorinated and aromatic volatiles, ketones, carbon disulfide, PAHs, and pesticides. Most notably, TCE was detected at several locations along the river. The less soluble organics, like PAHs and pesticides, as well as volatile organics were detected more often in sediments than in the associated surface water.

When detected, organic compounds were predominantly found at SD-08 and SD-11. Both of these locations are near Saugatucket Road and were sampled in areas where the river widens and current is slower. As a result, suspended sediment tends to settle out here. In June 1991, volatile organics were primarily found along with PAHs at SD-08, which is located downstream of Saugatucket Road. This suggests that organic compounds and metals detected in this section of the river are probably more related to the road than to other sources.

For the most part, all of the metals detected in sediment were also found in the background location during the study period. Iron and aluminum were the predominant metals. As shown on Figure 4-27, the concentrations were generally consistently higher at SD-04 and SD-5, and coincided with higher concentrations in surface water at these locations. Both are immediately downgradient of the large leachate seeps east of the bulky waste area. Orange floc and precipitate covering the sediment in this area were also present. Concentrations for these metals were also elevated at SD-06, below the confluence of Mitchell Brook, although surface water concentrations at this location were not. Lead, on the other hand, was lower at these locations and in general did not exhibit any discernable pattern. In relation to background concentrations, concentrations of lead, barium, manganese, and iron were significantly elevated at most of the downstream locations (SD-04, SD-05, SD-06, SD-08, SD-11). Iron and manganese concentrations at SD-03 were also found to be significantly higher (Appendix D). As discussed above, elevated metal concentrations near Saugatucket Road (SD-08 and SD-11) can be attributed to the road.

All metals were generally at the highest concentrations in September/October 1991. This corresponds with higher concentrations in surface water during the same period and may be somewhat related to seasonal variations. Following drier summer periods, metal concentrations generally increased during lower flow periods, when groundwater discharge accounts for a larger portion of a stream's volume.

4.2.7.4 Summary of Sediment Findings. Like surface water, organic compounds were occasionally found in sediment in the unnamed brook, Mitchell Brook, and the Saugatucket

River, although concentrations were generally low. In contrast, the less mobile, more adsorptive organic compounds (phthalates, PAHs, and pesticides) were detected more often and in higher concentrations than volatile organics (chlorinated and aromatic volatiles, ketones, and carbon disulfide). Since these compounds were not consistently detected over the study period, and were seldom found in more than one related location, there was no obvious pattern of distribution. This is not atypical, given the nature of streambed sediments which includes non-uniform distribution of grain size and organic materials along the stream, transport mechanisms (section 5), and heterogeneity of solid materials. The detection of PAHs near roads and areas of vehicular activity is evident. Most notable are PAHs near Rose Hill Road, the northern portion of the solid waste area, and downstream near the Saugatucket Road, which is likely a contributing source. Pesticides, on the other hand, were more widely distributed, and the types of pesticides varied.

In comparison to surface water, many more metals were found in sediment. In the Saugatucket River, elevated metal concentrations occurred near the leachate seeps, and in Mitchell Brook, elevated concentrations were found south of the transfer station road. Surface waters in the same locations exhibited similar trends. These locations were also characterized by the presence of orange floc and precipitates that stained the sediment.

In the unnamed brook, sediment and water quality are not likely impacted by the disposal areas, since this stream is upgradient of the disposal areas.

4.2.8 Landfill Gas

Landfill gas samples were collected from each of the disposal areas and from permanent off-site monitoring points in June and July 1991 as part of the site reconnaissance activities. The off-site monitoring points were again measured in September 1991. Percent carbon dioxide (CO_2), methane (CH_4), oxygen (O_2), and percent of the lower explosive limit (LEL) were measured, and nearly all of the points were analyzed using a field GC equipped with a PID as described in sections 2.2.1.4 and 2.4.2.1.

In December 1991, additional points were sampled offsite to define the areal extent of landfill gas migration and its proximity to adjacent residences. At this time, 16 additional permanent monitoring points were installed. Eight were located near homes, and eight were located along the furthest known extent of the landfill gas plume (Figure 2-21). Each of the eight points near adjacent homes and selected other permanent points were monitored monthly from January through April 1992. Approximately 24 of the 48 permanent points were measured during each of these monthly sampling rounds.

In May 1992, six points were sampled using SUMMA passivated canisters for laboratory analysis of volatile organics by method TO-14 (Figure 2-28). At the same time, impingers were used to collect and analyze samples for reduced sulfur, consisting of hydrogen sulfide and mercaptan sulfur in the landfill gas, using ASTM method D 2385-81. The impingers were analyzed in an on-site laboratory. Samples from these locations were also analyzed using the field GC. A detailed discussion of analytical methodologies, sample collection procedures, and data use is presented in section 2.5.8.

4.2.8.1 Sewage Sludge Area. Twenty-two points were sampled in the sewage sludge area in June 1991. These points were located using a 100-foot-by-100-foot grid and are shown on Figure 4-28. Many of the grid points were omitted because volatile organics were not detected in adjacent samples and concentrations of methane and carbon dioxide were much lower than in the other disposal areas. One point [SS(08+000)] was resampled in May 1992 for SUMMA canister and reduced sulfur analysis, as shown on Figure 4-29.

Field Data. Carbon dioxide, methane, and oxygen concentrations were measured at all 22 points on the sewage sludge area. The only point with a methane concentration greater than 1% was SS(08+000), with a concentration of 9%. The carbon dioxide concentration at this point was 12%, which was the second highest concentration of carbon dioxide detected in the sewage sludge area.

Three points [SS(07+000), SS(04+000) and SS(01+100)] contained similar concentrations of carbon dioxide (9, 14, and 11% respectively). Two of these points, SS(07+000) and SS(01+100), also contained concentrations of methane (100 and 80 ppm, respectively) that were similar to concentrations detected in other disposal areas. (Concentrations less than 1,000 ppm of methane were measured with an OVA. A concentration of 1% methane is equivalent to 10,000 ppm.) Carbon dioxide was measured at several other points at concentrations ranging from 1 to 6%. Figure 4-30 shows the areal distribution of carbon dioxide using the data collected.

The trend indicated by the contours in Figure 4-30 is a long north-south-oriented band of elevated carbon dioxide concentrations along the eastern perimeter of the sewage sludge area. This area is located in a similar position as a long trench visible in an areal photographs taken in April 1981 (USEPA 1987a).

No volatile organic compounds were detected in the sewage sludge area using the field GC.

SUMMA Canister Analysis. Some volatile organics were detected by method TO-14 using the SUMMA canister sample. Figure 4-29 shows the sampling locations for the SUMMA canister samples and the concentrations of different groups of compounds.

One SUMMA canister sample was collected from SS(08+000) at a depth of 12 feet below ground surface. The 12-foot depth was selected because the LEL was 8% at this depth, the highest of any of the depths tested. The hand-held instrument measurements made during the SUMMA canister sampling are not comparable to those made in June 1991 because the soil encountered during the SUMMA canister sampling was less permeable than soil encountered in June 1991. The small pumps in the hand-held instruments were unable to draw a representative sample from the ground because of the low soil permeability. The SUMMA canister and the field GC sampling achieved with stronger pumps were not affected by the lower permeability.

A concentration of 0.081 mg/m^3 of acetone was detected in the SUMMA canister collected from SS(08+000). Acetone was the only compound detected above the sample quantitation limit. Acetone was also detected in soil samples collected from boring BH-03, which was placed at this location.

Other trace compounds detected below the sample quantitation limit at SS(08+000) include methylene chloride (0.0029 mg/m^3), ethylbenzene (0.0087 mg/m^3), *m,p*-xylene (0.017 mg/m^3), *o*-xylene (0.0087 mg/m^3), 1,3,5-trimethylbenzene (0.0029 mg/m^3), and 1,2,4-trimethylbenzene (0.0049 mg/m^3).

Reduced Sulfur. Reduced sulfur, in the form of hydrogen sulfide and total mercaptan sulfur, was measured at SS(08+000). The hydrogen sulfide measured 1.1 mg/m^3. Mercaptan sulfur was not detected.

Distribution and Significance. Carbon dioxide was the primary component of landfill gas throughout the sewage sludge area. Methane was detected at one point SS(08+000) at a concentration above the LEL. The concentrations of these compounds, as discussed in the following sections, were much lower than were detected in other disposal areas. Carbon dioxide and methane in landfill gas result from the biological degradation of organic materials placed into a landfill. Digested sewage sludge disposed of in this area was previously degraded during primary and secondary treatment. This material would not be expected to consume as much oxygen or produce as much methane or carbon dioxide as untreated municipal waste.

The only volatile organic detected above the quantitation limit in either the field GC or the SUMMA canister analysis was acetone at SS(08+000). Volatile organic data for soil (sections 4.2.1 and 4.2.2) from this area are consistent with this finding. Acetone was detected at two of the surface soil locations (SS-11 and SS-12) and in three of the subsurface soils (BH-01 from 4 to 6 feet and 8 to 10 feet; BH-03 from 18 to 20 feet). 2-Butanone was also detected in all of these samples except SS-11. Toluene was detected in one of the soil samples (BH-03 from

18 to 20-feet), and TCE was detected at a concentration below its sample quantitation limit in SS-11.

In addition to acetone, several other volatile organics (methylene chloride, ethylbenzene, *m,p*-xylene, *o*-xylene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene) were detected in the SUMMA canister sample at concentrations below the sample quantitation limit.

4.2.8.2 Bulky Waste Area. Twenty-nine points, shown on Figure 4-28, were sampled in the bulky waste area in July 1991. These were located using a 100-foot-by-100-foot grid. Many of the grid points were omitted because the landfill gas was found to contain similar concentrations of the same compounds from point to point. Two points [BW(04+100) and BW(05+500)] were resampled in May 1992 for volatile organics using a SUMMA canister and also for reduced sulfur analysis, as shown on Figure 4-29.

Field Data. Carbon dioxide and methane were measured at all 29 points on the bulky waste area. Oxygen was measured at all but one of these points. The carbon dioxide concentrations ranged from 0 to 49%. Methane concentrations ranged from 0 to 57%. Carbon dioxide and methane concentrations are shown and contoured in Figures 4-31 and 4-32, respectively. The highest concentrations were restricted to the central portion of the area. In the southwest corner of the bulky waste area, there is some migration of landfill gas away from the area. Carbon dioxide measured 18% at a location [BW(01-25)] 25 feet west of the disposal area. The methane concentration, however, had decreased to 1%.

Oxygen concentrations ranged from ambient air levels (21%) to less then 1% and appeared to vary inversely to the methane and carbon dioxide concentrations. This trend was expected since, during biological activity, oxygen is consumed and carbon dioxide and methane are produced.

Twenty-seven of the points on the bulky waste area were analyzed using the field GC. Of the nine compounds detected (*trans*-1,2-DCE, *cis*-1,2-DCE, 1,1,1-TCA, benzene, TCE, toluene, ethylbenzene, *m*-xylene, and *o*-xylene), three compounds (*cis*-1,2-DCE, TCE, and toluene) were

found at nearly all points where volatile organics were detected. Concentration contours for these compounds are shown in Figures 4-33, 4-34, and 4-35. Total volatile concentrations are shown in Figure 4-36.

Ethylbenzene, *m*-xylene,and *o*-xylene may also be present at many of the points sampled, but these compounds were not quantified in many samples because a short precolumn backflush time was used. The use of a precolumn backflush is described in section 2.

At BW(05+400), toluene was detected at the highest concentration of any of the compounds detected (4,800 mg/m^3). A high concentration of toluene (830 mg/m^3) was also found at BW(04+100). Toluene was present at lower concentrations (53 to 170 mg/m^3) throughout the central portion of the bulky waste area.

The highest concentration of *cis*-1,2-DCE (3,500 mg/m^3) was encountered at BW(05+500). As illustrated in Figure 4-33, *cis*-1,2-DCE was also present throughout the central portion of the area (28 to 250 mg/m^3). The second highest concentration was 250 mg/m^3 at BW(04+300).

The highest TCE concentration measured was 190 mg/m^3 at BW(05+500). As with *cis*-1,2-DCE, TCE was present throughout the central portion of the disposal area. Generally the TCE concentrations appeared to vary with the *cis*-1,2-DCE concentrations. The TCE concentrations, however, were generally lower than the *cis*-1,2 DCE concentrations. This correlation is expected because these compounds are structurally similar, and *cis*-1,2-DCE is a biological degradation product of TCE (Smith and Dragun 1984, Parsons et al. 1984, Cline and Vista 1984).

The correlation between concentrations of these chlorinated compounds and toluene did not appear to be as great. For example, the highest concentration of toluene was detected at BW(05+400), and the highest concentrations of *cis*-1,2-DCE and TCE were detected at BW(05+500).

As indicated by the SUMMA canister TO-14 analysis, the field GC was unable to identify numerous compounds due to the complexity of the matrix and the limitations of the field instrumentation. Figure 4-36 shows the contours generated from measurements for total volatile organics concentrations. The total volatile organic measurements included non-target compounds so that comparisons between points could be made. The highest total volatile measurements were at BW(05+400) and BW(05+500) (20,000 and 10,000 mg/m^3, respectively). Other areas of high total volatile organic concentrations appear to be centered around BW(04+100) and BW(01+300). As Figure 4-36 indicates, volatile organics were present in landfill gas throughout the bulky waste area.

There were, however, some areas where the volatile organics were one to two orders of magnitude higher than in other areas. In addition, not all regions with elevated total volatile organics show elevated concentrations of the same compounds. BW(05+400) and BW(05+500) exhibited the two highest total volatile organic concentrations (20,000 and 10,000 mg/m^3, respectively). The *cis*-1,2-DCE concentrations were 79 and 3,500 mg/m^3, respectively, and the toluene concentrations were 4,800 and 170 mg/m^3, respectively. It appears that the bulky waste area landfill gas is heterogeneous in composition.

SUMMA Canister Analysis. Two SUMMA canister samples were collected at depths of 6 and 12 feet below ground surface at BW(04+100) and BW(05+500). The locations and the concentrations of various chemical groups are shown in Figure 4-29.

Aromatic and chlorinated aliphatic compounds were the primary volatile organic compounds found at BW(04+100). The highest concentration found in this sample was toluene (34 mg/m^3). Other aromatics detected included benzene (2.9 mg/m^3), ethylbenzene (12 mg/m^3), *m,p*-xylene (24 mg/m^3), *o*-xylene (6.5 mg/m^3), styrene (4.7 mg/m^3), 1,3,5-trimethylbenzene (1.5 mg/m^3), and 1,2,4-trimethylbenzene (2.3 mg/m^3).

Vinyl chloride (14 mg/m^3) and *cis*-1,2-DCE (17 mg/m^3) were the chlorinated compounds with the highest concentrations detected in the BW(04+100) SUMMA canister sample. Other chlorinated compounds detected at concentrations greater than the sample quantitation limit include 1,1-DCA (6.9 mg/m^3), chloroethane (1.9 mg/m^3), and TCE (3.1 mg/m^3). 1,1-Dichloroethene, methylene chloride, *trans*-1,2-DCE, 1,1,1-TCA, and PCE were all detected at concentrations below sample quantitation limits. Acetone and MEK were each detected at concentrations of 1.3 and 2.2 mg/m^3, respectively. Three Freon compounds, dichlorodifluoromethane, trichlorofluoromethane, and freon 113, were also detected in BW(04+100) at concentrations of 1.4, 1.3, and 0.11 mg/m^3, respectively.

A similar group of compounds was detected in the SUMMA canister samples from BW(05+500). Twenty of the compounds detected in the two samples were the same. Once again the volatile organic compound with highest concentration was toluene (21 mg/m^3). Other aromatic compounds were detected at lower concentrations than those in BW(04+100). Ethylbenzene (5.6 mg/m^3) and *m,p*-xylene (3.3 mg/m^3) were the only other aromatic compounds that were above the sample quantitation limit. All of the aromatic compounds detected in sample BW(04+100) were also detected in BW(05+500). In addition, 1,2,4-trichlorobenzene was detected below its quantitation limit in BW(05+500).

The concentrations of chlorinated compounds in BW(05+500) were generally lower than those detected in BW(04+100). The compound *cis*-1,2-DCE had the highest concentration at 4.8 mg/m^3. Vinyl chloride (1.2 mg/m^3), chloroethane (1.8 mg/m^3), methylene chloride (2.4 mg/m^3), 1,1-DCA (2.1 mg/m^3), and TCE (3.8 mg/m^3) were all detected at concentrations above sample quantitation limits. Several other compounds were detected at concentrations below the sample quantitation limit; these included 1,1-DCE, *trans*-1,2-DCE, and PCE.

2-Butanone (1.7 mg/m^3) was the only ketone compound to be detected in the BW(05+500) sample.

Sampling point BW(05+500) had a much higher concentration of dichlorodifluoromethane than BW(04+100) (26 vs. 1.4 mg/m^3). The only other Freon compound detected was trichlorofluoromethane at a concentration less than the sample quantitation limit.

Reduced Sulfur. The hydrogen sulfide concentrations at BW(04+100) and BW(05+500) were 7.6 and 2.8 mg/m^3 respectively. The value of 7.6 mg/m^3 was the highest hydrogen sulfide concentration detected in any of the six locations sampled. Mercaptan sulfur was not detected in either of the bulky waste area samples.

Distribution and Significance. Carbon dioxide and methane concentrations were greater than 25% throughout most of the bulky waste area and were measured as high as 49% for carbon dioxide and 57% for methane. Oxygen concentrations were generally depressed from ambient air concentrations to as low as 1%.

Volatile organics were present throughout the disposal area but had elevated concentrations at some hot spots such as BW(05+400), BW(05+500), BW(04+100) and BW(01+300). The relative concentrations of different volatile organic compounds in the landfill gas also varies. Toluene, *cis*-1,2-DCE, and TCE were the primary compounds detected during the field GC analysis.

Toluene had the highest concentration of any component identified during the analysis of SUMMA canister samples collected from BW(04+100) and BW(05+500). Other aromatic compounds were also detected in each of these samples.

Chlorinated compounds were present in greater quantities in BW(04+100) than in BW(05+500). Vinyl chloride and *cis*-1,2-DCE had the highest concentrations of the chlorinated compounds in BW(04+100). The compounds 1,1-DCA, chloroethane, *trans*-1,2-DCE, 1,1,1-TCA, methylene chloride, PCE and TCE were also detected.

In BW(04+100), the ketone MEK was detected in both of the SUMMA samples, while acetone was the only ketone detected.

Dichlorodifluoromethane was detected at a higher concentration in BW(05+500) than in BW(04+100). Trichlorofluoromethane was detected in both samples, while Freon 113 was only detected in BW(04+100).

Hydrogen sulfide was detected at both BW(04+100) and BW(05+500), while mercaptans were not detected at either point.

4.2.8.3 Solid Waste Area. Eighty-five points were sampled in the solid waste area in June and July 1991. These points were located using a 100-foot-by-100-foot grid. The actual sampling locations are shown on Figure 4-28. Three points [SW(03+300), SW(11+500) and SW(13+300)] were resampled in May 1992 for SUMMA canister and reduced sulfur analysis, as shown on Figure 4-29. Permeation of the landfill gas through the cover material of the solid waste area was measured using two flux boxes installed in February 1992.

In addition to the points placed within the solid waste area, points were sampled around the north, west, and south perimeter to monitor the migration of landfill gas from this area. These perimeter points are discussed in section 4.2.8.4.

Field Data. Carbon dioxide and methane were measured at 81 of the points and oxygen at 79 points. Carbon dioxide concentrations ranged from 0 to 62%, and methane concentrations ranged from 0 to 60%. Most of the points were found in the range of 20 to 50% carbon dioxide with similar concentrations for methane. Figures 4-37 and 4-38 show carbon dioxide and methane concentrations, respectively. Elevated concentrations of carbon dioxide and methane were observed throughout the solid waste area with a decline in concentrations to less than 5% at the perimeters of the area sampled.

Eighty points in the solid waste area were analyzed using a field GC. Of the nine compounds detected (*trans*-1,2-DCE, *cis*-1,2-DCE, 1,1,1-TCA, benzene, TCE, toluene, ethylbenzene, *m*-xylene, and *o*-xylene), three compounds (*cis*-1,2-DCE, TCE, and toluene) were found at nearly all points where volatile organic contamination was detected. Concentration contours for these compounds are shown in Figures 4-39, 4-40, and 4-41. Total volatile organic concentrations are shown in Figure 4-42.

Ethylbenzene, *m*-xylene, and *o*-xylene may also be present at many of the points sampled, but these compounds were not quantified in many samples because a short precolumn backflush time was used. The use of a precolumn backflush is described in section 2.

The compound with the highest concentration at any point using the field GC was *cis*-1,2-DCE at SW(11+500) with a concentration of 46,000 mg/m^3. The adjacent point, SW(11+600), also had an elevated concentration of *cis*-1,2 DCE at 1,800 mg/m^3. Two other points on this disposal area [SW(13+200) and SW(05+000)] had concentrations that were elevated. As illustrated by Figure 4-39, *cis*-1,2-DCE was detected at most other locations in the northern part of the area at concentrations ranging from 1 to 160 mg/m^3. *cis*-1,2-Dichloroethene was not detected in the southernmost portion of the solid waste area.

Trichloroethene appeared to follow similar trends as *cis*-1,2-DCE but at lower concentrations. Concentrations at the points SW(11+500) and SW(11+600) were relatively high, as shown in Figure 4-40. Although TCE was found throughout the solid waste area, concentrations were generally less then 50 mg/m^3.

Toluene ranged from nondetected to 318 mg/m^3. It was generally present throughout the solid waste area, but at varying concentrations. As illustrated in Figure 4-41, there was no clear trend. This suggests that the waste composition is heterogeneous and that toluene does not correlate well with the concentrations for chlorinated compounds such as *cis*-1,2-DCE and TCE.

Several relatively high concentrations were apparent at SW(13+200), SW(10+400), and BW(05+000).

The total volatile concentrations, as shown on Figure 4-42, ranged from nondetected to 89,000 mg/m^3. Two apparent hot spots were located at SW(11+500) (89,000 mg/m^3) and SW(13+200) (30,000 mg/m^3); however, volatile organics were present throughout the solid waste area. The northern third of the solid waste area appeared to have relatively higher concentrations of volatiles than the southern portion of this area.

Although volatile organics were present in landfill gas throughout the solid waste area, in some areas total volatile concentrations were one to two orders of magnitude higher than in others. In addition, not all of the elevated volatile organic regions showed elevated concentrations of the same compounds. At points SW(11+500) and SW(13+200), the two highest total volatile concentrations (89,000 and 30,000 mg/m^3 respectively) were measured. However, the *cis*-1,2-DCE concentrations were 46,000 and 9,500 mg/m^3, respectively, and the toluene concentrations were 39 and 170 mg/m^3, respectively. Thus, although volatile organic compounds were present throughout the solid waste area, the volatile organic composition of the landfill gas was heterogeneous.

SUMMA Canister Analysis. Three locations in the solid waste area, SW(13+300), SW(11+500), and SW(03+300), were sampled for laboratory analysis of volatiles by method TO-14 using SUMMA canisters. Two samples were collected from SW(13+300) for a total of four samples from this area. The locations of these samples are shown on Figure 4-29.

The two samples from SW(13+300) were intended to be field duplicates. However, after a careful review of the field sampling procedure and the resulting laboratory data, these two samples were not treated as duplicates. The intent of duplicate samples is to collect two samples from the same location as close together chronologically as possible so that variations in concentration caused by time differences are minimized.

The two samples collected from SW(13+300) were collected more than six hours apart. During the interim, nearly 400 liters of landfill gas were purged from this point as part of the reduced sulfur sampling. As a result, the volatiles detected in the second sample from this location were generally two to three times higher than those in the first sample. Because of the difference in sampling times and the large volume of reduced sulfur sample drawn in between, these two samples do not represent field duplicates.

Aromatic compounds were present in both of the samples collected from SW(13+300). Benzene (8.0 mg/m^3), toluene (83 mg/m^3), and 1,3,5-trimethylbenzene (4.3 mg/m^3) were all detected in the first SUMMA canister sample. Only toluene (233 mg/m^3) was detected in the second SUMMA canister sample. The reason that other aromatic compounds were not detected was probably due to the elevated quantitation limits in these samples. The quantitation limits in the first and second samples from SW(13+300) were approximately 200 mg/m^3 and 700 mg/m^3, respectively. Elevated quantitation limits were necessitated by the high concentrations of the other volatile organic compounds.

Vinyl chloride and *cis*-1,2-DCE were the chlorinated compounds detected at the highest concentration at SW(13+300). In the first sample, their concentrations were 1,300 mg/m^3 and 9,100 mg/m^3 respectively. The concentrations in the second sample were even higher: 3,100 mg/m^3 and 23,000 mg/m^3. Several other chlorinated compounds [chloroethane (17 mg/m^3), 1,1-DCE (22 mg/m^3), methylene chloride (28 mg/m^3), *trans*-1,2-DCE (14 mg/m^3), 1,1-DCA (89 mg/m^3), 1,1,1-TCA (10 mg/m^3), and TCE (14 mg/m^3)], were also found in the first sample.

1,1-Dichloroethene (32 mg/m^3), methylene chloride (66 mg/m^3), *trans*-1,2-DCE (27 mg/m^3), and 1,1-DCA (140 mg/m^3) were also found in the second sample collected at SW(13+300) but at higher concentrations than those detected in the first sample. Other chlorinated compounds were probably also present in both of these samples, but due to the required dilutions they could not be detected.

One ketone, 4-methyl-2-pentanone, was detected in the first sample collected from SW(13+300) but not in the second sample. Other ketone compounds were likely present in these samples, but due to the required dilutions could not be detected.

Dichlorodifluoromethane was the only Freon compound detected at SW(13+300). It was found in both of the samples at 59 mg/m^3 and 110 mg/m^3 respectively.

Some compounds detected in the first sample were not detected in the second sample. This is most likely the result of a greater dilution factor and a correspondingly higher quantitation limit for these compounds. Generally, however, volatile concentrations in the second sample were two to three times greater than those in the first sample collected from SW(13+300). One possible explanation for this observation may be that landfill gas in a region close to the sampling point had concentrations of volatiles that were greater than those detected in the first sample collected. This region of higher contamination might have been deeper than the depths sampled using the Geoprobe apparatus or at a location in close proximity to SW(13+300). As landfill gas was purged from SW(13+300) during the reduced sulfur sampling, the more concentrated landfill gas was drawn towards the sampling point. At the end of the reduced sulfur sampling, the more concentrated landfill gas was collected in the second SUMMA canister.

One SUMMA canister sample was collected at SW(11+500) at a depth of 5 feet. This depth was chosen because multiple attempts to sample at greater depths were met with refusal.

Toluene had the highest concentration of any of the aromatic compounds (71 mg/m^3) in the sample collected at SW(11+500). Six other aromatic compounds were also detected, including benzene (2.0 mg/m^3), ethylbenzene (13 mg/m^3), *m,p*-xylene (24 mg/m^3), *o*-xylene (4.3 mg/m^3), 1,3,5-trimethylbenzene (0.74 mg/m^3), and 1,2,4-trimethylbenzene (1.1 mg/m^3).

The chlorinated compounds exhibiting the highest concentrations in sample SW(11+500) were *cis*-1,2-DCE at 7,100 mg/m^3 and vinyl chloride at 100 mg/m^3. Chloromethane (2.9 mg/m^3),

1,1-DCE (15 mg/m^3), methylene chloride (8.3 mg/m^3), *trans*-1,2-DCE (4.0 mg/m^3), 1,1-DCA (16 mg/m^3), 1,1,1-TCA (1.3 mg/m^3), carbon tetrachloride (0.28 mg/m^3), TCE (31 mg/m^3), and PCE (8.1 mg/m^3) were also detected in sample SW(11+500).

Dichlorodifluoromethane (45 mg/m^3), Freon 114 (2.0 mg/m^3), trichlorofluoromethane (1.4 mg/m^3), and Freon 113 (0.29 mg/m^3) were detected in SW(11+500). Carbon disulfide was detected in the SUMMA canister sample collected at SW(11+500) at a concentration of 0.87 mg/m^3. Bromoform was detected at SW(11+500) at 2.4 mg/m^3. This was the only sample in any of the disposal areas where bromoform was detected. No ketone compounds were detected in sample SW(11+500). These compounds may be present but due to the required dilutions they were not detected.

The final SUMMA canister sample, from the southern end of the solid waste area was collected at SW(03+300). This sample was collected from a depth of 6 feet because attempts to sample at greater depths were met with refusal.

Aromatic compounds were detected at the highest concentrations. The coeluting pair *m*- and *p*-xylene had the highest concentration detected at 41 mg/m^3. Other aromatic compounds detected were toluene (21 mg/m^3), ethylbenzene (25 mg/m^3), *o*-xylene (11 mg/m^3), benzene (2.6 mg/m^3), 1,3,5-trimethylbenzene (1.0 mg/m^3), 1,2,4-trimethylbenzene (2.5 mg/m^3), and 1,4-dichlorobenzene (0.43 mg/m^3).

Although similar chlorinated compounds were found at SW(03+300), the concentrations were relatively lower. When compared to other samples, total chlorinated aliphatics at SW(03+300) were detected at a concentration of 9.0 mg/m^3 compared to 8,200 mg/m^3 at SW(11+500) and an average of 19,000 mg/m^3 at SW(13+300).

Vinyl chloride was the most concentrated chlorinated compound at SW(03+300) (3.1 mg/m^3). Other chlorinated compounds detected were chloroethane (1.2 mg/m^3), methylene chloride

(0.69 mg/m^3), *cis*-1,2-DCE (1.5 mg/m^3), TCE (0.45 mg/m^3), PCE (0.57 mg/m^3), *trans*-1,2-DCE (0.087 mg/m^3), 1,1-DCA (0.21 mg/m^3), and 1,1-DCE (0.040 mg/m^3). Dichlorodifluoromethane (1.0 mg/m^3) and trichlorofluoromethane (0.18 mg/m^3) were the only Freon compounds detected at SW(03+300). Carbon disulfide was also detected at this location at a concentration of 0.12 mg/m^3. No ketones were detected in the sample from SW(03+300).

Reduced Sulfur. Reduced sulfur samples were collected from each of the three locations where SUMMA canister samples were collected. A duplicate was collected from SW(03+300). The hydrogen sulfide concentrations at SW(13+300) and SW(11+500) were 6.3 and 1.0 mg/m^3, respectively. The average concentration of the samples collected from SW(03+300) was 6.0 mg/m^3. As found in the other disposal areas, mercaptan sulfur was not detected in the solid waste area.

Flux Boxes. In the solid waste area, two flux boxes were installed on an experimental basis near settlement platform PS-05 and in the vicinity of surface soil sample SS-03 (designated FLUXWEST and FLUXEAST, respectively). These were installed in February 1992 and monitored in March and April 1992 using both hand-held instruments and the field GC.

The initial concentrations of carbon dioxide and methane measured after installation were identical to ambient conditions or were not detected. In March, the carbon dioxide and methane concentrations were 22% and 38%, respectively, at FLUXEAST and 0.3% for both carbon dioxide and methane at FLUXWEST. In April the carbon dioxide and methane concentrations at FLUXEAST were 36% and 58%, respectively. The concentrations of these constituents at FLUXWEST were 1.7% carbon dioxide and 4 ppm methane.

The field GC results appeared to follow the same trend. During the March sampling and analysis, total volatile organics concentrations measured 11,000 mg/m^3 in FLUXEAST. At FLUXWEST total volatile organic concentrations were zero. The compounds *cis*-1,2-DCE (2,800 mg/m^3), 1,1-DCE (300 mg/m^3), and toluene (110 mg/m^3) were the primary volatiles identified in March. Trace amounts of TCE, m-xylene, and o-xylene were also detected.

The April field GC data were very similar qualitatively but exhibited higher concentrations of all components in FLUXEAST. In comparison, nondetected results were obtained for FLUXWEST. For FLUXEAST the total volatile organic concentrations were 21,000 mg/m^3. As in March, the compounds *cis*-1,2-DCE (6,300 mg/m^3), *trans*-1,2-DCE (410 mg/m^3), and toluene (59 mg/m^3) were all major constituents. Vinyl chloride was also identified and quantitated at 480 mg/m^3. Vinyl chloride may have been present in the March sampling round, but it was not identified since a vinyl chloride standard was not available at that time.

All of the results reported above were acquired using the 11.7-eV lamp in the field GC detector. In April, however, FLUXEAST was analyzed using both an 11.7- and a 10.2-eV lamp (the use of an 11.7- vs. a 10.2-eV lamp is discussed in section 2). The 10.2-eV lamp results were higher for all of the compounds detected [*cis*-1,2-DCE (22,000 mg/m^3), toluene (210 mg/m^3), vinyl chloride (1,700 mg/m^3), total volatile organics (320,000 mg/m^3)]. The compound *trans*-1,2-DCE was not detected due to matrix interference.

The difference between the two flux box measurements may be attributed to the landfill cover present at each location. FLUXEAST was located in an area where landfill gas is venting from the solid waste area. The compounds identified in FLUXEAST are the same as those identified in the landfill gas. There is no cover material present at this location, exposed refuse can be seen in the surface soil, and no vegetation is present in this immediate area.

At FLUXWEST, the cover material is much more substantial. Grass has covered the ground completely, and there is no refuse visible in the surface soil. These flux box measurements show that, at least in some areas, landfill gas is venting into the atmosphere and contains many of the constituents present in the subsurface landfill gas.

Distribution and Significance. Carbon dioxide and methane concentration were greater than 35% throughout most of the solid waste area and ranged as high as 62% for carbon dioxide and 60% for methane. Oxygen concentrations were generally depressed from ambient air concentration to as low as 1%.

Volatile organics were present throughout the disposal area but appear to have elevated concentrations at SW(11+500) and SW(13+200). The relative concentrations of different volatile organic compounds in the landfill gas also appear to vary. Toluene, *cis*-1,2-DCE, and TCE were the primary compounds detected during the field GC analysis. For the SUMMA canister data, *cis*-1,2-DCE had the highest concentration of any volatile organic in the solid waste area. Vinyl chloride had the second highest concentration at SW(13+300) and SW(11+500). Chloromethane, chloroethane, 1,1-DCE, methylene chloride, *trans*-1,2-DCE, 1,1-DCA, 1,1,1-TCA, TCE, and PCE were all detected at these two points.

At SW(03+300), aromatic compounds were the primary volatile organics present in the SUMMA canisters. Although most of the same chlorinated compounds are present, the concentrations of toluene, ethylbenzene, *p*-xylene, and *o*-xylene are higher than those of any of the chlorinated compounds.

Of the Freon compounds, dichlorofluoromethane was present in all of the solid waste area SUMMA canisters. Freon 114 and 113 and trichlorofluoromethane were present periodically.

2-Butanone was the only ketone detected, and it was present at a much lower concentration relative to other volatile organics.

Carbon disulfide was present in two of the four samples, and bromoform was found in only one of the four samples from the solid waste area. These compounds were present at concentrations much less than those of other volatile compounds detected in these samples.

Reduced sulfur analysis indicated hydrogen sulfide results ranging from 1.0 to 6.3 mg/m^3. No mercaptan sulfur was detected.

Of the two flux boxes installed on the solid waste area, FLUXEAST indicates that landfill gas is readily passing through the landfill cover material. Concentrations of methane, carbon

dioxide, and volatile organic compounds appeared similar to concentrations of these compounds in landfill gas detected in the same area.

4.2.8.4 Delineation of Off-Site Landfill Gas Plume. In June and July 1991, 32 permanent landfill gas sampling points were installed around the perimeter of the solid waste area. Nine points, spaced at approximately 100-foot intervals, were placed at the north end of the solid waste area along the driveway at the northern boundary. Eighteen points were placed along the west side of Rose Hill Road also at approximately 100-foot intervals. Five points were placed at the southern perimeter of the solid waste area, just inside the fence that divides the solid waste area from the transfer station road, again at approximately 100-foot intervals.

These sampling points are shown on Figure 4-43. Permanent sampling points along the driveway north of this disposal area are designated LFGF. Permanent sampling points west of the solid waste area along Rose Hill Road are designated LFGR. Points south of the solid waste area along the transfer station road are designated LFGT.

In December 1991 sampling was performed to characterize the areal extent of the landfill gas migration. Additional temporary and permanent sampling points were installed as indicated on Figure 4-44. The permanent sampling points installed in December, along with selected other permanent sampling points, were monitored monthly from January to March 1992. All of the permanent sampling points were resampled in April 1992. During the December and the January through March sampling, the field GC was used at approximately 33% of the points sampled. In April 1992 the field GC was used at all sampling points.

July and September 1991 Sampling. In July and September 1991, all 32 points were sampled using both hand-held instruments and the field GC. carbon dioxide, methane, and total volatile organic concentrations for the July sampling are shown in Figures 4-37, 4-38, and 4-42, respectively.

Three primary areas of landfill gas migration were indicated from the July 1991 sampling data. These areas were characterized by elevated carbon dioxide, methane, and total volatile organic measurements and by reduced oxygen content. Contours for carbon dioxide, methane, *cis*-1,2-DCE, TCE, toluene and total volatile organics for the solid waste area, as shown in Figures 4-37 through 4-42, include data from perimeter and off-site landfill gas sampling points. The highest off-site volatile organic concentrations were found at LFGR-08. During the July 1991 sampling, the total volatile organic concentrations were 12,000 mg/m^3 at this point. Methane and carbon dioxide were both above 40%, and the oxygen concentration was less then 1%. This region of landfill gas migration extends south as far as LFGR-13 and north as far as LFGR-07. The primary volatile compound identified using the field GC was *cis*-1,2-DCE (5,600 mg/m^3). Other volatile compounds identified at this time were *trans*-1,2-DCE, TCE, toluene, ethylbenzene, *m*-xylene, and *o*-xylene.

On the north side of the landfill, sampling point LFGF-03 had the highest methane, carbon dioxide, and total volatile organic measurements and the lowest oxygen measurements (58%, 32%, 3,000 mg/m^3, and 3% respectively). The migration of landfill gas in this area appeared to be localized. This is the only point with elevated methane and carbon dioxide on the north side of the landfill. The volatile compounds identified by the field GC at LFGF-03 were similar to those detected on the solid waste area. The volatile compound with the highest concentration identified at this time was *cis*-1,2-DCE.

At LFGF-08, 4.3 mg/m^3 of TCE was identified in July 1991. Its presence was confirmed in later rounds of sampling. Other typical components of landfill gas such as methane, carbon dioxide, or other volatile organics were not detected at LFGF-08. Thus, although TCE is a common component of landfill gas in the solid waste area, its presence at LFGF-08 did not appear to be due to landfill gas migration.

At the southern end of the landfill, a broad band of landfill gas was detected along the transfer station road. Although all five of the points (LFGT-01 to LFGT-05) indicated the presence of

landfill gas, the highest concentrations of all components were found at LFGT-02 and LFGT-03. The soil gas collected from these points contained approximately 50% each of methane and carbon dioxide.

The volatile compounds identified at the southern end of the landfill were different from those identified to the north and west of the landfill. For example, *cis*-1,2-DCE, a major component at LFGR-08 and LFGF-03, was not present at any of the points along the transfer station road.

December 1991 Sampling. In December 1991, additional landfill gas sampling was conducted to define the areal extent of landfill gas migration away from the landfill and the proximity of landfill gas to surrounding homes. The locations of the points sampled at this time are indicated on Figure 4-44. Many of these points were not analyzed with the field GC because delineation of high methane concentration was the primary objective of the off-site landfill gas delineation.

Sixteen of these points were installed as permanent sampling points: eight in close proximity to foundation points of surrounding homes and eight to monitor the extent of the landfill gas plume. The contour diagrams for field analytical data (Figures 4-37 through 4-42) include points sampled in December 1991. These diagrams illustrate the extent of landfill gas migration.

The largest area of off-site migration was along the western perimeter of the landfill. Methane, carbon dioxide, and some volatiles appeared to migrate as far as 200 feet from the perimeter of the solid waste disposal area near LFG-LHR. The nature of the volatile constituents changed as the landfill gas plume moved away from the solid waste area. Compounds that are less volatile (ethylbenzene and xylenes for example) were not detected in the landfill gas collected at points farthest away from the landfill. Other more volatile compounds were detected at these points using the field GC. Although these compounds were not identified because they were not part of the standard mixtures routinely used, the field GC did provide information concerning their volatility.

Methane and volatile organics were not detected at any of the residential (foundation) sampling points. Two of the sampling points (LFG-AD and LFG-LHR) had concentrations of carbon dioxide that were elevated above background concentrations. Background concentrations of carbon dioxide ranged from 0 to 4%, while LFG-AD and LFG-LHR had CO_2 concentrations of 8.6 and 5.6%, respectively. Although carbon dioxide is not generally considered to be a hazardous constituent of landfill gas, it may be part of the leading edge of a landfill gas plume.

January through April 1992 Monthly Monitoring. From January through March 1992, approximately 26 permanent monitoring points were sampled each month. About half of these were analyzed each month using the field GC. The remaining points were only analyzed using hand-held instruments. An attempt was made to sample all 16 of the permanent sampling points installed in December 1991 (Figure 4-44). Additional points were selected based on field conditions and an attempt to maximize areal coverage. LFGR-08 and LFGF-03 were sampled during all of the monthly sampling rounds. In April, all of the remaining points were sampled and analyzed using the field GC.

At five of the eight residential monitoring points (LFG-GT, LFG-JB, LFG-NG and LFG-RK), no volatile organics or methane were detected during any of the landfill gas monitoring rounds. At three of the residential (foundation) monitoring points (LFG-AD, LFG-GT and LFG-LHR), volatile organics were detected using the field GC. At LFG-LHR, as much as 1.6% methane was also detected.

Volatile organics were first detected at LFG-LHR, LFG-GT, and LFG-AD during the February sampling. This was also the first time a 10.2-eV lamp was used in the field GC. A discussion of the use of a 10.2- vs. 11.7-eV lamp appears in section 2.4.2. Total volatile organic and methane concentrations at these three points are summarized in Table 4-26.

LFGR-08 and LFGF-03, the off-site permanent sampling points with the highest landfill gas concentrations, showed some variability from December 1991 to April 1992. The carbon dioxide concentrations at LFGF-03 ranged from 53 to 31%, and the methane ranged from 35 to

28%. In each case, the highest concentrations were measured in December 1991 and declined over time. The total volatile concentrations, however, did not follow the same trend. The December and April concentrations were approximately the same (4,300 and 5,000 mg/m^3, respectively) while the January and April values were different (1,300 and 9,200 mg/m^3, respectively; the February data are not comparable because a 10.2-eV lamp was used for this analysis).

Carbon dioxide concentrations at LFGR-08 increased with each monthly sampling round, from 33% in December 1991 to 41% in April 1992. The methane concentrations increased from 51% in December 1991 to 70% in March 1992 and then decreased to 57% in April. As with LFGR-03, the total volatile concentrations did not follow any consistent trend at LFGR-08. Concentrations ranged from 4,500 mg/m^3 in March 1992 to 20,000 mg/m^3 in January 1992.

In April 1992, vinyl chloride was identified in LFGR-08 and LFGF-03 (3,700 and 3,500 mg/m^3, respectively). Previously, the presence of vinyl chloride had been suspected, but since a usable standard was not available it had not been identified. Vinyl chloride was also identified at LFGR-07, LFGR-09, LFGR-10, and LFGT-07 at concentrations of 500, 160, 240, and 6 mg/m^3, respectively.

Distribution and Significance. Sampling of the perimeter landfill gas monitoring points in July and September 1991 indicated that landfill gas was migrating from the solid waste area to the north, west, and south. Elevated methane, carbon dioxide, and total volatile organics were identified at LFGF-03 to the north of the site. *cis*-1,2-dichloroethene and vinyl chloride were the primary volatile components identified at this point. TCE, toluene, ethylbenzene, and xylenes were also identified.

The largest area of landfill gas migration was along the western perimeter of the site. The highest landfill gas concentrations were at LFGR-08. Methane and carbon dioxide concentrations at this point were consistently high. *cis*-1,2-dichloroethene and vinyl chloride were the primary volatile components identified at this point. Trichloroethene, toluene,

ethylbenzene, and xylenes were also identified. Although LFGR-08 had the highest concentrations of off-site landfill gas, this plume appeared to extend from LFGR-07 as far south as LFGR-14. Although the landfill gas plume leaving the western perimeter of the solid waste area was about 700 feet wide, it appeared to extend only about 200 feet west from the landfill.

South of the solid waste area, methane, carbon dioxide, and volatiles were found to migrate south of the transfer station road. This plume extended the width of the southern end of the solid waste area and approximately 100 feet south of the transfer station road. The volatile organic compounds detected south of the solid waste area varied from those detected to the north and west. The high concentrations of *cis*-1,2-DCE and vinyl chloride exhibited in the landfill gas north and west of the solid waste area were not present south of the disposal area.

Volatile organics were detected at three permanent residential sampling locations (LFG-LHR, LFG-GT, and LFG-AD). Methane was detected at only one of these (LFG-LHR).

4.2.8.5 Comparison of Field GC Data and Method TO-14 SUMMA Canister Data. As part of the quality control measures incorporated into the landfill gas study, samples of landfill gas were collected and analyzed using both the field GC/PID and fixed-laboratory analysis using method TO-14 GC/Mass spectrometry (GC/MS). Because the compounds detected by the field GC analysis were identified by retention time only on a single chromatographic column, the compound identities were considered tentative. With the more sophisticated method TO-14 analysis, however, there is no uncertainty in the identity of the target compounds detected at concentrations above the quantitation limits. Furthermore, GC/MS data are far less affected by matrix interference than GC data from nonspecific detectors such as the PID. With the GC/MS data, ions arising from target compounds can be selectively searched for and interfering nontarget ions ignored. This cannot be done with GC/PID data.

There were a total of six soil gas sampling points selected for method TO-14 analysis that were also analyzed with the field GC. One sample was collected from the sewage sludge area [SS(08+000)], two samples were collected from the bulky waste area [BW(04+100) and

BW(05+500)], and three samples were collected from the solid waste area [SW(13+300), SW(11+500) and SW(03+300)].

Qualitative Comparison. At sampling point SS(08+000), seven method TO-14 target compounds were detected, four of which were field GC target compounds. A target compound is one that the instrument is calibrated for and would be detected and quantitated if it were present above the quantitation limit in a sample. The concentrations shown in the SUMMA canister analysis were well below the field GC quantitation limits.

At sampling point BW(04+100), a total of 23 method TO-14 target compounds were detected, of which 13 were field GC target compounds. Of the 13 field GC target compounds detected by method TO-14, six were below the field GC quantitation limits and therefore were not reported or quantitated by field GC. Five compounds were detected and quantitated by both methods including *cis*-1,2 DCE, benzene, toluene, ethylbenzene, and *m,p*-xylene. Two compounds, 1,1-DCA and TCE, were detected by method TO-14 above but near the field GC quantitation limits. Because nontarget volatile organic compounds were present in the landfill gas matrix, it was not possible to identify and quantitate 1,1-DCA and TCE in the field gas chromatogram.

At sampling point BW(05+500), 22 target compounds were detected during SUMMA canister analysis, of which 12 were field GC target compounds. Of the 12 field GC target compounds detected, eight were below the field GC quantitation limits and therefore not evaluated in the field GC data. Five compounds were identified by SUMMA canister analysis above the field GC quantitation limits and were also detected in the field GC data. These five compounds were *cis*-1,2-DCE, TCE, toluene, ethylbenzene, and *m,p*-xylene.

The samples collected from the solid waste disposal area at point SW(13+300) were intended to be field duplicates. However, as previously discussed, they were not treated as field duplicates. For the comparison of SUMMA canister data to the field GC data, the results from

the initial SUMMA canister were used because the sampling time for this canister (9:40 AM) was nearest the field GC sampling time of 9:00 AM.

SUMMA canister data from the initial canister collected at point SW(13+300) showed that only 14 method TO-14 target compounds were detected because of the dilution required on this sample. Of the 14 compounds detected, nine were field GC target compounds. Four of the nine field GC target compounds were below the field GC quantitation limits and therefore were not evaluated. Three compounds, vinyl chloride, *cis*-1,2 DCE, and toluene, were detected by both methods. Two compounds, 1,1-DCA and TCE, were detected by SUMMA canister analysis but were not detected by the field GC method. This occurred because the concentration of *cis*-1,2-DCE was so high that the large chromographic peak for this compound obscured the relatively low-concentration, closely eluting peaks for 1,1 DCA and TCE.

At sampling point SW(11+500) on the solid waste disposal area, 24 method TO-14 SUMMA canister target compounds were detected. These 24 compounds included all of the 14 field GC target compounds. Only one compound, 1,1,1-TCA, was detected below the field CG quantitation limit. Eight compounds were detected and quantitated using both methods: vinyl chloride, methylene chloride, *trans*-1,2-DCE, *cis*-1,2-DCE, TCE, toluene, ethylbenzene and *m,p*-xylene. Five compounds were reported from SUMMA canister analysis above the field GC quantitation limits but were not reported in the field GC data. As with sample SW(13+300) the large *cis*-1,2-DCE peak in SW(11+500) obscured the smaller closely eluting peaks for 1,1-DCA, chloroform, 1,1,1-TCA, and benzene. The compound *o*-xylene was obscured by late-eluting, nontarget interfering peaks and could not be evaluated.

The third and last point analyzed by both methods was SW(03+300). A total of 20 SUMMA canister target compounds were detected. Of these 20 compounds, 12 were field GC target compounds. Five of these 12 compounds were below the field GC quantitation limits and could not be evaluated. Six compounds were quantitated by both methods: *cis*-1,2 DCE, benzene,

TCE, toluene, ethylbenzene, and *m,p*-xylene. The compound *o*-xylene was obscured by late-eluting, nontarget interfering peaks and could not be evaluated.

Comparison of the field GC chromatograms and the SUMMA canister chromatograms at each sampling point confirmed that the largest peaks in the field chromatograms have been identified correctly. The relative sizes of these large peaks also appeared to be proportional to the remaining peaks in the chromatograms from each of the two methods.

Quantitative Comparison. Statistical confidence increases as the number of observations or, in this case, data points available increase. For the quantitative comparison, a limited number of data points were available. For this discussion, a data point is the analysis of one sample using both the field GC and the SUMMA canister for one compound. Thus, each of the six sampling locations produces a maximum of 14 data points (there were 14 target compounds for the field GC that were also analyzed using the SUMMA canister). A total of 24 positive results were quantitated by both SUMMA canister analysis and field GC. A total of 38 data points had 0 mg/m^3 values (0,0) for both field GC and SUMMA canister analysis for purposes of quantitative comparison. Fifteen of these values were for compounds that were not detected by both methods. The remaining 23 points of (0,0) were assigned because the SUMMA canister results were detected at concentrations lower than the field GC quantitation limits. The laboratory SUMMA canister results and field results in mg/m^3 were plotted in Figure 4-45, which incorporates the best straight-line fit). The correlation coefficient of the least squares linear regression is 0.927, which demonstrates agreement between the two data sets. However, the graphical results and correlation coefficient across the 62 data points are dominated by only a few very large (greater than 1,000 mg/m^3) values for *cis*-1,2 DCE and vinyl chloride. Vinyl chloride is particularly difficult to analyze for quantitatively because it is extremely volatile and has a boiling point of -13 degrees Celsius. During the reduction of the field data, large variations in the response factor were observed for vinyl chloride. The field GC data for vinyl chloride were approximately an order of magnitude lower than the SUMMA canister data.

When the four largest values are removed, the correlation coefficient drops to 0.633. This plot is shown in Figure 4-46 with the best straight line fit incorporated. The limitations of the field GC method caused by matrix interference, particularly with low concentrations of the early eluting compounds methylene chloride, *trans*-1,2-DCE, *cis*-1,2-DCE, benzene, and TCE, lower the correlation coefficient. Even with those limitations, the correlation is reasonably good.

Plots of the individual quantitations for *cis*-1,2-DCE and toluene, the two compounds most frequently detected, are shown in Figures 4-47 and 4-48. The correlation coefficients are 0.914 for *cis*-1,2-DCE and 0.944 for toluene, demonstrating strong agreement between the field and laboratory results.

Conclusions. The qualitative comparison of the data from the field GC and the SUMMA canister analysis showed that in most cases when a field GC target compound was detected above the field GC quantitation limit by SUMMA canister analysis, it was also detected by the field GC. In some cases, compounds eluting near a high concentration compound could not be detected with the field GC method. The largest peaks were always correctly identified by the field GC method, and the field GC chromatograms correlated well with the method TO-14 chromatograms.

The quantitative comparison was conducted with a limited number of data points. For the 62 data points, there was agreement between the field GC data and the method TO-14 data as demonstrated by a correlation coefficient of 0.927. When the large values that dominate the correlation are removed, matrix interference lowers the correlation coefficient to 0.633. Although *cis*-1,2-DCE elutes early, its high concentration in many samples required dilutions for quantitation, and the matrix interference was also diluted out. Toluene, eluting near the middle of the chromatographic runs, was less subject to interference and also had some high concentrations. The correlation coefficients for *cis*-1,2-DCE and toluene plotted individually demonstrate excellent agreement between the field GC data and the method TO-14 data.

4.2.8.6 Summary of Landfill Gas Data. The field analysis of landfill gas in the sewage sludge area did not indicate the presence of any volatile organic compounds. Methane and CO_2 were found only sporadically. The SUMMA canister analysis showed that acetone was the only compound found above the sample quantitation limit. Some hydrogen sulfide was also detected in the sewage sludge area.

In the bulky waste area, elevated concentrations of methane and CO_2 were detected throughout the central portion of the landfill. Field GC analysis indicated the presence of volatile organic compounds. *cis*-1,2-Dichloroethene, TCE and toluene were detected at nearly all of the points sampled. *trans*-1,2-Dichloroethene, 1,1,1-TCA, benzene, ethylbenzene, *m*-xylene and *o*-xylene were also detected.

SUMMA canister analysis indicated that vinyl chloride, *cis*-1,2-DCE, toluene, benzene, ethylbenzene, *m,p*-xylene, *o*-xylene, styrene, 1,1-DCE, and dichlorodifluoromethane were all major components of landfill gas from the bulky waste area. A number of other compounds were also detected in the SUMMA canister samples but at lower concentrations. The highest concentration of hydrogen sulfide was found in the bulky waste area.

Elevated concentrations of methane and carbon dioxide were detected over the entire solid waste disposal area. The highest volatile organic concentrations were detected using both the field GC and the SUMMA canisters. The volatile with the highest concentration identified in this area was *cis*-1,2-DCE. Trichloroethene and toluene were also major components identified using the field GC. SUMMA canister analysis identified vinyl chloride, *cis*-1,2-DCE, and toluene as the largest components.

The northern and the southern portions of the solid waste area exhibited different groups of volatile organics. In the northern part of the area, chlorinated compounds appear to be the most concentrated. In the southern half of the area, chlorinated compounds were not as prevalent and aromatic compounds appeared in the highest concentrations.

Hydrogen sulfide was detected in all three of the locations sampled in the solid waste area.

One of the flux boxes installed in the solid waste area indicated that high concentrations of landfill gas are venting into the atmosphere.

Mercaptan compounds were analyzed for but not detected in any of the landfill areas.

Permanent and temporary sampling points installed around the perimeter of the solid waste area showed landfill gas migration offsite to the north, west, and south of the solid waste area. Elevated methane, carbon dioxide and volatile organics were measured in these areas. *cis*-1,2-Dichloroethene, toluene, and vinyl chloride were major constituents of landfill gas to the north and west of the solid waste area. Volatile organics were detected at three residential monitoring locations (foundation points), and methane was detected at one of these.

A comparison of field GC and SUMMA canister data indicates that the field GC was able to identify the predominate volatile organic compounds. There were many compounds that the field instrument was unable to identify due to limitations of the field methodology. Quantitative comparisons of field GC and SUMMA canister data indicated a relatively strong correlation between concentrations. This correlation varies considerably, however, depending on the compound being considered, because matrix interferences were more problematic when using the field GC.

4.3 SUMMARY AND SIGNIFICANCE OF FINDINGS

Numerous organic compounds and metals were found in the site study area during this investigation. Most were generally related to wastes deposited in the disposal areas. Volatile organics and metals were the major contaminants found in surface and subsurface soil, leachate, groundwater, surface water, and sediment in the site study area. Landfill gas generated from landfilled waste in the disposal areas was also characterized by elevated methane, carbon dioxide, and volatile organics. These chemicals were also found in several residential wells.

Volatile organics were the most prevalent of the organic compounds detected, and chlorinated (i.e., 1,2-DCE, 1,1-DCA, vinyl chloride, chloroethane) and aromatic (i.e., BTEX compounds) volatiles, and ketones were among the compounds detected more frequently and in higher concentrations.

The nature of landfill waste is such that many different materials containing chemicals can be disposed of, or other chemicals can be generated and subsequently released to subsurface and other media. During landfill operations, the known types of wastes disposed of were sewage sludge and municipal and industrial waste. Furthermore, the types of industrial wastes either documented as being disposed of or found in the solid waste area were a liquid waste containing urethane adhesive and mixed solvents including TCE, MEK, *N,N*-DMF, and toluene. A solid waste adhesive characterized as containing TCE, toluene, and PCE could also have been disposed of. A foreign glue-like waste found along the eastern perimeter of the solid waste area most closely resembled polymethyl acrylate (methyl methacrylate), which is known to be a component of adhesives and laminates.

In surface soil, the detection of organic compounds and metals was dependent on location. The detection of chlorinated volatiles (1,2-DCE, 1,1-DCA, vinyl chloride, chloroethane), aromatic volatiles (BTEX compounds), and ketones in surface soil covering the solid waste and bulky waste areas were primarily related to refuse and landfill gas. Pesticides, PAHs, and phthalates were found less frequently and were more widely distributed, although in the sewage sludge area, the occurrence of pesticides and other organic compounds was more localized. Higher metal concentrations in surface soil were found largely near leachate seeps along the eastern perimeter of the bulky waste area and north and west of the solid waste area. Elevated lead concentrations were more widespread.

The chemical composition of subsurface soil helped to characterize the refuse and wastes in the disposal areas. In the sewage sludge area, subsurface soil containing sludge material (primarily along the eastern perimeter) exhibited elevated metal and low volatile organic concentrations. In the bulky waste area, 6 feet of refuse intermixed with soil contained several organic

compounds. In the solid waste area, at least 20 feet of refuse intermixed with soil was encountered. Pesticides, PAHs, phthalates, PCBs, and metals with elevated concentrations were among the components detected.

The leachate seeps that were found along the perimeter of the bulky waste area and solid waste areas were found to have elevated metal concentrations and a few organic compounds. Particularly along the eastern perimeter of the bulky waste area, the leachate seeps were extensive, and orange floc and stained ground cover were characteristic of the outbreaks.

Numerous organic compounds were detected in the different groundwater flow zones. The types of compounds ranged from volatile organics to compounds that were less volatile and soluble (semivolatiles, pesticides, PCBs) to compounds that were more soluble (water-soluble organics). Of the volatile organics detected in groundwater, chlorinated and aromatic volatiles were frequently and consistently detected in the different flow zones throughout the study period. The highest concentrations were found directly in and to the west and east of the solid waste area. Lower concentrations were found north of and southeast of the solid waste area and east and southeast of the bulky waste area. The detection of *N,N*-DMF west and north of the solid waste area strongly indicates that transport of contaminated groundwater to these areas is occurring. Volatile organics were also found in and downgradient of the sewage sludge area, but inconsistently. East of the Saugatucket River, volatile organics were rarely detected and, when present, concentrations were low. Other organic compounds (i.e., PAHs, pesticides) and elevated metal concentrations were found in groundwater, particularly in and near the solid waste area.

A few organic compounds were found in several residential wells that were sampled, although it is not clear if they are all directly related to the disposal areas. The highest volatile organic concentrations were found in the site owner's wells, which are located between the solid waste and bulky waste areas. Volatile organics as well as other organic compounds were not found in residential wells south of the disposal areas or in the most northern residential well, although

volatile organics were detected in the residential well immediately north of the solid waste area.

In surface water and sediment, organic compounds were not found to exhibit any discernable pattern of distribution. For the most part, a few volatile organics were found in surface water, and less mobile organic compounds such as PAHs and pesticides were dominant in sediment. Elevated metal concentrations in surface water and sediment in Saugatucket River were found downgradient of the bulky waste area near the large leachate seeps. In Mitchell Brook, metal concentrations substantially increased in surface water and sediment south of the transfer station road. In both channels, marked increases in metals coincided with the presence of orange floc and precipitate covering the sediments. Downstream of the confluence of Mitchell Brook with the Saugatucket River, concentrations were lower.

Landfill gas generated in the disposal areas was characterized by elevated methane, carbon dioxide, and volatile organic concentrations. Hydrogen sulfide was also found. In the bulky waste area, the volatile organics in landfill gas were primarily comprised of *cis*- and *trans*-1,2-DCE, TCE, and BTEX compounds. In the solid waste area, numerous volatile organics were found in landfill gas; however, vinyl chloride, *cis*-1,2-DCE, and toluene were the major components. These compounds were also the major volatile organics in landfill gas north and west of the solid waste area. West of the Rose Hill Road, volatile organics were detected on three residential properties.

#9053+
#9054
Rose Hill
3.6
Other #9053a
#9054

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REMEDIAL INVESTIGATION FINAL REPORT

Volume I
Text

Rose Hill Regional Landfill Superfund Site
South Kingstown, Rhode Island

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Prepared by:

Metcalf & Eddy
An Air & Water Technologies Company

#9054

Site: Rose Hill
Break: 3.6
Other: #9054

SECTION 5.0
CONTAMINANT FATE AND TRANSPORT

The nature and extent of chemicals detected in different media at the Rose Hill site study area are discussed in section 4. The extent to which these chemicals have migrated and the expected fate of future migration depends on three principal factors:

- Physical and chemical properties of the contaminants
- Transport processes
- Characteristic properties of the media through which the contaminants migrate

These factors control dominant transport pathways and migration rates of contaminants through different environmental media. For example, the interaction between contaminants and the different media may be affected by the physical adsorption of a chemical onto soil particles or the chemical reactions involving ion exchange between soils and the chemical and water. In addition, mechanical transport processes such as the rate of transport may be affected by the adsorption capability of soils or bedrock fracture zones through which the contaminants migrate. Following a summary of the principal contaminants at the site study area, the predominant transport processes are identified in the following sections.

5.1 SITE CONTAMINANTS

More than 132 chemicals that are potential contaminants, including both organic and inorganic chemicals in surface and subsurface soils, groundwater, leachate, surface water, sediments, and landfill gas, were detected at the site study area. Contaminants were detected in all media with the highest concentrations generally within and downgradient of the disposal areas. Chemicals detected above expected background levels are considered to be contaminants. Although seasonal trends were not evident based on the data collected, variations in the number of chemicals and concentrations detected was observed. Chemicals of concern, a subset of this

group, were selected based on potential toxicity due to elevated concentrations (sections 6 and 7). These chemicals of concern can be separated into different groups based on physical and chemical characteristics. The groups consist of volatile organics, which include chlorinated aliphatics, aromatic volatiles, ketones, and carbon disulfide; water-soluble organics; semivolatile organics, which include PAHs, phthalates, phenols, and pesticides; metals; and other inorganics. Section 5.2 focuses on the physical and chemical properties of these different chemical groups and discusses how these properties affect potential transport processes.

5.2 PHYSICAL AND CHEMICAL PROPERTIES OF THE CONTAMINANTS OF CONCERN

Physical and chemical properties of a contaminant provide information on the behavior of that contaminant in different media. An understanding of these properties helps predict how the contaminant will move (or partition) from one media into another media (i.e., soils into air or groundwater into air). The extent to which a contaminant moves or is transported through the environment is often referred to as mobility. A contaminant that is easily released from a waste source or soils into groundwater, where it is transported into a surface water body and is then volatilized into air, is considered highly mobile. On the other hand, a contaminant that remains strongly adsorbed onto soil particles is considered to have low mobility. In part, the ability of a contaminant to be transported through various media is based on the many types of chemical and physical interactions of that contaminant with the media. Examples of the types of interactions or processes that influence the transport of a contaminant are hydrolysis, volatilization, adsorption, and photolysis. In addition, chemicals undergo different degrees of degradation. Physical and chemical properties of the contaminant affecting these interactions include, but are not limited to, water solubility, partition coefficients, and chemical structure.

This section describes the physical and chemical properties associated with the contaminants and the relationship of these properties to the environmental transport processes and persistence of the various contaminants. Physical and chemical properties for organic chemicals and cyanide are presented in Table 5-1. Physical and chemical properties for metals are presented in

Table 5-2. Each of the properties provides some guidance regarding the expected behavior of the contaminant in a given environment. Only physical state and solubility information are shown for metals, because each metal may possess a variety of different forms (i.e., salts, inorganic and organic complexes) with widely varying physical and chemical properties.

The water solubility of a chemical is defined as the maximum concentration of that chemical that will dissolve in pure water at a specific temperature and pH. The water solubilities of most common organic chemicals fall between 1 and 100,000 mg/L (Lyman et al. 1982). Highly soluble chemicals can be rapidly leached from wastes or contaminated soils and are generally easily transported in water.

Vapor pressure and Henry's Law constant are two measures of chemical volatility. Vapor pressure is a measure of the volatility of a chemical from its pure state at a specific temperature. The vapor pressures of liquids typically range from 0.001 to 760 mm Hg (USEPA 1986a). A higher vapor pressure indicates a greater tendency for movement of a chemical from water or soil into air. A vapor pressure greater than 1 mm Hg is usually characteristic of chemicals having high volatility, whereas a vapor pressure less than 0.01 is characteristic of chemicals with low or very limited volatility.

Henry's Law constant considers the interaction between water solubility and vapor pressure and is an important predictor of a chemical's volatilization from water to air. A large Henry's Law constant (i.e., greater than 1×10^{-3} atm-m^3/mole) indicates a tendency for a chemical to readily move from water into air.

The octanol/water partition coefficient (Kow) represents the distribution of a chemical between octanol and water phases under equilibrium conditions. Octanol/water partition coefficients are usually reported in logarithmic form and represent the tendency of a chemical to move between organic material, such as soil or fish tissue, or organic phases such as nonaqueous-phase liquids, and water. Chemicals with a low log Kow value (i.e., less than 1) tend to remain dissolved in water rather than adsorb onto an organic material and are classified as hydrophilic compounds.

Chemicals with a high log Kow value (i.e., greater than 4) are more likely to remain adsorbed to organic material rather than migrate to water. These chemicals are considered hydrophobic (Lyman et al. 1982).

The organic carbon partition coefficient (Koc) indicates the tendency of an organic chemical to be adsorbed to organic material in soils or sediments. The Koc is largely independent of soil properties. The capacity for a chemical to be adsorbed is a function of the Koc and is directly dependent on the percentage of organic carbon in the soil. A low value indicates that a chemical can easily be leached (desorbed) from soil/sediment to water. A high Koc value indicates that a chemical has a strong affinity to bind to organic material in soil. A chemical with a high Koc value may be of great concern if it is detected in water, as it usually indicates a tendency to bioaccumulate (USEPA 1986a). The typical range of Koc values for organic chemicals is from 1 to 1×10^7 (Lyman et al. 1982). Values of Koc greater than 1,000 generally indicate chemicals with greater adsorption potential. A Koc value between 100 and 1,000 is considered intermediate, while a Koc value less than 100 indicates a low adsorption capability.

Density, mass per unit volume, is a physical parameter that controls the rate of contaminant movement in the subsurface. In natural waters, density and specific gravity are approximately equivalent. If the density of the contaminant is greater than that of water (i.e., greater than 1 g/cm^3), the contaminant will tend to displace groundwater and sink until a horizontal, less permeable barrier is encountered. It will move horizontally along the barrier in the direction of maximum slope. A density less than that of water (i.e., less than 1 g/cm^3), will tend to cause the contaminant to float on the groundwater surface and move horizontally downgradient along the water surface.

The following sections describe how these properties help in characterizing the tendency of the contaminants of concern to be transported through or be retained in specific media in the site study area.

5.2.1 Volatile Organics

In general, volatile organics are nonmethane organic compounds characterized by high vapor pressures and Henry's Law constants, moderate to low Kows, and low Kocs. As a result, these chemicals tend to be very mobile in the environment. In the site study area, volatile organics were the most prevalent and widespread contaminants found.

5.2.1.1 Chlorinated Aliphatics. Chlorinated aliphatics is a term that describes branched or straight-chained alkanes, alkenes, and alkynes that are chlorinated. Chlorinated aliphatics detected at this site include chloroethane, PCE, 1,1-DCA, 1,1-DCE, 1,2-DCE, dichlorodifluoromethane, methylene chloride, TCE, and vinyl chloride.

If released to soils, these chemicals have more of a tendency to leach rapidly to groundwater than to adsorb to soil particles because of low Kocs and high water solubilities. Volatilization from soils, particularly surface or shallow soils, also occurs rapidly because of high vapor pressures and can be a primary removal mechanism from this medium. In addition, vinyl chloride exists in a gaseous state under normal environmental conditions.

Once in groundwater or surface water, chlorinated aliphatics are very mobile because of low Kocs and Kows. A major mechanism for removal of these chemicals from groundwater and even more so from surface waters is volatilization to the atmosphere, as indicated by high Henry's Law constants. Adsorption to sediments does not readily occur. Upon release to the atmosphere, chlorinated aliphatics preferentially exist in a vapor phase, and wet deposition of these chemicals is likely due to large water solubility values.

Chlorinated aliphatics do not readily degrade in the atmosphere. Trichloroethene will degrade slowly in soil and water, though this is not considered a significant removal mechanism (Howard 1990b). The predominant chemicals formed during the degradation of TCE are 1,2-DCE (cis and trans isomers). In general, the dechlorinated aliphatics are relatively resistant to degradation processes (Howard 1990b; ATSDR 1987-1990).

In addition, chlorinated aliphatics are denser than water. If these chemicals are released to aqueous systems in concentrated form, they may migrate vertically through a saturated medium as a separate phase. In this form, these chemicals are referred to as DNAPLS (dense nonaqueous phase liquids). In the site study area, chlorinated compounds were found more often and in higher concentrations than dechlorinated compounds.

5.2.1.2 Aromatic Volatiles. This group of chemicals includes BTEX (benzene, toluene, ethylbenzene, and xylene) compounds. Collectively, aromatic volatiles possess similar physical and chemical properties, which influence their fate and transport throughout natural environments.

In soils, aromatic volatiles have a stronger tendency to leach into groundwater or surface water when in contact with water because of relatively high water solubilities. Volatilization from dry or wet soils is a major removal mechanism, especially from shallow soils. This occurs because of high vapor pressures and Henry's Law constants. A combination of high Kows and moderate Kocs causes aromatic volatiles to reabsorb to soils and sediments while dissolved in water. When in contact with soils, aromatic volatiles may adsorb to the soil surface. The degree of adsorption is primarily dependent on the amount of organic matter present in the soils. Since aromatic volatiles have low Kocs, higher organic matter content provides more favorable conditions under which aromatic volatiles will adsorb to the soils.

In subsurface soils and water, degradation is an important removal process. The rates of degradation in the atmosphere and water and soil systems depend on many variables, including microbial populations, temperature, moisture, and oxygen conditions. Aromatic volatiles are relatively resistant to hydrolysis (Howard 1990b).

Aromatic volatiles are less dense than water. As saturation is reached between these chemical and aqueous systems, or if released in concentrated solutions, these chemicals are lighter than water and will tend to float on top of the water column. When groundwater comes into contact

with the concentrated solutions, dissolution and leaching of the aromatic volatile components occur until saturation in groundwater is reached or exceeded.

In the site study area, aromatic volatiles were detected in all media. In groundwater, these compounds tended to be found in overburden rather than bedrock groundwater, since they concentrate in the upper portions of the water column.

5.2.1.3 Ketones. Acetone and 4-methyl-2-pentanone (MIBK) are part of this group. Acetone is a degradation product of isopropanol (IPA). In the absence of water, ketones are easily volatilized from soils into air due to high vapor pressures. Ketones are readily leached to water systems because of very high water solubilities and low Kocs and Kows. As suggested by low Henry's Law constants, these chemicals would preferentially remain in water systems; however, volatilization is considered the major mechanism of release. Adsorption to sediments or soils from water is unlikely based on low Kocs. Ketones degrade in water and soil over long periods of time.

In the site study area, ketones were found in all media with acetone being one of the most prevalent. Elevated concentrations of ketones in groundwater may be attributed to their high solubility.

5.2.1.4 Carbon Disulfide. Carbon disulfide is a product of anaerobic biodegradation of municipal waste and sludges (Howard 1990a) and occurs naturally under reducing conditions in the environment. Physical and chemical properties of carbon disulfide are similar to those previously discussed; therefore, these chemicals are expected to behave similarly in different environmental media. As suggested by high water solubilities, low Kocs and Kows, carbon disulfide tends to volatilize quickly from soils and waters to the atmosphere. Carbon disulfide leached to groundwater will tend to biodegrade readily (Howard 1990a). In the site study area, carbon disulfide was detected in several media in low concentrations.

5.2.2 Water-Soluble Organics

This group of chemicals includes *N,N*-dimethylformamide and acrylamide. Upon release to the environment, these chemicals tend to be highly mobile aqueous systems. Because of low Kocs and large water solubility, water-soluble organics do not readily adsorb to soil and are easily leached from organic materials to water, where they are expected to biodegrade rapidly in the environment. Volatilization from water or soil is not a major transport mechanism for these chemicals. *N,N*-Dimethylformamide is expected to exist almost entirely in the gaseous phase in ambient air; however, volatilization is not a primary mechanism of release from aqueous environments (HSDB 1992).

In the site study area, *N,N*-dimethylformamide was detected north, west, and east of and at the southern end of the solid waste area. Acrylamide was measured in SW-12. Due to their high solubility, water-soluble organics are highly mobile; however, transport is limited due to rapid degradation.

5.2.3 Semivolatile Organics

High Kocs and Kows coupled with low vapor pressures and Henry's Law constants indicate the tendency of semivolatile organics to be relatively immobile and very persistent in the environment. For the most part, when released to water or soil systems, the major fate of these chemicals is governed by adsorption to soil and sediment, particularly those high in organic materials. In the site study area, semivolatile organics were found in low concentrations in groundwater due to their strong adsorption to soil and low solubility.

5.2.3.1 PAHs. Members of this group consist of PAHs with 2- to 6-ring structures and include 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. In comparison to volatile organics, PAHs strongly adsorb to soils, sediments, and organic materials because of large Kocs and are not easily leached to water systems. Because the smaller-ring PAHs (i.e., napthalenes) have

moderate Kocs, they are slightly soluble in water and may volatilize from water to air to a limited extent. The extent to which napthalenes adsorb to soils largely depends upon the organic content of the soils. PAHs do not reside in the water column, as they preferentially adsorb to soils, sediments, or organic particles quickly. In general, as the number of aromatic rings in the chemical structure of PAHs increases, the affinity for adsorbing to soils and organic materials increases, and solubility and volatilization processes decrease. This is related to increasing Koc and Kow values coupled with decreasing vapor pressures and Henry's Law constants and lower solubility in aqueous systems.

Biodegradation of larger-ring PAHs in waters and soil, although slow, is the major mechanism for the removal of PAHs. Degradation of PAHs in water by photolysis and chemical oxidation are important removal processes (ATSDR 1988a).

5.2.3.2 Phthalates. This group of chemicals includes bis(2-ethylhexyl)phthalate. Upon release to the environment, this chemical will strongly adsorb to soils. Because of high Kocs and Kows and low water solubilities, phthalates are not readily leached to groundwater or surface water. Low vapor pressures indicate that volatilization from soils is not generally significant, although studies have shown that the potential for volatilization from dry surfaces exists for diethylphthalate (Howard 1990a). When present in groundwater or surface water, the major removal mechanism is adsorption to soils or sediments. Low Henry's Law constants indicate that volatilization from water systems is minimal. Phthalates usually biodegrade quickly in waters and soils in the presence of oxygen. Hydrolysis and photodegradation are not considered typical fates for these chemicals.

5.2.3.3 Phenolics. Included in this group are 4-chloro-3-methylphenol, pentachlorophenol, and 4-methylphenol. As indicated by low Kocs and high water solubilities, these chemicals will slowly leach to groundwater or surface waters from soils. Volatilization from soils and water is minimal because of low vapor pressures and low Henry's Law constants. Phenolics biodegrade quickly in soil and water systems under both aerobic and anaerobic conditions to form simple aliphatic alcohol and carboxylic compounds.

5.2.4 Pesticides

Included in this group is dieldrin. Chemical and physical properties of pesticides contribute to the mobility and persistence of these compounds in different environmental media. Dieldrin is one of the most persistent chlorinated pesticides. It is the primary decomposition product of aldrin. The transformation of aldrin to dieldrin does not lessen its toxicity or persistence. High Kow and Koc values, coupled with low vapor pressure and solubility, indicate the relatively low mobility of dieldrin. Dieldrin tends to adsorb to soils, although volatilization and photolysis are known release mechanisms. In addition, adsorption to sediments and bioaccumulation are mechanisms that remove dieldrin from aqueous systems.

In the site study area, pesticides were found in low concentrations in groundwater because of their strong adsorption to soil and low solubility. They were also detected in sediments.

5.2.5 PCBs

Polychlorinated biphenyls, including Aroclor-1260, have been detected in low concentrations at the site, although are not considered chemicals of concern. Collectively, PCBs possess a variety of physical and chemical properties that influence their fate and transport throughout natural environments. In general, PCBs are persistent in the environment and are characterized by low water solubilities, low vapor pressures, low Henry's Law constants and high Kocs. The physical and chemical properties of specific PCB compounds depend on the extent of chlorination and position of chlorine atoms around the biphenyl ring structure. PCBs with a small degree of chlorination generally tend to be less persistent and more mobile in the environment than heavily chlorinated biphenyls. The distribution of PCBs within the environment is, therefore, determined by the properties of individual components of the mixture.

The ability of PCBs to degrade within natural environments also depends on the degree of chlorination. Because PCBs do not readily react with other chemicals, they are considered to be inert and are expected to persist in the environment. In the site study area, Aroclor-1254 was

detected in one soil sample, and Aroclor-1260 was measured in one groundwater sample. The differences in arochlors detected may be related to the properties discussed above.

5.2.6 Nonaqueous Phase Liquids

Nonaqueous phase liquids (NAPLs) are typically defined as hydrocarbons (chlorinated and nonchlorinated) that are not highly soluble in water and exist as a separate fluid phase in aqueous systems. When present in aqueous systems, NAPLs do not readily mix with water, preferentially remaining as a separate phase. NAPLs occur in aqueous solutions when organic contaminant concentrations are high enough to reach or exceed their ability to dissolve in water. Dense NAPLs (DNAPLS) are NAPLs that are denser than water, such as chlorinated organics (i.e., PCBs, 1,1,1-TCA, or TCE). Because they are heavier than water (densities greater than 1), DNAPLS tend to sink in the water column. Light NAPLs (LNAPLS) are NAPLs that are less dense than water, such as aromatic volatiles (i.e., benzene, toluene), fuel, or gasoline. Because they are lighter than water (densities less than 1), LNAPLS tend to float in the water column. Concentrations of NAPL-related chemicals greater than approximately 1% of its water solubility are generally considered to be characteristic of a NAPL source in groundwater and soils (USEPA 1992).

In the site study area, NAPL phases were not measured in groundwater; however, some concentrations detected were greater than 1%.

5.2.7 Metals

Assessing the mobility and persistence of metals in environmental media is complicated and often difficult because of the many inorganic and organic complexes and salts they form. In addition, metals undergo a variety of processes in soils and water, which include hydrolysis, reduction, oxidation, and ion exchange. These reactions are highly dependent on factors such as pH, salinity, ionic strength, particle-surface reactions, and the presence of anions and natural organic acids (humics and fulvics). Many of the metals of concern at this site are relatively insoluble

either in metallic form or as inorganic complexes and salts yet become soluble in the presence of organic acids and oxidizing conditions. An exception is mercury, which is not very soluble in water but will readily volatilize from water to air. Cation exchange of metals by soils and sediments is the dominant fate mechanism in natural systems.

Specifically, elemental iron and various complexes are insoluble in water and tend to partition into sediments. The pure metal is very chemically reactive and in the presence of oxygen and moisture forms iron hydroxide. In the environment, the common valence states of iron are Fe^{2+} and Fe^{3+}. Under reducing conditions, iron is predominantly present in aqueous systems as Fe^{2+}, and in oxidizing conditions Fe^{3+} is the dominant specie. Fe^{2+} is less mobile than Fe^{3+} and tends to complex with ligands and anions. This complexing causes precipitation. The solubility is pH dependent. In water samples, iron may be present in true solution, colloidal state, inorganic or organic complexes, or suspended particulate (Standard Methods 1989). Groundwaters that contain elevated levels of iron usually are low in dissolved oxygen and high in carbon dioxide. The mobility of iron is relatively low in soils, and atmospheric transport is possible but unlikely (USEPA 1985).

In comparison, cations such as barium and manganese are very mobile in natural environments. These cations are easily leached from salts and minerals to water systems due to weathering processes. In water, these cations are dissociated to ionic forms, which tend to remain mobile unless affected by changes in pH or other interactions such as retention by soils through cation exchange reactions.

Specifically, barium is normally found in the valence state of Ba^{2+} and readily forms inorganic complexes with carbonate, sulfate, chloride, nitrate, and hydroxide. Solubility of inorganic complexes varies as $BaCl_2$ is readily soluble, while barium sulfate is insoluble. Dissolution of barium compounds is pH dependent and usually occurs only when concentrations are exceedingly high.

The difference between metal concentrations in unfiltered and filtered samples provides information on the predominant form or species that the metal exists as in groundwater, surface water, and leachate. Higher metal concentrations in filtered samples relative to unfiltered samples indicates that the metal is likely present in a more soluble form. In contrast, where concentrations are low or not detected in filtered samples in comparison to unfiltered samples, less soluble forms are present. Aluminum and iron were found to have a high degree of solubility as were barium and manganese in groundwater and water. Other metals were present in less soluble forms.

5.2.8 Other Inorganics

Ammonia, cyanide, and sulfide are the other inorganics that are predominant at Rose Hill.

5.2.8.1 Ammonia. In the environment, ammonia is a naturally occurring byproduct of microorganisms. Ammonia toxicity is highly dependent upon pH. Ammonia concentration is generally low in groundwater because of ammonia's tendency to adsorb to soils and resistance to leaching. Thus, ammonia is relatively immobile in the environment, and volatilization is low (Standard Methods 1989). In the site study area, concentrations in groundwater and surface water were low.

5.2.8.2 Cyanide. Evaluating the mobility and persistence of cyanide in the environment is as difficult and complex as it is for metals because of the many different forms in which cyanide can exist. In the environment, cyanide is most often found in the forms of hydrogen cyanide or metallocyanides. The form in which cyanide exists is highly pH dependent. At pHs less than 9.2, cyanide usually exists as hydrogen cyanide (USPHS 1988). Cyanide complexes have low to moderate solubility in water, and vapor pressures range from very low to very high. As a result, cyanide can have mobilities ranging from very low to very high. Hydrogen cyanide is generally considered the most mobile form, being easily soluble in water and tending to volatilize readily. Biodegradation is also a viable release mechanism. Cyanide complexed with either metals or anions is generally less mobile and tends to adsorb to soils. In addition, cyanide

complexes are typically denser than water and will sink in the water column as saturation is approached. In the site study area, cyanide was generally not found.

5.2.8.3 Sulfides. Because the chemical and physical properties of sulfides vary widely, the behavior of these compounds differs in various environmental media. In landfills, sulfides are most often found in the form of hydrogen sulfide gas. Anaerobic decomposition of organic matter is the major source of hydrogen sulfide. Although hydrogen sulfide in the atmosphere is present in a gaseous/vapor phase, volatilization is not considered a primary mechanism of removal (USEPAb). Concentrations of sulfides in the site study area were generally low.

5.3 FATE AND TRANSPORT PROCESSES

The predominant transport processes for contaminants identified in the site study area include transport via leachate runoff, landfill gas migration, groundwater flow through the shallow and deep overburden and fractured bedrock, and surface water and sediment movement.

5.3.1 Unsaturated Zone Transport

The primary transport mechanism for contaminant transport in the unsaturated zone is leachate runoff and landfill gas migration. Typically, heterogeneous refuse with varying decomposition rates is deposited and layered with soil in disposal areas. The unsaturated zone is a very active area where many chemical transformations and phases occur. Factors such as organic content, metal oxide species, and soil structure, in addition to waste characteristics, can substantially affect the rate of movement of contaminants through the unsaturated zone. In this zone, partitioning of chemicals between solid or liquid and gaseous phases readily takes place because of physical interactions, including volatilization, solubility, and adsorption, as well as chemical interactions, including hydrolysis, oxidation/reduction, or precipitation. The phase in which a chemical exists in this zone can quickly change and can greatly affect the mobility or persistence of the chemical in the subsurface materials.

In the three disposal areas, sewage sludge and municipal and industrial wastes were landfilled. Following disposal, contaminants move downward through the unsaturated zone (approximately zero to 20 feet below the ground surface within the site study area) until they are immobilized by adsorption onto the soil particles, retained by capillary forces within the soil pore spaces, released to groundwater, or leached via seeps to the surface water receptors. Downward movement through the unsaturated zone is enhanced by the infiltration of water from precipitation or surface water, which mobilizes the more soluble contaminants and produces leachate. Due to the heterogeneous nature of wastes, the chemical composition of the leachate may vary over time.

The main factor contributing to leachate quantity is infiltration. However, other factors, including groundwater and surface water recharge and the water generated as part of refuse decomposition, all contribute to the quantity of leachate generated. Leachate production follows a cyclic pattern depending on local rainfall, runoff, and evapotranspiration rates. Higher leachate production is expected during increased rainfall seasons (spring and fall). The combination of the infiltration of precipitation and the heterogeneous nature of the refuse may result in localized mounding. Subsequently, this mounding effect may result in leachate seeps discharging from landfill areas prior to contact with groundwater. Leachate carries many suspended and dissolved materials; the specific nature and concentration depend on the landfill history as well as its degradation stage.

In addition, volatilization of the waste constituents results in landfill gas migration. The mobility of organic compounds found in landfill gas is dependent on characteristics of the environmental media in which they are retained, as well as chemical and physical properties of the individual components of landfill gas. Molecular diffusion and displacement caused by compaction, settling, pressure changes, and water table fluctuations are mechanisms that affect the rate at which landfill gas is transported through environmental media.

Landfill gas migrates through landfill cover materials by pressure and diffusion flow. Several processes influence pressure and concentration gradients in the cover materials. These processes

include (1) changes in temperature, barometric pressure, and other meteorological variables; (2) changes in soil moisture, which affect the volume of pore space available for gas transport and may influence rates of landfill gas production in deeper zones of the landfill; (3) changes in soil temperature, which affect evaporation/condensation of soil moisture; and (4) major biochemical consumption reactions. If a migration pathway is present near the disposal area, such as an excavated area, the movement of the gas will be facilitated along this pathway. In some cases, this movement may result in the venting of landfill gas to the atmosphere (California Air Pollution Control Association 1990).

5.3.1.1 Landfill Leachate Runoff. Landfill leachate seeps in the site study area were observed at various points along the Saugatucket River, especially east of the bulky waste area. The permeability of the landfill cover material and sand content were noted to be very high, thus facilitating the discharge of leachate. In addition, it was reported that trenches along the slope of the bulky waste area were filled with gravel to facilitate drainage (RIDEM 1992a). Leachate was also observed on the northern portion of the solid waste area, discharging to Mitchell Brook. Leachate seeps were also reported along Rose Hill Road at the northern end of the solid waste area. This discharge may have been enhanced by road and water line construction in that area.

Metal and volatile organic concentrations, especially iron, were elevated in leachate samples relative to background groundwater. The presence of floc in leachate seeps and surface water and orange staining of surface soils provided evidence of the precipitation of iron. This may be due to the presence of an oxidizing environment at the ground surface. Surface water and sediment contamination was evident in samples collected near leachate seeps on the Saugatucket River (SW/SD-04 and SW/SD-05). Further downstream, surface water and sediment contamination decreased (SW/SD-06, SW/SD-17, and SW/SD-18). Soils collected in nondisposal areas near leachate seeps (SS-18, SS-22, and SS-23) exhibited volatile organic and metals contamination similar to that in leachate samples. In addition, soils collected near Rose Hill Road had elevated PAHs and volatile organics. This contamination provides evidence of

contaminant transport by surface runoff from automobile traffic and release from landfill gas to surface soils.

5.3.1.2 Landfill Gas Migration. Landfill gas generation and migration are major mechanisms responsible for transport of volatile contaminants, carbon dioxide, and methane from the disposal areas in the site study area. Typically, carbon dioxide and methane result from microbial degradation of organic wastes. Within the three disposal areas, there appeared to be a direct correlation between the levels of carbon dioxide and methane and an inverse correlation between carbon dioxide or methane and oxygen. Landfill gas migration trends studied included migration of carbon dioxide, methane, and volatile organic compounds. Volatile organic contamination was variable but directly related to carbon dioxide and methane concentrations. Volatile organic contamination primarily consisted of chlorinated volatile organics and aromatics and their degradation products. High landfill gas contamination concentrations were found in the bulky waste and solid waste areas; the permanent points installed north, south, and west of the solid waste area; and temporary points west of Rose Hill Road and north and south of the solid waste area.

In the northwest portion of the solid waste area, the highest landfill gas concentrations occurred in the most elevated and soil-covered areas. Field and flux box measurements indicated that the venting of landfill gas is occurring in uncovered areas of this disposal area. Volatile organic compounds detected in landfill gas were also detected in groundwater north, west, and east and at the southern end of the disposal area. This suggests contaminant transport from soil to landfill gas and groundwater from the solid waste area. Also, a broad area of contamination was found to extend south of the permanent points along the transfer station road, as well as west of Rose Hill Road. The volatile organic contamination in groundwater west of Rose Hill Road (MW-07) is an example of this transport method.

To the west of the solid waste area, several factors may contribute to the migration of landfill gas. The construction of Rose Hill Road and the installation of town water lines to residents along Rose Hill Road may have resulted in conduits through which landfill gas could migrate.

In addition, the road surface may form an impermeable barrier limiting the dispersion of landfill gas to the atmosphere and facilitating lateral migration. The excavation from the sand and gravel operations west of Rose Hill Road likely serves to enhance migration in this direction. South of the solid waste area, the transfer station road may similarly enhance migration of landfill gas.

In the bulky waste area, elevated levels of methane, carbon dioxide, and various volatile organics were measured. Groundwater contamination in downgradient wells indicated the impact of contaminated soil and/or landfill gas on groundwater quality (MW-12 and MW-03).

In the sewage sludge area, low volatile organic contamination was detected, and carbon dioxide and methane concentrations were low, relative to other disposal areas. Although groundwater contamination was low within the disposal area (MW-02), downgradient in MW II contamination was evident.

Within the disposal areas, the primary organic contaminants identified in surface soils were volatile organics. In fill/soil-covered areas, the compounds identified were similar to those encountered in landfill gas and subsurface soil and appear to be related to underlying refuse. As previously discussed, volatile contaminants may be released from subsurface soil or refuse to landfill gas. Diffusion may be an important mechanism controlling the movement of landfill gas to surface soil, since volatile organics appear to be partitioning onto surface soil. Adsorption to soil may, however, be limited by the high permeability and sand content and low organic content of soils. In areas of low vegetative cover and/or limited cover material, landfill gas may be escaping to ambient air as evidenced by field and flux box measurements.

5.3.2 Saturated Zone Transport

The two major factors controlling the transport of contaminants in groundwater through the overburden in the site study area are advection and dispersion. The physical movement of a contaminant plume in a specific direction and at a specific flow rate in groundwater is defined

as advection. Advection is a function of the hydraulic conductivity, the hydraulic gradient, and the porosity of the media.

Increases in the extent (volume) of a plume and decreases in contaminant concentrations of a plume are caused by dispersion. Dispersion is a function of hydrodynamic dispersivity and molecular diffusion. Hydrodynamic dispersivity is a property of the porous matrix and occurs as a result of water flowing around soil particles. It is generally proportional to the groundwater flow velocity. Molecular diffusion is a process whereby a contaminant moves under the influence of its concentration gradient, causing it to move from areas of high concentration to areas of lower concentration. Both dispersion and molecular diffusion result in a dilution of contaminant concentrations.

The transport of contaminants in fractured rock is primarily governed by the same processes that occur in the overburden. These processes consist of groundwater flow (advection and dispersion), molecular diffusion, and chemical transformations. The major factors affecting advective and dispersive transport processes in fractured rock include fracture density and orientation, fracture opening size, and the type of rock matrix (USEPA 1989a). Overall, contaminant transport through fractured rock is a combination of advective and dispersive processes through fracture openings and diffusion of contaminants into and out of the adjacent rock matrix.

The most important factors that affect the extent of contaminant transport by diffusion in fractured rock are the permeability and primary porosity of the rock matrix itself. Diffusion in fractured rock is independent of fractures (USEPA 1989a). For example, contaminated groundwater would be expected to diffuse more easily into sedimentary rock such as a coarse-grained sandstone, which typically exhibits a high primary porosity, than into a metamorphic rock, which has a low primary porosity. Even in rock matrices with low porosities, some diffusion still occurs, although to a lesser extent, temporarily retaining a portion of the contaminated groundwater (Palmer 1988).

Generally, the movement of groundwater and contaminants occurs through fracture openings. Fracture openings are generally found to be very small in size (tens of microns; Freeze and Cherry 1979) and account for less than one percent of the bulk volume of the rock. Velocity of groundwater is directly related to the size of the fracture opening (Grisak and Pickens 1980). The filling of fractures with fine-grained materials or cementing materials such as quartz or clay minerals can reduce or eliminate the porosity and permeability of open fractures (USEPA 1989a).

Adsorption is probably the most important process affecting the transport of contaminants through fractured bedrock. Fracture surfaces generally have small irregularities that can have considerably large surface areas, providing more reactive surface area for adsorption of contaminants to occur.

Downward movement of contaminants into the bedrock groundwater in the site study area is evident from downward vertical gradients between the overburden and bedrock groundwater (section 3) and analytical data (section 4). Because the porosity of the bedrock formation in the site study area is expected to be very low (between 1 and 2%, Freeze and Cherry 1979), diffusion through the rock matrix is not expected to play a significant role in transport of contaminants through the bedrock groundwater. This indicates that advection and dispersion are likely the primary groundwater flow processes controlling contaminant transport through fracture openings in bedrock underlying the site study area.

5.3.2.1 Shallow and Deep Overburden Transport. Shallow groundwater flow is characterized by movement through unconsolidated glacial outwash deposits. Currently, several transport processes are affecting the migration of contaminants in the shallow overburden. These factors include landfill gas migration, infiltration of precipitation, horizontal groundwater movement through the sandy overburden deposits, upward groundwater flow from deeper groundwater systems and the interception of shallow groundwater by surface water bodies. Sections 3 and 4 provide evidence that migration of contaminants is occurring in both the lateral and vertical directions as discussed below. The areal extent of contamination by lateral migration in

groundwater is shown by the elevated concentrations of contaminants in wells directly adjacent to or downgradient of the disposal areas (Figures 4-9, 4-10, and 4-11; MW-11, MW-06, MW-04, MW-12, and MW-03.).

Groundwater flow in the shallow overburden of the site study area is predominately south-southeast, although in the northwest corner of the solid waste area, mounding of groundwater may facilitate radial migration of contaminants. The sand and gravel operations west of Rose Hill Road may also enhance contaminant migration to the west.

As discussed in section 4, contaminant mobility is affected by chemical and physical interactions such as adsorption, partitioning and oxidation/reduction, and soil and refuse layering. These reactions tend to retain contaminants or limit their mobility, thereby increasing the persistence of contaminants in subsurface materials. This is demonstrated by the presence of similar but fewer semivolatile organics, pesticides, PCBs, and inorganic compounds in groundwater within and downgradient of disposal areas.

Chlorinated volatiles are generally quite mobile in aqueous media, although the potential for volatilization, degradation, and adsorption to soils does exist (section 5.2), as evidenced by decreased surface water concentrations relative to shallow groundwater (MW-12-01, SW-04, and SW-05). Semivolatiles were found less frequently and at low concentrations in groundwater and surface water relative to soil and sediment, as expected because of their low mobility (SW/SD-08, SW/SD-11, and BH-07/MW-14).

The volatile organics detected in overburden groundwater were similar to those detected in landfill gas. This is evidenced by groundwater samples collected in MW-07-01, OW-27 and OW-30, where high concentrations of these contaminants in landfill gas are impacting groundwater quality.

Ultimately the groundwater flowing laterally through the shallow overburden aquifer discharges to Mitchell Brook or the Saugatucket River (section 3). As a result, any contamination in

shallow overburden groundwater would be expected to be transported to these surface water bodies. This is indicated by an increase in concentration of contaminants (primarily metals) in surface water downgradient of the disposal areas (SW-03, SW-04, SW-07, and SW-12). In addition, the surface water bodies may intercept groundwater contaminants as evidenced by lower concentrations of contaminants in shallow overburden wells (MW-06-01 and MW-11-01) relative to deep overburden wells (MW-06-02 and MW-11-02) east of Mitchell Brook and adjacent to the solid waste area.

The transport of contaminants in shallow overburden groundwater is dependent on groundwater flow velocity (flow velocity range of 0.07 to 0.24 ft/day, average hydraulic conductivity of 16.43 ft/day, and horizontal hydraulic gradient range of 0.003 to 0.1 ft/ft) and flow direction (south-southeast). As contaminants are transported further downgradient of the disposal areas, concentrations likely decrease to some extent, because of increased diffusion of contaminants to areas of lower concentration as well as dilution by mixing with uncontaminated groundwater. This was demonstrated by a decrease in groundwater contamination in wells further downgradient of the disposal areas (MW-05, MW-10, Resident #7, and Resident #6).

Groundwater flow direction in the deep overburden is also south-southeast towards the Saugatucket River. The range of flow velocity is 0.24 ft/day to 0.59 ft/day, the average hydraulic conductivity is 19.00 ft/day, and the horizontal hydraulic gradient is 0.01 ft/ft. The mechanisms of increased diffusion of contaminants to areas of lower concentration, as well as mixing with uncontaminated groundwater are also active in this groundwater flow system.

The mounding of groundwater in the northwest corner of the solid waste area and the pumping of residential wells north of the site study area may contribute to the contamination detected in MW-13-02, MW-07-01, and OW-30.

The deep overburden flow system is less influenced by surface water interaction as a result of the partially confining conditions created by the less permeable lacustrine stratum that exists between the shallow and deep overburden in the southeastern portion of the site study area

(MW-03, MW-11, and MW-12). These lacustrine deposits consist of horizontal layers of silt and clay sediments between the till and outwash strata, which were found in the southern portion of the site study area below the bulky waste area, along the southeastern side of the Saugatucket River and along the southern edge of the solid waste area. The deposits were absent between the solid waste and bulky waste areas. These deposits thicken to the southeast and were found directly underlying topsoil at MW-10, east of the Saugatucket River.

Where present, lacustrine deposit causes strong upward vertical gradients, as observed east of the bulky waste area and adjacent to the river at MW-12 and limits the mobility of contaminants as a result of the physical interactions between contaminants and the silt and clay composition of the lacustrine deposit.

As discussed earlier, a contaminant's mobility in subsurface materials is affected by chemical and physical interactions (adsorption, partitioning, oxidation/reduction). In general, these reactions tend to retain contaminants and limit their mobility. For example, in one boring installed as a monitoring well (MW-14), fewer contaminants were detected in groundwater than in subsurface soil, demonstrating this phenomenon.

5.3.2.2 Bedrock Groundwater Transport. Fractures in most natural systems have preferred orientations that can be grouped into sets. Two possible fracture orientations were identified at the site study area (section 3; BCI Geonetics 1987). As described in section 3, the fractures are thought to trend both southwest and southeast. Although groundwater generally flows in the bedrock to the southeast, groundwater flow from the solid waste area towards Rose Hill Road may follow the southwest-tending fractures. For bedrock wells west of the site (MW-07 and MW-08), this fracture zone may be a significant pathway for groundwater flow, interactions between the overburden and bedrock groundwater, and contaminant migration. This is further evidenced by the extent of landfill gas migration to these areas. Fractured bedrock southeast and northwest of the solid waste area also contribute to contaminant migration (MW-07-02 and MW-11-03).

Although competent bedrock was observed in the central portion of the site, waste was reported to have been deposited in the solid waste area to the bedrock surface. Contaminants were detected in the bedrock groundwater in this area, which may indicate a lateral flow of contaminants across the bedrock surface (MW-04-03). Predominant bedrock groundwater flow in this area of the site is to the southeast.

The Saugatucket River is not considered a boundary for bedrock groundwater movement to the southeast, although the bedrock surface topographic low, defined immediately west of the river is believed to be a regional bedrock groundwater discharge area. Bedrock residential drinking water wells, east of the river are not currently impacted by site-related contaminants.

The horizontal gradient in the bedrock flow system in the site study area is 0.004 ft/ft. The south-central section of the site study area between the solid waste area and the bulky waste area has a horizontal gradient of 0.006 ft/ft. Average hydraulic conductivity for the bedrock was 2.78 ft/day, and the transmissivity was calculated to be 82.25 ft^2/day.

The topography of bedrock also plays a significant role in the transport of contaminants in groundwater. The topographic high located in the northeast corner of the solid waste area (Plate 1) near MW-04 acts as a recharge area for groundwater. This feature permits rapid infiltration of precipitation to the solid waste area, and subsequently creates the mounding of groundwater around the high because water infiltrates more slowly into the underlying waste. This effect influences groundwater flow direction and contaminant transport north, northeast, and northwest (Residents #2 and #3, MW-07-02, and OW-30).

Contaminant source material still exists in the subsurface in the disposal areas. These sources provide a long-term source of contaminant release to groundwater (USEPA 1989a; Freeze and Cherry 1990). In addition, pumping of residential wells north of the solid waste area (Residential #1, #2, #3, and #4) may have contributed to changes in groundwater flow, which might have affected contaminant migration in bedrock and overburden groundwater. However, the contamination transport may be decreasing because of the cessation of pumping.

5.3.3 Surface Water Transport

In surface water, the dominant factors affecting the transport of contaminants are flow rates, dilution, and evaporation. Generally, inflow to surface water consists of groundwater discharge, surface water runoff, and direct rainfall. Surface water bodies are characterized by large surface areas and considerable loss of volume to the atmosphere from evaporative processes. These processes are common and aid in the reduction of volatile organics as well as in the concentration of other chemicals. Depending on the body of water, transport of surface water to other places by rivers or channels is typical.

Chemical and physical transformations can be significant as water passes from groundwater, rain, or runoff into a body of surface water. Volatilization, precipitation, dissolution, oxidation, reduction, and hydrolysis reactions can be substantial because of mixing processes and aeration as well as changes in pH and partial pressures. In addition, changes in dissolved organic matter and the presence of microbial activity in the water column can also facilitate transformations such as adsorption onto sediments or organic particles and biodegradation of contaminants. In particular, groundwater discharging into a surface water body undergoes many of these reactions, resulting in loss of chemicals to the atmosphere, precipitation of organic or inorganic complexes (especially metals) from the water column, and adsorption of contaminants to sediments and organic materials.

In the site study area, the main surface water bodies impacted by the disposal areas are the Saugatucket River and Mitchell Brook. The data collected during the groundwater-surface interaction study (section 3.2) with regard to the fate and transport of potential contaminants along the Saugatucket River and Mitchell Brook are summarized below.

The study indicates that groundwater is discharging to the Saugatucket River. The chemical data support this, since the contaminants detected in the Saugatucket River are similar to those detected in the shallow overburden wells (MW-12-01 and SW/SD-04 and SW/SD-05).

Volatile organics were generally detected in the Saugatucket River at lower concentrations than in upgradient wells in the shallow overburden (SW-04 and SW-05 and MW-12-01 and MW-03-01). This decrease may be attributed to volatilization of these contaminants from surface water as well as dilution. Similarly, metals concentrations in the shallow overburden, particularly in wells MW I, II, III, IV, and V, were also detected at lower concentrations in the surface water, with highest concentrations found in SW-03, SW-04, and SW-05. In addition, discharge of groundwater and leachate to surface water may be an important contaminant transport mechanism. For example, SW-04 and SW-05 are directly east of the bulky waste area and downgradient of the leachate seeps. Metals concentrations decreased further downgradient (SW-17, SW-18, and SW-06), which indicated a localized area of discharge of contamination to the Saugatucket River adjacent to the bulky waste area. Exposed refuse may also release contaminants to surface runoff.

As discussed in section 3, shallow and deep groundwater is discharging to Mitchell Brook. Contaminant transport from the solid waste area toward Mitchell Brook was evident in OW-30 and MW-04. Both volatiles and metals associated with the solid waste area were found in Mitchell Brook. Lower concentrations in the surface water (found in SW-09 and SW-15) result from volatilization, retention by soil, and dilution by uncontaminated surface water.

5.3.4 Sediment Transport

Transport of sediments depends on the velocity of the surface water and the grain size of the sediment. The velocity of the water must be sufficient to allow suspension of finer silt and clay particles or movement of larger-sized sediments along the bottom. The ability of a stream to transport sediment is also dependent on channel shape, shape and degree of sorting of sediment particles, the amount of suspended load, and water temperature.

Chemical data collected from the sediments in the site study area indicated the presence of elevated concentrations of metals, particularly in the Saugatucket River downgradient of the sewage sludge and bulky waste areas (SD-03, SD-04, and SD-05). These data coincide with

high concentrations found in leachate discharging at this area. While low organic and high sand content in sediments facilitates transport of contaminants from groundwater to surface water, some retention of less soluble organics in sediments may be occurring since these compounds were detected more often in sediments than in associated surface water. The low velocity of the river in this area may cause local deposition of contaminated sediment. These concentrations decrease further downgradient before the river merges with Mitchell Brook (SD-17 and SD-18). Although the low organic composition of sediments at the site would enhance downstream contaminant transport, semivolatile contamination in sediments adjacent to Saugatucket Road (SD-11 and SD-08) may be indicative of runoff from the road surface. Semivolatile organics were not detected in upgradient sediments and the presence of these compounds in SD-11 and SD-08 may not be attributable to site contamination.

5.4 CONTAMINANT MIGRATION TRENDS

Chlorinated and aromatic volatiles, ketones, and metals were the major contaminants found in the site study area. Although seasonal trends were not evident based on the data collected, variations in the number of chemicals and concentrations detected were observed. The current extent of contamination and the hydrogeologic characteristics of the site suggest the following migration trends:

Leachate

- Numerous leachate seeps were noted along the Saugatucket River east of the bulky waste area and the northern portion of the solid waste area along Mitchell Brook.
- Discharge of leachate was facilitated by high permeability of cover material and manmade trenches along the Saugatucket River and road and water line construction.
- Contamination of surface soil, surface water, and sediment by metals was evident near areas of leachate seeps along the Saugatucket River.

Landfill Gas

- Various organic compounds, consisting primarily of chlorinated and aromatic volatiles, were predominately found in the solid waste and bulky waste areas. Migration of landfill gas containing methane, carbon dioxide, and volatile organics to the north, west, and south of the solid waste area was evident.

- Road and water line construction west and south of the solid waste area and the sand and gravel operations to the west may enhance landfill gas migration.

- Release of landfill gas to the ambient air was evident in the solid waste area where no cover material (fill/topsoil) was present.

- Methane, carbon dioxide, and volatile organic contamination in the sewage sludge area was low relative to that in the other disposal areas.

- For chlorinated and aromatic volatile organics, diffusion from landfill gas and adsorption to surface soils act to restrict contaminant movement. However, volatilization of organic compounds from subsurface soil and disposal area contents to landfill gas and subsequent adsorption to surface soil or release to the ambient air may also be occurring.

Overburden Groundwater

- Highest concentrations of contaminants were found in wells and in areas adjacent to disposal areas. Contamination decreased with distance from these areas. This is most likely caused by retention of contaminants and dilution of contaminated groundwater as it comes into contact with uncontaminated groundwater downgradient (south-southeast).

- Mounding of groundwater in the northwest corner of the solid waste area and residential well pumping may have facilitated the radial migration of contaminants to the north, east, and west.

- The interception of contaminants by Mitchell Brook and the Saugatucket River may have decreased the contamination in the shallow overburden groundwater in nearby wells east of these water bodies.

- Glacial lacustrine deposits, which cause strong upward vertical gradients in the deep overburden, tend to restrict vertical movement from the deep overburden to

shallow overburden, as evidenced by higher contaminant levels in deep overburden wells relative to adjacent shallow overburden wells.

- Retention of contaminants by soil may be an important factor in limiting mobility. Fewer, less-soluble compounds were detected in groundwater than in subsurface soil.

- The layering of subsurface soils with refuse may limit vertical and enhance horizontal migration of contaminants.

- Contaminants found in the shallow overburden groundwater flow system discharge to the surface water along most of the Saugatucket River adjacent to the site study area. The greatest outlet for the shallow groundwater and hence contamination was along the eastern edge of the bulky waste area.

Bedrock Groundwater

- Groundwater moves through a network of fractures tending both southwest and southeast. This facilitates contaminant transport to bedrock northwest and southwest of the disposal areas.

- In the central and eastern portions of the site, contaminant transport may be lateral along the dipping bedrock surface.

- The bedrock topographic high in the solid waste area contributes to the mounding in the northwest corner of this area.

- Highly fractured bedrock west and south of the site study area allows interaction between overburden and bedrock groundwater.

- Lateral transport of contaminants in bedrock groundwater from west of the Saugatucket River to residential wells east of the river was not clearly evident.

Surface Water

- Contaminants primarily associated with the solid waste area found in the shallow overburden groundwater flow system discharge to the surface water along the lower reaches of Mitchell Brook as evidenced by contaminant levels detected south of the transfer station road.

- Contaminant transport to and from groundwater in the shallow, deep, and bedrock flow systems is possible along the northern reaches of Mitchell Brook because of the thin saturated overburden and bedrock high located in this area.

- High runoff may result in groundwater discharges and increased sediment loading caused by erosion, especially in areas of exposed refuse.

Sediment

- Low organic and high sand content in sediment facilitates transport of contaminants from groundwater to surface water. However, some retention of less soluble organics in sediments may be occurring since these compounds were detected more often in sediments than in associated surface water.

- The contamination of sediments increased in areas of leachate outbreaks along the Saugatucket River.

- The low velocity of surface water in many areas may decrease downstream contaminant transport.

Section 6.0
HUMAN HEALTH RISK ASSESSMENT

A variety of chemicals were detected at the Rose Hill site study area, as discussed in section 5. Most of these chemicals are likely to be related to waste disposal activities conducted at the site. This section is intended to estimate and present the risks to human health posed by site contaminants. The assessment is for baseline conditions -- those that exist presently and those that may exist in the future in the absence of any remedial action. Risks to the environment are considered separately, in section 7.

6.1 HAZARD IDENTIFICATION

This subsection describes the source of data used to characterize contamination at the site study area, describes calculations of average and maximum concentrations, and presents the selection process by which 55 chemicals were identified as the chemicals of concern at the site study area.

6.1.1 Source of Data

Baseline risks associated with the site study area are estimated based on site data presented in sections 2 through 5. Analytical data from several media at the site study area, collected over the course of several sampling rounds during the RI field investigation (section 2), were used to identify chemicals of human health concern and to evaluate site risks. Six rounds of RI data are incorporated in this baseline risk assessment. These data are presented in section 4. However, the sixth round of groundwater data was not incorporated in the risk assessment tables but is discussed in the uncertainty section. In addition, SUMMA canister data collected in February, March, and May 1993 by the USEPA Environmental Services Division (ESD) from residential areas in the site study area were incorporated in this baseline risk assessment. The data used include chemical data from surface soils, leachate, groundwater monitoring and residential wells, surface water, sediments, landfill soil gas, ambient residential air, and indoor residential air.

Other potential sources of data for the site are generally out of date, do not include analyses for as many chemicals, and do not cover the entire site. Previously collected data include groundwater monitoring well analyses for volatile and heavy metals from 1981 through 1984 and surface water, sediment, leachate, and soil samples from 1987 and 1988 (ATSDR 1990). The groundwater data are 7 to 10 years out of date, relative to data from this RI. The surface water, sediment, and soil samples were considered of inadequate quality by the Agency of Toxic Substances and Disease Registry, which reviewed the data (ATSDR 1990). Leachate was adequately sampled in this RI, so supplementation with 1978 to 1988 data is not necessary. None of these previously collected data are included in the quantitative assessment of risk.

6.1.2 Landfill Characteristics

The layout of the site study area is shown in Figure 6-1. Landfills typically contain a wide variety of organic and inorganic chemicals, some relatively mobile, others relatively immobile. The Rose Hill site study area contains potentially hazardous materials from both household and commercial waste sources. Among the commercial and industrial wastes that may have been disposed of at the site (section 4.1) were trichloroethene (TCE) and *N,N*-dimethylformamide (*N,N*-DMF).

As noted in section 4.1, the three disposal areas are the major known potential sources of contamination in the area. Portions of the site study area may have been used for agriculture, resulting in the application of pesticides, herbicides, and fertilizers.

Some contaminants at the site study area may have been transformed by microbial degradation from other chemicals. For example, chemicals such as *cis*-1,2-dichloroethene and vinyl chloride may be biodegradation products of TCE or tetrachloroethene (PCE). Although the biodegradation products may not have been disposed of at the site, their presence may be attributed to biological processes acting on household, commercial, or industrial waste in the disposal areas. Most of the disposal areas are covered with a layer of soil. However, this soil does not prevent migration of some disposal area contaminants. For instance, water-soluble

organics may leach from the fill contents into underlying groundwater. Volatile chemicals present in the disposal areas may move with gases generated within the fill to locations beyond or above the disposal area boundaries.

6.1.3 Selection of Representative Data

The arithmetic average and the maximum detected concentrations were used to represent environmental concentrations in each of the exposure equations developed for evaluating risks at the site study area or portions of the site study area. For the purpose of selecting chemicals of human health concern, site study area concentrations were represented by site-wide maximums in each of the media. For the purpose of estimating exposures and risks, average and maximum concentrations of chemicals of concern, utilized in each exposure scenario, were derived from selected data sets. These data sets are presented in Appendix E-1. Average and maximum concentrations are presented in tables referenced in section 6.3.

The maximum concentration for each chemical utilized in the exposure assessment was selected as the highest level detected, including the higher of any pair of duplicate samples. To determine overall average concentrations, the arithmetic mean of all selected samples was calculated by first averaging across sampling rounds for each sampling location, and then averaging across sampling locations. The variation in concentrations over the five rounds probably reflected seasonal or weather patterns and could not be attributed to long-term trends. No one round included all sampling points, so averaging data across sampling rounds was selected as the best method to develop representative data for average conditions. Analytical protocols were consistent between rounds and between locations, so the data are considered comparable. Each measured concentration has associated uncertainty. The uncertainty associated with nondetected concentrations was addressed as described below especially where detection limits are high.

If a particular chemical was not detected at a certain location and sampling round, one-half of the sample quantitation limit was used, for purposes of calculating the overall average

concentration. The exception was that the average concentration is considered to be zero if no detected concentrations occurred for a particular chemical within a set of sampling locations. Where the calculated average concentration exceeded the maximum detected value (due to high detection limits), the maximum value was used in the exposure assessment in place of the calculated average concentration. Samples with field duplicates were averaged to represent the concentration at one point. Samples collected at nearly the same location on two different dates were considered as separate samples.

Data that are not used in this human health risk assessment include analytical data rejected during data validation and analytical data rejected in the process of further evaluation of data quality, as presented in section 2.6.2. Methylene chloride was among the compounds judged to be nondetected during data validation. In samples which had detected concentrations, this determination, which followed EPA Region I data validation criteria, was due to the presence of this common laboratory contaminant in laboratory blanks. However, the presence of related chlorinated volatiles in site soil and groundwater suggests that this chemical may potentially be considered as a site contaminant in accordance with recent data useability criteria (USEPA 1992b). The presence of methylene chloride in landfill gas samples also supports the potential presence of methylene chloride in other site media. However, based on the data validation criteria adopted at the outset of this study, methylene chloride was not included as a contaminant in site media, with the exception of landfill gas and residential ambient and indoor air, in the quantitative risk evaluation. No additional data were rejected during the risk assessment. Appendix E-1 describes how the available analytical data are used to represent environmental conditions at each of three disposal areas.

6.1.4 Selection of Chemicals of Concern

This subsection provides the rationale for the selection of the chemicals of concern (COCs) that adequately characterize the potential for noncarcinogenic effects and carcinogenic risks associated with human exposures to the contaminated environmental media at the site study area. Surface soils, subsurface soils, leachate, groundwater (in monitoring wells and in residential

wells), surface water, sediments, and landfill gas/soil vapor were sampled at the site study area during the RI. Each of these media was evaluated separately to identify chemicals of concern, except that subsurface soils were not evaluated for the risk assessment, due to the expected absence of exposures noted in section 6.3.2.

The general criteria and procedures used to identify the chemicals of concern for each of these media are described below. Appendix E-2 shows how the final list of chemicals of concern was determined through the application of a combination of specific criteria.

Methane typically makes up the largest volume of landfill gases. Methane is a colorless, tasteless, and odorless gas that originates from the natural decomposition of organic matter. Methane is not a toxic gas and therefore is not considered in the health risk assessment. Methane gas in the presence of a sufficient concentration of oxygen and an ignition source, can be ignited and burned. When a sufficient amount of methane gas (approximately 5-15% methane mixed with air) is found in a confined space, an explosion may occur. In rare cases, significant volumes of methane can displace available oxygen inside a building or confined space, causing possible asphyxiation. Methane is also lighter than air and can be associated with other landfill gases, emitting to the atmosphere.

Methane is present in portions of the site study area. It has been detected migrating to the west to adjacent properties and in at least one case, detected within the basement of an adjacent dwelling. A methane monitoring program is in place at the site. This program consists of alarms at 2 homes on the site study area, along with fire department monitoring and response as warranted.

6.1.4.1 Selection Criteria. The process of selecting COCs consisted of selecting all chemicals that exceed MCLs in groundwater, selecting chemicals of historical concern at the site study area, excluding some nutritionally essential minerals, excluding chemicals found only at low frequency, and conducting a relative comparison of the toxicity of chemicals to the concentrations found at the site study area. As noted in Appendix E-2, site concentrations could

not be compared to background concentrations with adequate statistical power, so no chemicals were excluded from consideration based on a comparison to background.

Comparisons to Standards. Chemicals that exceeded available standards were included as COCs. Federal drinking water standards were used for this purpose. No chemicals were screened out on the basis of the comparison to standards. Screening based on standards was not conducted for media other than groundwater. The comparison to standards is detailed in Appendix E-2.

Chemicals of Historical Concern. The only chemical identified as being of historical concern at the site study area is *N,N*-DMF. It was selected as a COC in the three media in which it was detected: surface water, groundwater, and water in residential wells.

Essential Nutrients. Several minerals that are essential nutrients and of low toxicity were excluded from the list of COCs. This exclusion is described in Appendix E-2.

Frequency. In most cases, chemicals detected in less than 5% of samples within any one of the media were excluded from the list of COCs. Exceptions are the chemicals included based on criteria listed above (such as those exceeding MCLs) and chemicals detected in residential wells.

Concentration-Toxicity Screening. The concentration-toxicity screening procedure presented in the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)* (USEPA 1989b) was used to identify those chemicals most likely to contribute significantly to risks associated with human exposure to contaminated media. Each chemical detected was assigned a risk factor based on the maximum concentration of the chemical in an

environmental medium and the toxicity criteria for the chemical. The following equation was used:

$R_i = C_i \times T_i$, where

R_i = Risk factor for chemical i in the environmental medium,

C_i = Maximum concentration of chemical i in the environmental medium, and

T_i = Toxicity value for chemical i in the environmental medium, i.e., either the slope factor (for carcinogenic risks) or the inverse of the reference dose (1/RfD, for noncarcinogenic risks)

The ratio of the risk factor for each chemical to the total risk factor for all chemicals is designated the relative risk for that chemical. (Carcinogens and noncarcinogens are evaluated separately.) Chemicals demonstrating a relative risk value less than 0.01 for both carcinogenic and noncarcinogenic risks were not selected as COCs, with exceptions as noted in Appendix E-2. As a result of updating the toxicity data through November 1993, it was decided that compounds would not be dropped from the list of COCs if the relative risk value dropped below 0.01 based on the updated toxicity data. On the other hand, if the relative risk value rose above 0.01, the compound was added to the list of COCs.

Ambient air and indoor air from residential areas in the site study area were sampled during the remedial investigation by USEPA ESD. Because only volatile organic compounds were analyzed for in ambient air and indoor air, all chemicals detected which were not rejected during the evaluation of data quality were included as COCs for residential ambient and indoor air.

6.1.4.2 Chemicals Selected. Chemicals analyzed and detected at the site study area include volatile organics, semivolatile organics, chlorinated pesticides, PCBs, metals, cyanide, ammonia, and sulfide. Chemicals selected as COCs for each of the media investigated are presented in Appendix E-2.

Table 6-1 shows the COCs for the surface soil, groundwater, leachate, surface water, sediment, residential wells, landfill gas/soil vapor, residential ambient air, and residential indoor air. There are 20 COCs for surface soils, 27 for groundwater, 14 for leachate, 8 for surface water, 15 for sediment, 13 for residential wells, 18 for landfill gas/soil vapor, 9 for residential ambient air, and 1 (vinyl chloride) for residential indoor air. These lists overlap such that there are 55 COCs among the various media. The remainder of the quantitative risk assessment, which follows, includes these 55 COCs only.

6.1.5 Toxicity Summaries

In this section, the toxicity of the COCs is briefly presented. More detailed toxicity information is provided in Appendix E-3.

6.1.5.1 Volatile Organics. These chemicals are readily absorbed into the body. Many volatile organics, including benzene, toluene, ethylbenzene, xylenes, trimethylbenzenes, chloroethane, methylene chloride, vinyl chloride, 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE), and carbon disulfide, can cause central nervous system depression (NIOSH 1990). Benzene and vinyl chloride are known carcinogens in humans, while methylene chloride, 1,1-DCA, 1,1-DCE, and TCE are suspected to be human carcinogens, based on information from animal testing (USEPA 1993a). In experimental animals, chronic exposure to toluene, ethylbenzene, xylene, acetone, 4-methyl-2-pentanone (MIBK), methylene chloride, 1,1-DCA, 1,1-DCE, 1,2-DCE, TCE, 1,1,1-trichloroethane (TCA), vinyl chloride, trichlorobenzenes, and carbon disulfide caused liver and/or kidney toxicity or weight changes in these organs (Appendix E-3). Acetone can cause the skin to be dry and irritated following exposure, but acetone is not otherwise known to be harmful to humans, except at high concentrations. Likewise, dichlorodifluoromethane can cause a decrease in coordination, but is not known to be toxic except at high concentrations.

6.1.5.2 Polycyclic Aromatic Hydrocarbons. While the pattern of physical properties of PAHs is closely related to the ring structure of each compound, the toxicities are more irregular.

Chemical mixtures containing PAHs are linked to a variety of effects, including skin cancer, lung cancer, gene mutation, and noncarcinogenic effects. PAHs with two or three aromatic rings (e.g., naphthalene and phenanthrene) have negligible carcinogenic activity, whereas many PAHs with four to six aromatic rings are carcinogenic (Wilson et al. 1988).

Six of the PAH compounds selected as COCs are carcinogenic. Among the six, benzo(a)pyrene and benzo(a)anthracene tend to show the greatest toxicity in a variety of tests related to carcinogenicity; benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indenopyrene are also carcinogenic. Some carcinogenic PAHs, such as benzo(a)pyrene, can destroy sebaceous glands in the skin and affect the immune system. There is little toxicologic data on 2-methylnaphthalene; however, it is not expected to be any more toxic than the noncarcinogenic PAHs that were dropped on the basis of the concentration-toxicity screen.

6.1.5.3 Non-PAH Semivolatiles. Exposure to 4-methylphenol (*p*-cresol) can lead to a variety of toxic effects, including mucous membrane irritation and neurotoxicity; it may act as a skin cancer promoter and is classified as a possible human carcinogen (Group C). Bis(2-ethylhexyl)phthalate has been linked to liver damage, cancer, and reproductive organ damage in experimental animals. No toxicologic information specific to 4-chloro-3-methylphenol was located. Pentachlorophenol is another Group B2 carcinogen. Acrylamide is a probable human carcinogen and is neurotoxic. The principal health impact of *N,N*-DMF is toxicity to the liver.

6.1.5.4 Pesticides. The only pesticide selected as a COC is dieldrin, a chlorinated insecticide that disrupts insect nervous system functioning. Dieldrin may be carcinogenic in humans. While dieldrin may also cause nervous system effects in mammals, toxicity occurs to the liver, kidneys, and immune system at low-level chronic doses.

6.1.5.5 Metals. Some of the metals that are COCs have been identified as potentially carcinogenic in an occupational environment. In many cases, the chemical form and physical nature of metals to which workers are exposed (i.e., metal fumes or electroplating solutions in

a reduced ionic state) are not comparable to metals in the environment to which the public is exposed (i.e., dissolved, mineralized, and adsorbed metal ions in soil and groundwater). Among the metals, those most often of concern for environmental exposures in urbanized areas include cadmium, lead, and mercury.

Aluminum is known to be a problem only in infants with reduced renal function, but is otherwise not known to be toxic. Excess antimony affected muscle control, blood pressure, and blood composition in experimental animals. Arsenic exposures by inhalation are associated with lung cancer, while arsenic levels in potable water appear to be associated with skin cancer; other ingestion exposures are linked to toughening of the skin, blood cell changes, limited blood circulation, and damage to liver, kidneys, and nerves. Ingestion of soluble barium compounds can cause muscle stimulation, increase blood pressure, and affect reproductive organs in animals. Beryllium causes skin damage from direct contact and berylliosis (a lung disease that may include chest pain and weight loss) from chronic inhalation.

Cadmium is associated with lung cancer, kidney effects, and hypertension when inhaled; kidney damage is the critical effect from oral exposures. Chromium, in forms such as chromic acid and chromate salts, is carcinogenic, ulcerative, and irritating; however, most environmental exposures are to chromium in its less toxic forms. Cobalt may cause heart disease when regularly ingested. Copper causes gastrointestinal distress at high concentrations in water.

Lead is best known as a toxin of the developing and established nervous system; it also affects blood chemistry and reproduction. Manganese has local effects when it is inhaled; it can also affect the central nervous system and the reproductive system. Neurotoxicity and kidney damage at low doses are the important known toxic effects of inorganic mercury. High doses of nickel may affect the immune system. Selenium may cause adverse alterations in skin, nails, hair and teeth, but also may protect against some carcinogenic effects and toxicity of some other metals. Thallium has several effects, including hair loss, paralysis, and gastrointestinal irritation. Toxic effects from vanadium are typically respiratory effects associated with inhalation exposures, not

ingestion exposures. Zinc is an essential nutrient; in medical use, high doses of zinc can reduce iron levels in blood.

6.1.5.6 Inorganics. Ammonia is a highly irritative alkaline compound. While hydrogen sulfide is a strong irritant, little toxicity information is available on other sulfide compounds.

6.1.6 Toxicity Profiles

Toxicological properties of the chemicals of concern are provided in Appendix E-3 to give background information on the derivation of public health standards and to present dose-response information. References used to obtain toxicity data include:

- The Integrated Risk Information System (IRIS; USEPA 1993a)
- *Health Effects Assessment Summary Tables* (HEAST; USEPA 1993b)
- USEPA health effects assessment (HEA) documents
- Toxicological profiles published by the Agency for Toxic Substances and Disease Registry (ATSDR)
- *Health Advisories for 25 Organic Chemicals* (USEPA 1987c)
- Additional secondary sources.

Tabulated toxicity data, including the oral reference dose (RfD), reference concentration (RfC), critical effect, weight of evidence, oral cancer slope factor, and inhalation unit risk of each COC, are presented in Table 6.2.

6.2 DOSE-RESPONSE ASSESSMENT

This section identifies the values used to quantitatively evaluate exposures modeled in section 6.3. Any potential exposures to contaminants under baseline conditions in the site study

area may recur over a long period of time. USEPA chronic reference doses (RfDs) and slope factors are appropriate for evaluating potentially long-term exposures. Reference doses and slope factors used in this assessment were taken from IRIS (USEPA 1993a), with supplementary data from HEAST (USEPA 1993b).

6.2.1 Noncarcinogenic Toxicity

The values for reference doses are generated by the USEPA based on the assumption that threshold levels exist for noncarcinogenic health effects (USEPA 1989b). The chronic RfD is defined as the daily exposure level for humans, including sensitive subpopulations, that is unlikely to result in adverse health effects over a lifetime of exposure. Each RfD is derived from a study in either humans or the most sensitive animal species from which the lowest observed adverse effect level (LOAEL) or the no observed adverse effect level (NOAEL) was determined. The development of the RfD includes application of an uncertainty factor and a modifying factor.

To calculate the RfD, the appropriate NOAEL or the LOAEL (if a suitable NOAEL is not available) is divided by the product of all of the applicable uncertainty and modifying factors. The RfD is generally considered to have uncertainty spanning an order of magnitude or more, and thus the RfD should not be viewed as a strict scientific demarcation between what is and is not a toxic level. The USEPA Region I approach for developing RfDs for PAHs was followed. This approach uses the reference dose for naphthalene for most PAH compounds that lack both an RfD and suggestive evidence of carcinogenicity. The RfD is used for comparison with calculated intake levels as discussed in section 6.4.

A reference concentration (RfC) is the concentration at which daily exposures for humans, including sensitive subpopulations, is unlikely to result in adverse health effects, over a lifetime of exposure. For this site, RfCs are used for inhalation exposures, and RfDs are used for ingestion and dermal exposures. Chronic reference doses, inhalation reference concentrations, and critical effects are presented in Table 6-2.

In order to determine the media-specific noncancer health hazard, it is assumed in the risk characterization that the effects of noncarcinogenic chemicals are additive when the effects are similar. Hazard indices of chemicals with similar toxic endpoints are summed separately when the total media-specific hazard index is high. Therefore, chemicals are grouped with respect to toxicity. Chemicals producing the same toxic effect or targeting the same internal organ are placed in the same group. The toxic endpoint(s) considered are those listed in IRIS (USEPA 1993a) or HEAST (USEPA 1993b); these are typically selected by USEPA as the toxic effects noted in the study or studies from which the RfD was derived. Below is a list of COCs grouped by common toxic endpoints, first for oral exposures and then for inhalation exposures.

6.2.1.1 Similar Toxic Endpoints for Oral Exposures

Liver toxins: acetone, ethylbenzene, toluene, bis(2-ethylhexyl)phthalate, pentachlorophenol, *N,N*-DMF, dieldrin, methylene chloride, 4-methyl-2-pentanone, and 1,1,1-trichloroethane

Kidney toxins: acetone, ethylbenzene, toluene, 4-methyl-2-pentanone, pentachlorophenol, cadmium, and mercury

Nervous system toxins: xylenes, 4-methylphenol, acrylamide, lead, and manganese

Weight reducers: dichlorofluoromethane, xylenes, and nickel

Red blood cell effects: *cis*-1,2-DCE, zinc

Blood serum effects: *trans*-1,2-DCE, antimony, thallium

6.2.1.2 Similar Toxic Endpoints for Inhalation Exposures

Liver toxins: dichlorodifluoromethane, methylene chloride, 4-methyl-2-pentanone, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, and *N,N*-DMF

Kidney toxins: 1,1-dichloroethane, and 4-methyl-2-pentanone

Nervous system toxins: toluene, lead, manganese, and mercury

Fetal and developmental toxins: carbon disulfide, chloroethane, ethylbenzene, and barium

Respiratory irritants: manganese and ammonia

6.2.2 Carcinogenicity

The USEPA defines the slope factor for carcinogenic risk as a plausible upperbound estimate of the probability of carcinogenic response per unit intake of a chemical over a lifetime (USEPA 1989b). Slope factors are often modeled from animal testing. In some cases, as with benzene, the slope factor was calculated by the USEPA from existing human epidemiologic data. The USEPA weight of evidence refers to evidence of carcinogenicity, with Group A signifying a known human carcinogen and Group D signifying no classification (see Appendix E-3). The unit risk is defined as a plausible upperbound estimate of the probability of carcinogenic response per unit concentration for a lifetime exposure. The slope factor and the unit risk for various carcinogens provide a relative measure of the strength of a carcinogen, with a larger slope factor or unit risk indicating a more potent carcinogen. Although the actual potency of a carcinogen may differ from the estimate, no quantitative estimate of uncertainty is given. Slope factors and unit risks for the chemicals of concern are shown in Table 6-2.

6.2.3 Dose-Response Data Gaps

The following are data gaps in the dose-response evaluation that contribute to uncertainty in the risk evaluation.

1) Oral RfDs have not been established for chloroethane, trimethylbenzenes, 2-methylnaphthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, sulfide, or several carcinogenic chemicals.

2) Inhalation RfCs have not been established for acetone, 1,1-DCE, 1,2-DCE, trimethylbenzenes, 2-methylnaphthalene, 4-methylphenol, 4-chloro-3-methylphenol, aluminum, antimony, cobalt, copper, lead, nickel, selenium, thallium, vanadium, zinc, sulfide, or several carcinogenic chemicals.

3) Oral slope factors have not been developed for three COCs that may be oral carcinogens in humans: 1,1-DCA, 4-methylphenol, and lead.

4) Inhalation unit risks have not been established for 1,1-DCA, several carcinogenic PAHs, bis(2-ethylhexyl)phthalate, 4-methylphenol, pentachlorophenol, or lead.

5) The oral slope factor for benzo(a)pyrene is used as the oral slope factor for five other carcinogenic PAHs detected, since it is the only PAH with a verified slope factor, and it is among the more toxic.

Chemicals of concern for which there are neither RfDs nor slope factors are omitted from the quantitative risk evaluation. These include chloroethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 2-methylnaphthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, and sulfide. With the exception of chloroethane, these chemicals also do not have RfCs or inhalation unit risks. Since these chemicals may contribute to adverse effects, they are included in the toxicological profiles in Appendix E-3 and considered qualitatively in the section presenting the risk characterization and in the discussion of uncertainty.

6.3 HUMAN EXPOSURE ASSESSMENT

In this subsection, the types and magnitudes of exposures to the contaminants identified as chemicals of concern in the site study area are evaluated. The analysis includes consideration of exposures from current land use and proposed future land use. The actual or potential routes of exposure are identified, exposed populations characterized, and the degree of exposure estimated. Section 6.4 combines the results of the exposure assessment with chemical-specific toxicity information to quantify potential risks associated with the site study area.

6.3.1 Identification of Potentially Exposed Populations

As is noted in section 3, the town of South Kingstown, Rhode Island, had a total population of 24,631 in 1990. Approximately 400 residents live within 1 mile of the site study area. Most of the land around the disposal areas is zoned for residential use. Some of these residents live

along the roads that border the site study area, and there are two residences near the center of the site study area. The densely settled villages of Peace Dale and Wakefield are approximately 2 miles south of the site study area, and the University of Rhode Island is approximately 2.5 miles northwest of the site study area.

Currently, a large portion of the site study area is used for organized small game hunts, the boarding, breeding, training and showing of hunting dogs, skeet and target shooting, and stocking and periodic release of small game birds. There is also a sand and gravel operation west of the site study area. There are no commercial agriculture operations adjacent to the site study area. No sensitive demographic groups (i.e., school children or nursing home residents) have been identified in the immediate vicinity of the site study area.

Surface water bodies in the area are used recreationally. The Saugatucket River, which runs southward along the eastern edge of the site study area, is a Class B surface water, suitable for both fishing and swimming. Approximately 1 mile south of the site study area is Saugatucket Pond, which is accessible for public use. Mitchell Brook, which runs south through the site study area, may also be used for recreational purposes; specifically, it may be regularly waded across. Mitchell Brook is too small for much swimming or fishing.

6.3.2 Identification of Exposure Pathways

A complete exposure pathway has three necessary components: (1) a source of chemical release to the environment, (2) a route of contaminant transport through an environmental medium, and (3) an exposure or contact point for a human receptor. Figure 6-2 shows exposure pathways that may exist at a landfill. Some of these are expected to be nonexistent or insignificant at the site study area. Tables 6-3 and 6-4 illustrate the selection of pathways for quantitative evaluation, under current and future land use, respectively. Scenarios were developed for all complete exposure pathways that could result in significant exposures to the previously identified populations. This included focusing on the most sensitive receptors of the population who would most likely be exposed to site contaminants.

6.3.2.1 Current Potential Exposures. The site study area has a number of residences around the periphery of the solid waste area including two houses that are partly surrounded by the disposal areas. In addition, the site study area is used privately for hunting of released game birds; see section 6.3.1. Many of the adjacent residences have private water supply wells; use of these wells has been discontinued. However, for risk assessment purposes, use of these wells as a source of potable water is considered as a current potential exposure. The site is readily accessible to children and adults who may be either local residents, visitors, hunters, or trespassers. Regular activities of visitors to the site study area may currently include driving on dirt tracks, hunting, and walking on the surface of each of the three disposal areas. These upland visitors may be exposed to contaminants in surface soil, leachate, and any landfill gas/soil vapors released from the disposal areas. The Saugatucket River, nearby, is used by fishermen. Occasional activities in the Saugatucket River may include wading, canoeing, and fishing. Activities in Mitchell Brook may include wading. The waders and swimmers may be exposed to any contaminants that have moved from the disposal areas into Mitchell Brook or the Saugatucket River; off-site exposures to sediment and surface water contaminants are likely. Nearby residents may also be exposed to any contaminants that have moved from the disposal areas into residential ambient air or indoor air; residential exposures to contaminants in ambient air and indoor air are likely. Any of these activities could occur for the duration of a person's residence, and thus are considered as chronic exposures.

6.3.2.2 Future Potential Exposures. Future potential exposures are assumed to be equivalent to current exposures. However, future indoor air exposures could also include inhalation exposure to vinyl chloride at 220 Rose Hill Road where the previous dwelling was demolished due to high indoor air contamination. It is assumed that indoor air concentrations of vinyl chloride sampled at 220 Rose Hill Road before the dwelling was demolished represent potential future indoor air contamination. In addition, future exposures may include consumption of groundwater from areas surrounding the disposal areas. It is assumed that groundwater as sampled by the monitoring wells represents water that could be used as drinking water in the future. Evaluation of exposures from potential future uses of the site study area is made with the conservative baseline assumption that no cleanup of the site will be undertaken.

6.3.2.3 Incomplete Exposure Pathways. Tables 6-3 and 6-4 identify several substantially incomplete exposure pathways. These include exposures to subsurface soil, ingestion of leachate and water in Mitchell Brook, ingestion of sediments, dermal absorption of sediment contaminants, and ingestion of fish. Dermal absorption and inhalation of contaminants in groundwater used as a potable water supply are considered to be adequately accounted for by the conservative assumptions used to evaluate ingestion of groundwater.

Contact with subsurface soils in the vicinity of and in the disposal areas is not expected since development of these areas will not include excavation, and visitors are not expected to be exposed to subsurface material. The leachate seeps and Mitchell Brook are too shallow for significant ingestion of leachate or surface water to occur in these areas. Dermal contact with and ingestion of sediments from the bottom of Mitchell Brook and the Saugatucket River is not anticipated because sediments would normally be rinsed off hands by the surface water and incidental ingestion would not occur. Fish in the Saugatucket River are not expected to be significantly contaminated by chemicals from the disposal areas; this issue is discussed in Appendix E-4. USEPA Region I evaluates only ingestion of groundwater (USEPA 1992c); dermal and inhalation routes are considered to be adequately addressed by the use of conservatism in ingestion assumptions.

6.3.2.4 List of Exposure Pathways Evaluated Quantitatively. Potential exposure pathways selected to quantitatively evaluate exposures of the public to the COCs at the site study area are as follows:

- **Present, future** incidental ingestion of surface soils by site visitors (adults): solid waste area
- **Present, future** incidental ingestion of surface soils by site visitors (adults): bulky waste area
- **Present, future** incidental ingestion of surface soils by site visitors (adults): sewage sludge area

- **Present, future** incidental ingestion of surface soils by site visitors (children): solid waste area

- **Present, future** incidental ingestion of surface soils by site visitors (children): bulky waste area

- **Present, future** incidental ingestion of surface soils by site visitors (children): sewage sludge area

- **Present, future** dermal absorption of surface soil contaminants by site visitors (adults): solid waste area

- **Present, future** dermal absorption of surface soil contaminants by site visitors (adults): bulky waste area

- **Present, future** dermal absorption of surface soil contaminants by site visitors (adults): sewage sludge area

- **Present, future** dermal absorption of surface soil contaminants by site visitors (children): solid waste area

- **Present, future** dermal absorption of surface soil contaminants by site visitors (children): bulky waste area

- **Present, future** dermal absorption of surface soil contaminants by site visitors (children): sewage sludge area

- **Present, future** dermal absorption of leachate by site visitors (adults): solid waste area

- **Present, future** dermal absorption of leachate by site visitors (adults): bulky waste area

- **Present, future** dermal absorption of leachate by site visitors (adolescents): solid waste area

- **Present, future** dermal absorption of leachate by site visitors (adolescents): bulky waste area

- **Future** ingestion of site groundwater, as sampled from monitoring wells, as a source of potable domestic water (by adults): solid waste area

- **Future** ingestion of site groundwater, as sampled from monitoring wells, as a source of potable domestic water (by adults): bulky waste area

- **Future** ingestion of site groundwater, as sampled from monitoring wells, as a source of potable domestic water (by adults): sewage sludge area

- **Present** ingestion of groundwater from residential wells (by adults)

- **Present, future** incidental ingestion of Saugatucket River water, by swimmers (adults)

- **Present, future** dermal absorption of Saugatucket River water, by swimmers (adults)

- **Present, future** incidental ingestion of Saugatucket River water, by swimmers (adolescents)

- **Present, future** dermal absorption of Saugatucket River water, by swimmers (adolescents)

- **Present, future** dermal absorption of Mitchell Brook water (by adults)

- **Present, future** dermal absorption of Mitchell Brook water (by adolescents)

- **Present, future** inhalation of outdoor air based on landfill gas contaminants as measured by Summa canisters (by adults): solid waste area

- **Present, future** inhalation of outdoor air based on landfill gas contaminants as measured by Summa gas canisters (by adults): bulky waste area

- **Present, future** inhalation of outdoor air based on landfill gas contaminants as measured by Summa canisters (by adults): sewage sludge area

- **Present, future** inhalation of residential ambient and indoor air based on ambient air contaminants as measured by Summa canisters (by adults)

- **Future** inhalation of residential indoor air based on indoor air concentrations of vinyl chloride as measured at the former 220 Rose Hill Road dwelling by Summa canisters (by adults)

For exposure pathways that are considered for both future and present scenarios, the present exposure is considered representative of future exposures. Except as noted, these exposure pathways are developed as chronic exposures to adults. Appendix E-1 describes which data were selected to represent site conditions for each detailed exposure scenario.

6.3.3 Evaluation of Exposure Intake

Exposure assumptions and dose equations presented in USEPA guidance, and the environmental concentrations measured for each of the media, are used to estimate chemical intake for the exposure pathways identified above. Dose equations were developed using equations given in *Risk Assessment Guidance for Superfund: Human Health Evaluation Manual* (USEPA 1989b) and USEPA Region I's *"Supplemental Risk Assessment Guidance for the Superfund Program"* (SRAG; USEPA 1989c). USEPA's "Standard Default Exposure Factors" (USEPA 1991c) was the primary document used for exposure assumptions; it was supplemented with SRAG (USEPA 1989c) and USEPA's *Dermal Exposure Assessment: Principles and Applications* (USEPA 1992d). Several site-specific exposure assumptions were also made; these are described in this subsection.

Direct measurements of chemical concentrations were used to represent environmental concentrations for all exposure pathways. However, exposure point concentrations for ambient air at the disposal areas were modeled from direct measurements of chemical concentrations in landfill gas/soil vapor at each disposal area. Direct measurements of chemical concentrations in residential ambient and indoor air were used to assess these exposure pathways. Selection of direct measurements to represent exposure conditions is described in Appendix E-1.

6.3.3.1 Current Exposures. Potential exposures to several media are associated with recreational use of the site study area. While in the site study area, individuals can be exposed to site contaminants from dermal contact with leachate and both incidental ingestion of and dermal contact with surface soils. In the adjacent waterways, individuals can be exposed to site contaminants via incidental ingestion and dermal absorption of stream water contaminants. Additional routes of potential exposure to site visitors and/or site residents are ingestion of contaminants present in groundwater used as a potable water supply and inhalation of outdoor or indoor air that may contain landfill gas/soil vapor contaminants.

Exposure dose equations and exposure assumptions for all ingestion and dermal contact exposure routes are presented in Figures 6-3 through 6-8.

Individuals can currently be exposed to site surface soils through ingestion and dermal contact. Assumptions and exposure equations for the ingestion of and dermal contact with surface soils are presented in Figures 6-3 and 6-4. Since the disposal areas are directly adjacent to homes, readily accessible to nearby residents, and frequently used by visitors, a high frequency of exposure is assumed. Dermal absorption from site soils is evaluated for VOCs, PAHs, and inorganics, following 1989 USEPA Region I guidance (USEPA 1989b); these analytes would not be evaluated for dermal absorption under more recent USEPA Region I guidance. The following conservative exposure parameters were considered for a site visitor who might be exposed to these soils:

1) The exposure frequency is assumed to be 150 days per year. This frequency corresponds to site visits an average of three days per week for 50 weeks per year.

2) Ingestion and contact with surface soils for any individual is concentrated in only one of three areas at the site.

3) Standard USEPA ingestion assumptions for soil are adopted.

4) A soil contact rate of 500 mg/day is assumed.

An area resident visiting the site study area is assumed to contact site leachate 3 days per week, 8 months per year. This exposure is considered both for 7 years of adolescence and a 30-year adult residency in the area. Since the leachate seeps are located in areas that are difficult to access, in wooded areas along the streams, it is assumed that the receptor is either an adolescent or an adult. Dermal contact with leachate is assumed to be with the hands and feet (a total of 1800 cm^2 of skin surface) for 1 hour on each day exposed. Assumptions and exposure equations for the dermal absorption of leachate contaminants are presented in Figure 6-5.

Ingestion of site groundwater as a source of potable water is considered as both a potential present and potential future exposure pathway. This pathway is evaluated even though use of on-site groundwater is unlikely. Groundwater sampled from residential wells is also evaluated as a potential present source of drinking water for residents in the area. Exposure to groundwater is considered quantitatively only for ingestion, in accordance with USEPA Region I policy. The ingestion rate for water is assumed to be two liters per day for 30 years of residence, in accordance with standard USEPA assumptions. Figure 6-6 presents the assumptions and equations used to estimate intake via the ingestion of groundwater.

The Saugatucket River, which flows past the sewage sludge and bulky waste areas, is used for fishing and possibly swimming. Exposure to Saugatucket River contaminants via fish ingestion appears to be negligible, as evaluated in Appendix E-4. Swimming may occur on a limited basis in the river and is evaluated here. The swimming duration is assumed to be 1 hour per day. The swimming frequency is assumed to be 10 times per year, which has been cited as an average swimming frequency for the northeastern U.S. (USDOI 1973). Swimming is likely to occur less frequently because large ponds and bathing beaches on the Atlantic Ocean are available nearby for swimming. The swimming exposure scenario also assumes the following:

1) Incidental ingestion of 50 mL of water (about 10 teaspoonsful) per hour of swimming is assumed.

2) Dermal absorption of chemicals from the Saugatucket River would occur over the entire skin surface area, (16,000 cm^2 for an adolescent and 18,000 cm^2 for an adult).

3) Dermal absorption of chemicals in water is estimated using chemical-specific dermal permeation constants, where available from the USEPA.

Assumptions and exposure equations for the ingestion of and dermal contact with Saugatucket River surface water are presented in Figures 6-7 and 6-8. Exposure to Saugatucket River contaminants via fish ingestion is evaluated in Appendix E-4. Dermal contact with Mitchell Brook surface water is also considered. No ingestion of Mitchell Brook water is anticipated.

Wetted skin surface area would be similar to the skin surface area evaluated for exposures to leachate (i.e., hands and feet).

An area resident visiting the site study area is assumed to inhale contaminants released to ambient air with landfill gas/soil vapor from the disposal areas for 150 days per year, for a 30-year residency in the area. Outdoor exposures are assumed to last 4 hours per day. Ambient air concentrations at the disposal areas are modeled from landfill gas/soil vapor measurements, using two different screening models described in Appendix E-5. Air concentrations are compared to reference concentrations, so conversions based on inhalation rate and body weight are not used.

Landfill soil gas emissions and dispersion in ambient air from the three disposal areas were calculated using a conservative screening model and a simple conservative box model, respectively. Because results of the conservative screening model showed elevated landfill soil gas emissions at the solid waste area and bulky waste area, a more detailed analysis of the soil gas emissions at these two disposal areas was generated as a preliminary Feasibility Study task. These refined landfill gas emission rates for the solid waste area and bulky waste area are incorporated in this baseline risk assessment, and landfill soil gas emissions for the sewage sludge area are based on the conservative screening model.

An area resident is assumed to inhale contaminants in ambient air released with landfill gas/soil vapor from the disposal areas for 350 days per year, for a 30-year residency in the area. It is assumed that an area resident is away from home 2 weeks per year. Exposures may be indoors or outdoors; however, indoor exposure concentrations are assumed to be the same as outdoor exposure concentrations (USEPA 1989c), and are assumed to last 24 hours per day. For this evaluation of an area resident, it is assumed that this receptor is not the same receptor for the evaluation of an area resident visiting the site. Air concentrations are compared to reference concentrations, so conversions based on inhalation rate and body weight are not used.

6.3.3.2 Future Exposures. Future exposures to the residents of existing homes, to site visitors, and to users of the Saugatucket River are expected to remain consistent with present exposures. Changes in land use could result in additional or increased exposure. However, significant changes in land use are not expected.

Groundwater, as sampled from on-site monitoring wells, is evaluated as a potential future source of drinking well water for current or future residents of the area, although municipal water is now available along main roads in the area. Evaluation of consumption of on-site groundwater is conservative because installation of drinking water wells immediately adjacent to the disposal areas is unlikely. Exposure to groundwater is considered quantitatively only for ingestion. The ingestion rate for water is assumed to be 2 liters per day for 30 years of residence, in accordance with standard USEPA assumptions. Figure 6-6 presents the assumptions and equations used to estimate intake via the ingestion of groundwater.

Indoor air concentrations of vinyl chloride at the former 220 Rose Hill Road dwelling are evaluated for potential future indoor air contamination based on the assumption that a future dwelling may be constructed at this location. The prior dwelling was demolished due to elevated indoor air contamination. Evaluation of potential future indoor air contamination based on vinyl chloride concentrations detected at the former 220 Rose Hill Road dwelling may be conservative. This is because the earth floor and fieldstone wall construction of this former dwelling may have resulted in high vinyl chloride concentrations in indoor air at this residence. New construction would be expected to minimize potential infiltration from soil. At this location, it is assumed that a future area resident is exposed to indoor air by inhalation 350 days per year, for a 30-year residency in the area. Indoor air exposures are assumed to last 24 hours per day. Air concentrations are compared to reference concentrations, so conversions based on inhalation rate and body weight are not used.

6.3.3.3 Exposure Routes Not Evaluated Quantitatively. No exposures are evaluated qualitatively. The minimal risk from exposures by fish ingestion is described in Appendix E-4.

For a discussion of other potential exposure routes, see section 6.3.2.3, Incomplete Exposure Pathways, and section 6.5, Limitations and Uncertainty.

6.3.4 Calculation of Dose

Dose is estimated for each of the quantified exposures using both the average and maximum concentrations, as required by USEPA Region I (USEPA 1989c). The average-case scenario and the reasonable maximum exposure (RME) scenario, as defined by USEPA Region I (USEPA 1991d), are generated by incorporating average and maximum concentrations, respectively. The two sets of calculations result in a range of exposures and risk estimates that allows for some consideration of uncertainty. Data summary tables showing the average and maximum concentrations selected from all available data sets are presented in Tables 6-5 through 6-20.

Dose calculation estimates for each exposure pathway are included in Tables 6-21 through 6-82, with odd-numbered tables representing doses calculated from the average concentrations, and the subsequent even-numbered tables representing doses calculated from the maximum concentrations.

6.4 RISK CHARACTERIZATION

The risk characterization discussed below is presented in three parts: 1) a description of risk characterization terms and methodology, 2) a comparison of the estimated ingestion and dermal doses with available reference doses for noncarcinogenic hazards and slope factors for the calculation of increased lifetime cancer risks, 3) a comparison of the estimated time-averaged inhalation concentrations with available reference concentrations for noncarcinogenic hazards and unit risks for the calculation of increased lifetime cancer risks, and 4) an evaluation of risks from chemicals for which there are no such quantitative dose-response data available. The characterization of risk focuses on exposures to the chemicals of concern for each of the pathways identified in the exposure pathway screening.

6.4.1 Risk Characterization Method

The objective of this subsection is to estimate the potential for adverse human health effects under the exposure scenarios defined in section 6.3.3. USEPA guidelines for the use of risk-additive models are used to combine the risks for individual chemicals in order to estimate the cumulative risks for the mixtures found at a particular site, assuming that the toxicologic endpoints are the same. This section characterizes the process by which carcinogenic and noncarcinogenic risks in the site study area are quantified.

6.4.1.1 Estimation of Noncarcinogenic Effects. Potential health risks other than cancer, resulting from ingestion and dermal exposures to site contaminants are estimated by comparing the chronic exposure dose to the chronic oral reference dose. If the ratio of the exposure dose to the RfD for any chemical exceeds one, there may be a health risk associated with exposure to that chemical. The dose/RfD ratio is not a mathematical prediction of the severity or probability of toxic effects, but it indicates the potential for adverse effects. The ratio of the exposure dose to the RfD is sometimes referred to as the hazard quotient (HQ). Oral RfDs are used to evaluate dermal exposures, since dermal RfDs have not been established.

Potential health risks, other than cancer, resulting from inhalation exposures are estimated by comparing a time-averaged air concentration to the chronic inhalation reference concentration. The ratio of the air concentration to the reference concentration is also a hazard quotient. If this HQ exceeds one, there may be a health risk associated with inhalation exposures.

The summation of HQs for several compounds is called a hazard index (HI). A total HI for any exposure route is calculated by summing the dose/RfD or concentration/RfC ratios (HQs) for all the individual chemicals of concern. To provide a better indication of risks when the total HI exceeds one, HQs are summed according to the target organ affected (e.g., the HQs for chemicals affecting the liver are summed separately from HQs for chemicals affecting the nervous system). The target organ(s) or toxicity endpoint(s) of concern, as identified in section 6.2.1, are limited to those that are specified in IRIS (USEPA 1993a) or in the *Health*

Effects Assessment Summary Tables (USEPA 1993b) as the endpoint of concern for the RfD or the RfC. For exposures to soils, the hazard indices for the dermal and ingestion route may be added to get media-specific HIs. The noncarcinogenic risk calculations for the site are included in Tables 6-21 through 6-82.

6.4.1.2 Estimation of Cancer Risk. Increased lifetime cancer risk from ingestion or dermal exposure to carcinogens is calculated by multiplying the lifetime route-specific dose by the route-specific carcinogenic slope factor. This calculation is considered valid only at low risk levels (less than $1x10^{-2}$), where a linear relationship is expected by USEPA (USEPA 1989b). Ingestion slope factors were used to assess cancer risk from dermal contact, since slope factors for dermal exposure have not been developed.

The estimate of increased individual lifetime cancer risk is an expression of the individual's likelihood of developing cancer as a result of exposure to a carcinogenic chemical. This likelihood is in addition to an individual's risks incurred by everyday activities. The risk (e.g., $1x10^{-6}$ or a 1 in 1,000,000 chance) can also be applied to a given population to estimate the number of excess cases of cancer that could be expected to result from exposure. The level of increased cancer risk considered negligible is widely debated, but the USEPA has adopted a risk range of 10^{-4} to 10^{-6} for use at Superfund sites. The potential cancer risk calculations for the site study area are included in Tables 6-21 through 6-82.

The estimated total cancer risk from exposure to multiple chemicals and exposure routes is the summation of the risk for the individual chemicals and exposure routes. Risks from multiple chemicals can be calculated in this manner under the assumption that there are no antagonistic or synergistic effects between chemicals. Also, cancer risks from various exposure routes to each medium are additive, if the exposed populations are the same (USEPA 1986a). These assumptions are problematic. For instance, some carcinogens may interact in roles as cancer "initiator" or "promoter." Skin cancer from arsenic and leukemia from benzene may not be equally serious or life-threatening, so addition of risks may not be entirely appropriate. Also, it may not be entirely appropriate to sum risks from a human carcinogen (e.g., vinyl chloride)

with risks from a possible human carcinogen (e.g., 1,1-DCA) (USEPA, 1989b). Nevertheless, summing risks across individual chemicals indicates total site risks.

6.4.2 Quantitative Risk Assessment Results

Calculated risk estimates, arranged by media, are summarized in this section.

6.4.2.1 Surface Soil Exposures (Present and Future). Potential risks to a site visitor resulting from ingestion and dermal exposures to surface soils are estimated for adults and children for each of the three disposal areas. These risks are presented separately in Tables 6-21 through 6-44, and in combination in tables referenced in section 6.4.4.

The total hazard index associated with the ingestion and dermal absorption of chemicals in solid waste area soils is less than 1.0, based on both the average and maximum concentrations, for both adults and children. The total cancer risk for these exposure routes (combining additively both ingestion and dermal absorption, and additively combining child and adult exposures) is calculated as 5.5×10^{-6}, based on average concentrations, or 1.1×10^{-5}, based on maximum concentrations. Both the average and the RME risk estimates are within the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

The total hazard index associated with the ingestion and dermal absorption of chemicals in bulky waste area soils is less than 1.0, based on both the average and maximum concentrations, for adults. However, the total hazard index associated with the ingestion and dermal absorption of chemicals in bulky waste area soils is greater than 1.0, based on both the average and maximum concentrations, for children. The elevated hazard index is associated with ingestion exposures only. Based on average concentrations, the hazard index for nervous system toxins is 1.5, and based on maximum concentrations, the hazard index for nervous system toxins is 6.7. Both the average and the RME risk estimates are above the USEPA's target hazard index of one. Excess risk is associated with manganese. The total cancer risk for these exposure routes (additively combining ingestion and dermal adsorption, and additively combining child and adult exposures)

is calculated as 3.7×10^{-6}, based on average concentrations, or 4.7×10^{-6}, based on maximum concentrations. Both the average and the RME risk estimates are within the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

The total hazard index associated with the ingestion and dermal absorption of chemicals in sewage sludge area soils is less than 1.0, based on both the average and maximum concentrations, for both adults and children. The total cancer risk for these exposure routes (combining additively both ingestion and dermal absorption, and additively combining child and adult exposures) is calculated as 2.0×10^{-6}, based on average concentrations, or 2.2×10^{-6}, based on maximum concentrations. Both the average and the RME risk estimates are within the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

6.4.2.2 Leachate Exposures (Present and Future). Potential risks to a site visitor resulting from dermal exposures to leachate are estimated for adults and adolescents for each of the two disposal areas (solid and bulky waste areas) where leachate was observed. These risks are presented separately in Tables 6-45 through 6-52.

The total hazard index associated with the dermal absorption of chemicals in solid waste area leachate is less than 1.0, based on both the average and maximum concentrations, for both adults and adolescents. The total cancer risk for this exposure route (considering adult and adolescent exposures separately) is calculated for an adult as 1.7×10^{-7}, based on the one available sample. For an adolescent, cancer risk is calculated as 4.8×10^{-8}. These risk estimates are below the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

The total hazard index associated with the dermal absorption of chemicals in bulky waste area leachate is less than 1.0, based on both the average and maximum concentrations, for both adults and adolescents. The total cancer risk for this exposure route (considering adult and adolescent exposures separately) is calculated for an adult as 3.0×10^{-8}, based on average concentrations, or 1.2×10^{-7}, based on maximum concentrations. For an adolescent, cancer risk is calculated as 8.4×10^{-9}, based on average concentrations, or 3.3×10^{-8}, based on maximum concentrations. Both

the average and the RME risk estimates are below the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

6.4.2.3 On-Site Groundwater Exposures (Future). Potential risks to a future resident resulting from ingestion of site groundwater are estimated for adults drinking water from each of the three disposal areas. These risks are presented in Tables 6-53 through 6-58.

The total hazard index associated with the ingestion of chemicals in solid waste area groundwater would be greater than 1.0, based on both the average and maximum concentrations. Based on average concentrations, the hazard index for nervous system toxins would be 32. Based on maximum concentrations, the hazard indices for nervous system toxins, kidney toxins, and red blood cell effects would be 85, 2.2, and 2.7, respectively. The total cancer risk for this exposure route is calculated as 9.4×10^{-3}, based on average concentrations, or 2.8×10^{-2}, based on maximum concentrations. Both the average and the RME risk estimates are above the USEPA's target hazard index of one and its target range of 10^{-6} to 10^{-4} lifetime excess cancer risk. Several chemicals contribute to these estimated risks. The greatest risks are associated with vinyl chloride and acrylamide. Arsenic, beryllium, 1,2-DCE, cadmium, manganese, and zinc also contribute significantly to the potential risks.

The total hazard index associated with the ingestion of chemicals in bulky waste area groundwater would be greater than 1.0, based on both the average and maximum concentrations. Based on average concentrations, the hazard index for effects of antimony (reduced life span, blood glucose, cholesterol effects) would be 1.3, and the hazard index for nervous system toxins would be 8.8. Based on maximum concentrations, the hazard indices for antimony and for nervous system toxins would be 7.2 and 54.8, respectively. The total cancer risk for these exposure routes is calculated as 1.2×10^{-4}, based on average concentrations, or 5.8×10^{-4}, based on maximum concentrations. Both the average and the RME risk estimates are above the USEPA's target hazard index of one and its target range of 10^{-6} to 10^{-4} lifetime excess cancer risk. Excess risks are associated with antimony, beryllium, and manganese.

The total hazard index associated with the ingestion of chemicals in sewage sludge area groundwater would be greater than 1.0, based on both the average and maximum concentrations. Based on average concentrations, the hazard indices for antimony and nervous system toxins would be 1.2 and 13.7, respectively. Based on maximum concentrations, the hazard indices for antimony, nervous system toxins, and kidney toxins would be 5.1, 34.1, and 1.1, respectively. The total cancer risk for these exposure routes is calculated as 1.2×10^{-4}, based on average concentrations, or 2.8×10^{-4}, based on maximum concentrations. Both the average and the RME risk estimates are above the USEPA's target hazard index of 1.0 and its target range of 10^{-6} to 10^{-4} lifetime excess cancer risk. Risks from arsenic and cadmium are only marginally above risk limits. Risks from antimony, beryllium, and manganese are higher.

6.4.2.4 Off-Site Groundwater Exposures (Present and Future). Potential risks to a neighborhood resident resulting from ingestion of private well water are estimated for adults. These risks are presented in Tables 6-59 through 6-60.

The total hazard index associated with the ingestion of chemicals in well water is greater than 1.0, based on both the average and maximum concentrations. Based on average concentrations, the hazard index for nervous system toxins is 4.9. Based on maximum concentrations, the hazard index for nervous system toxins is 17. The total cancer risk for these exposure routes is calculated as 7.0×10^{-7}, based on average concentrations, or 9.8×10^{-7}, based on maximum concentrations. The average and the RME risk estimates are below the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk. Both the average and the RME risk estimates are above the USEPA's target hazard index of 1.0. Excess risk is associated with manganese.

6.4.2.5 Surface Water Exposures (Present and Future). Potential risks to a site visitor resulting from exposures to surface water are estimated for adults and adolescents for each of two water bodies: the Saugatucket River and Mitchell Brook. For the Saugatucket River, both ingestion and dermal exposures are evaluated; for Mitchell Brook, only dermal exposures are evaluated. These risks are presented in Tables 6-61 through 6-72.

The total hazard index associated with the ingestion of chemicals in Saugatucket River water is less than 1.0, based on both the average and maximum concentrations, for both adults and adolescents. The total hazard index associated with the dermal absorption of chemicals in Saugatucket River water is less than 1.0, based on both the average and maximum concentrations, for both adults and adolescents. Cancer risk appears to be negligible from surface water exposures in the Saugatucket River.

The total hazard index associated with the dermal adsorption of chemicals in Mitchell Brook water is less than 1.0, based on both the average and maximum concentrations, for both adults and adolescents. The total cancer risk for this exposure route is calculated for an adult as 1.1×10^{-7}, based on average concentrations, or 2.3×10^{-7}, based on maximum concentrations. For an adolescent, cancer risk is calculated as 3.1×10^{-8}, based on average concentrations, or 6.5×10^{-8}, based on maximum concentrations. Both the average and the RME risk estimates are below the USEPA's target hazard index of 1.0 and target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

6.4.2.6 Soil Gas Exposures (Present and Future). Potential risks to a site visitor resulting from inhalation exposures to contaminants released to ambient air with soil gas are estimated for each disposal area. These risks are estimated using modeled soil gas emissions to air. Inhalation risks are presented in Tables 6-73 through 6-78.

The total hazard index associated with inhalation of contaminants released to ambient air with soil gas from the solid waste area is less than 1.0, based on both the average and maximum concentrations and based on conservative modeling assumptions. The total cancer risk for this exposure is calculated as 6.0×10^{-4}, based on average concentrations, or 1.3×10^{-3}, based on maximum concentrations. Both the average and the RME risk estimates exceed the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk. The estimated cancer risk is primarily associated with vinyl chloride.

The total hazard index associated with inhalation of contaminants released to ambient air with soil gas from the bulky waste area is less than 1.0, based on both the average and maximum

concentrations. The total cancer risk for this exposure is calculated as 7.5×10^{-7}, based on average concentrations, or 1.4×10^{-6}, based on maximum concentrations. The average and the RME risk estimates are within or below the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

The total hazard index associated with inhalation of contaminants released to ambient air with soil gas from the sewage sludge area is less than 1.0, based on both the average and maximum concentrations. The total cancer risk for this exposure is calculated as 2.6×10^{-11}, based on average concentrations, or 2.3×10^{-10}, based on maximum concentrations. Both the average and the RME risk estimates are below the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk.

6.4.2.7 Residential Ambient and Indoor Air Exposures (Present and Future). Potential risks to a neighborhood resident resulting from inhalation of contaminants in ambient and indoor air are estimated for adults. These risks are presented in Tables 6-79 through 6-80.

The total hazard index associated with the inhalation of chemicals in ambient and indoor air is less than 1.0, based on both the average and maximum concentrations. The total cancer risk for these exposure routes is calculated as 2.1×10^{-4}, based on average concentrations, or 2.8×10^{-3}, based on maximum concentrations. The average and the RME risk estimates exceed the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk. The greatest risks are associated with 1,1,2,2-tetrachloroethane, benzene, and vinyl chloride.

6.4.2.8 Residential Indoor Air Exposures (Future). Potential risks to a future resident at 220 Rose Hill Road resulting from inhalation of vinyl chloride in indoor air are estimated for adults. These risks are presented in Tables 6-81 through 6-82.

The cancer risk for this exposure route is calculated as 7.9×10^{-4}, based on average concentrations, or 1.9×10^{-3}, based on maximum concentrations. The average and the RME risk estimates exceed the USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk. The

estimated cancer risk is wholly a result of vinyl chloride, which was detected in indoor air at the former residence at 220 Rose Hill Road. Noncancer risks from vinyl chloride are not estimated due to the absence of dose-response data.

6.4.3 Risks from Chemicals Evaluated Qualitatively

The following chemicals of concern are not included in the quantitative risk characterization, because no dose-response data are available from the USEPA: chloroethane (no data for ingestion), trimethylbenzenes, 2-methylnaphthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, and sulfide. These chemicals are evaluated qualitatively for human health risks in this section. Nitrate, which was sampled by other investigations, is also reviewed in this section.

Chloroethane, a COC in groundwater, has anaesthetic properties that can be a problem in industrial situations (Torkelson and Rowe 1981). It appears to be less toxic than related compounds as 1,1-DCA and 1,2-DCA, and has a higher Threshold Limit Value (TLV = 1,000 ppm; ACGIH 1991); however, this value is based on limited data (Torkelson and Rowe 1981). Chloroethane was present at lower concentrations than 1,1-DCA. Risks from chloroethane at the site study area are therefore probably less than those from 1,1-DCA.

Among common motor fuel components, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene have not been highlighted as being of special interest toxicologically. Trimethylbenzene toxicity is similar to that of xylenes which are closely related (xylenes can be called dimethylbenzenes). A concentration of 40 mg/L of either of these trimethylbenzenes in air produces loss of reflexes in mice, while 30 mg/L of xylenes can be lethal (Sandmeyer 1981). The trimethylbenzenes are present in site soil gas at concentrations approximately one order of magnitude below the concentrations of xylenes. Therefore, it is unlikely that risks from trimethylbenzenes would exceed those estimated for xylenes.

The PAH, 2-methylnaphthalene, is a COC in groundwater. It is less toxic than naphthalene (both in lethality by injection and its lack of skin irritancy; Sandmeyer 1981) and is present at smaller concentrations than naphthalene at the site study area. Naphthalene was not selected as a groundwater COC, based on a low C-T score. Therefore, 2-methylnaphthalene is unlikely to be a significant contributor to site risks.

No toxicity data on 4-chloro-3-methylphenol were located, so associated health risks cannot be adequately evaluated.

Although there is some public interest in the relationship between aluminum and disease, aluminum is not generally considered to be an environmental health threat to humans. Aluminum is abundant in the earth's crust, and the body tends to absorb only minimal amounts of this metal.

Cobalt and copper are essential nutrients that may be toxic if unusual exposures occur, such as through ingestion of concentrated solutions of soluble salts. Cobalt and copper are not among the metals for which there has been sufficient concern and experimental toxicity data on which to base reference doses. Concentrations of these metals at the site study area are not sufficiently elevated to be a likely health threat.

When compared to USEPA interim guidelines for soil lead cleanup levels at Superfund sites of 500 to 1,000 mg/kg (USEPA 1989d), the maximum lead concentration in site surface soil, 124 mg/kg, and the maximum concentration in sediment, 243 mg/kg, are both relatively low. In site groundwater and leachate, lead was detected in almost half of the samples. The lead in these media was generally removed by filtration, suggesting that the lead at the site is predominantly inorganic lead, which would absorb to particulation more so than organic lead compounds. Inorganic lead is not readily absorbed through the skin, so the lead in the leachate would be unlikely to pose significant risks. The old MCL for lead of 50 μg/L has been replaced by a health-based action level of 15 μg/L of lead in tap water. On-site groundwater, as represented by unfiltered monitoring well data, contains high concentrations of lead (up to

307 μg/L), which could generate the potential for health risks if there were to be future exposures to on-site groundwater as a potable water supply.

It is not known what proportion of the sulfur at the site measured as sulfide is present as free hydrogen sulfide, which is more toxic than most other sulfides. Also, information on the toxicity of sulfide salts is not available. Therefore, health risks associated with sulfide cannot be adequately evaluated.

Groundwater samples were not analyzed for nitrate in the RI, but have been analyzed for the town of South Kingstown for several years. In five years, one sample, at MW-III and collected 6/24/92, exceeded the MCL of 10 mg/L (by a factor of two). It is not known whether the measurement was anomalous or representative of an increasing trend in nitrate concentrations. Nitrate concentrations above the MCL are a health hazard to infants. Nitrate may cause alterations in oxygen-carrying hemoglobin in these individuals.

6.4.4 Summary of Site Risks

Six media (surface soil, leachate, groundwater monitoring and residential wells, surface water, landfill soil gas, and residential ambient and indoor air) were evaluated quantitatively under various exposure scenarios. Exposures to leachate at all disposal areas and surface waters at the site study area are not expected to result in hazard indices above one or in a carcinogenic risk above USEPA's target range of 10^{-6} to 10^{-4} lifetime excess cancer risk, as presented in Tables 6-83 and 6-84. Exposure to contaminants in ambient air released with landfill soil gas in the solid waste area may result in a carcinogenic risk above the USEPA's target risk range, with total excess cancer risks ranging up to 1.3×10^{-3}. Vinyl chloride is the principal contributor to this inhalation risk; however, this risk estimate is based on modeled landfill gas emissions and may not represent actual exposures.

Noncarcinogenic risks may exceed a hazard index of one in the case of a child exposure at the bulky waste area from ingestion of surface soils. This exposure route is expected to result in

hazard indices ranging from 1.6 to 6.8. Manganese in surface soil at the bulky waste area is the principal contributor to these risks. Noncarcinogenic risks may also exceed a hazard index of one in the case of ingestion of residential well groundwater. This exposure route is expected to result in hazard indices ranging from 4.9 to 17.0. Manganese in residential well groundwater is the principal contributor to these risks.

Future exposure to groundwater may result in risks above a hazard index of one and/or above a carcinogenicity risk range of 10^{-6} to 10^{-4} in each disposal area. For the ingestion of site groundwater by an adult resident, the total excess cancer risks ranged up to 2.8×10^{-2} and hazard indices ranged up to 93, for the RME scenario at the solid waste area. The evaluation for noncarcinogenic compounds indicated that adverse noncarcinogenic health effects could occur from groundwater ingestion. Acrylamide, 1,2-DCE, vinyl chloride, manganese, arsenic, cadmium, antimony, beryllium, and zinc in site groundwater are the principal contributors to these risks. These calculations assume consumption of groundwater classified as GB ("may not be suitable for public and private drinking water") and groundwater mapped as GA non-attainment (NA) (goal is "restoration of the groundwater to drinking water quality") (RIGIS 1992). Groundwater underneath the site is classified as GB, because it is directly underneath a disposal area. The areal extent of the plume is classified as GA-NA. This classification is used where the groundwater quality goal is GA but where groundwater is degraded as a result of contamination from a specific source.

Carcinogenic risks may exceed the risk range of 10^{-6} to 10^{-4} in the case of inhalation exposures to ambient and indoor air at nearby residences. The total excess cancer risks ranged up to 2.8×10^{-3} for the RME scenario. Benzene, 1,1,2,2-tetrachloroethane, and vinyl chloride are the principal contributors to these inhalation risks. In addition, future indoor air exposures to vinyl chloride at 220 Rose Hill Road may result in carcinogenic risks above the risk range of 10^{-6} to 10^{-4}. The total excess cancer risks ranged up to 1.9×10^{-3} for the RME scenario.

Site study area media for which all evaluated exposure pathways are below USEPA's target risk range for carcinogens and noncarcinogens are:

- Solid waste area leachate
- Bulky waste area leachate
- Saugatucket River surface water
- Mitchell Brook surface water
- Sewage sludge area soil gas

Site study area media for which one or more exposure pathways are within USEPA's target risk range for carcinogens and/or noncarcinogens are:

- Solid waste area surface soil
- Sewage sludge area surface soil
- Bulky waste area soil gas

Site study area media for which one or more exposure pathways are above USEPA's target risk range for carcinogens and/or noncarcinogens are:

- Bulky waste area surface soil
- Solid waste area groundwater
- Bulky waste area groundwater
- Sewage sludge area groundwater
- Residential well groundwater
- Solid waste area soil gas
- Residential ambient and indoor air
- Residential indoor air at 220 Rose Hill Road

6.5 LIMITATIONS AND UNCERTAINTY

The uncertainty associated with the risk assessment is a combination of the uncertainties associated with the data, the assumptions used in developing the exposure scenarios, the toxicity database, and the risk characterization models used to evaluate exposure. General sources of uncertainty include the following:

Site Characterization Limitations

- Sample point selection and sampling methodology
- Analytical chemistry and reporting
- Restricted set of chemicals under consideration
- Fate and transport assumptions
- Background comparison

Dose-Response Uncertainty

- Uncertainty inherent in dose-response values
- Restricted set of dose-response values

Exposure Uncertainty

- Exposure scenario development
- Target population characteristics

Uncertainty in Risk Characterization

- Interactions between chemicals
- Assumptions of linearity and threshold

6.5.1 Site Characterization Limitations

There is always some imprecision, inaccuracy, and unrepresentativeness in the environmental data used to characterize site risks. The extent to which the data are incomplete is usually quantifiable, but precision, accuracy, and representativeness can only be estimated or described qualitatively.

Analytical data from any field work have some inherent uncertainty. Data collected during the RI may have a greater degree of associated uncertainty than an idealized field study for reasons discussed below.

The data include many measurements flagged with a "J," indicating that the measurement is approximate, or with a "UJ," indicating that the detection limit is approximate. These measurements are flagged because of conditions such as the presence of many analytes below USEPA's contract required quantitation limit and due to samples exceeding data validation criteria. These approximate measurements contribute to the overall uncertainty in the estimate of risks.

Much of the predicted risk for solid waste area groundwater is from acrylamide, which was detected infrequently. The identification of acrylamide is not confirmed by the procedure used for most other chemicals, since no confirmation column is used in the analysis of acrylamide.

Many contaminants were measured near their detection limits, where the measurement precision is low. Also, with the typical incidence of low-level laboratory contaminants, measured concentrations of many samples were flagged "J" (estimated) wherever observed concentrations were low, which was usually the case.

Methylene chloride may not only be a laboratory contaminant, but may also be present in site media, surface soil and groundwater in particular. However, because measured concentrations of methylene chloride were the same order of magnitude as vinyl chloride concentrations in soil

gas, and because methylene chloride is considered to be much less toxic than vinyl chloride, a determination that methylene chloride is indeed present in site soil and groundwater would have little effect on the estimated risks associated with these media.

The assumption of a concentration of one-half the sample quantitation limit (SQL) in media in which there are several detects may lead to an over- or underestimate of risk wherever there are high SQLs. This uncertainty in the risk estimate is perhaps greatest for the water-soluble organics such as acrylamide, which generally have higher detection limits in aqueous samples than other organic analytes, as well as for semivolatiles such as benzo(a)pyrene which have higher detection limits in soils and sediments than other analytes.

Some of the sampling patterns were skewed toward more highly contaminated areas. This may result in an overestimate of risks calculated based on average concentrations. Leachate and surface water quality is likely to be highly dependent on recent precipitation. Thus, measurements taken at one point in time and used in risk calculations may not represent typical surface water concentrations. This may result in an over- or underestimate of risks attributed to surface water.

A round of groundwater sampling in residential wells subsequent to that evaluated in these exposure and risk tables (sixth round, September 1993) showed generally stable chemical concentrations. For example, the maximum unfiltered concentration of manganese (a chemical showing a high hazard index) was 2120 μg/L in September 1993, compared to the maximum of 3100 μg/L selected for the RME exposure point concentration.

Ambient air concentrations at the disposal areas are modeled from landfill soil gas measurements. Due to quality control problems, analytical data from ambient air samples from the landfill were not available. The use of models to estimate landfill soil gas emissions to ambient air may result in an over- or underestimate of risks attributed to the inhalation of contaminants released to ambient air with landfill soil gas.

Analytical data used to evaluate inhalation exposures at nearby residences were based on air data presented in two different USEPA ESD reports. Additional sources of volatile organics at nearby residences such as gasoline or paints may result in an overestimate of risks attributed to the site study area from the inhalation of contaminants in residential ambient and indoor air.

No comparison to background concentrations is included in the health risk assessment because the number of background samples (and, for most media, the number of samples in each location) were insufficient to test the premise that site concentrations of any contaminant do not exceed background, with sufficient statistical power to satisfy USEPA-recommended minimum statistical performance parameters (USEPA 1992b) -- on the order of 10 samples for each location. Therefore, chemicals that do not exceed background concentrations may be erroneously included in this assessment of site-related risks.

An important assumption in this assessment is that environmental concentrations of chemicals will remain constant for the foreseeable future. This assumption is made when estimated exposure rates are extended a number of years. A more detailed model might predict dispersion of contamination and degradation of organic compounds; however, such modeling is not very reliable. Uncertainty about the extent of contamination and movement of contaminants toward the nearby residences means that risks to neighborhood residents could be underestimated or overestimated by this assessment.

Use of maximum values for an upper estimate of exposure is very conservative. Points of maximum concentration for different compounds are in different places, so it is unlikely that an individual would be exposed to maximum levels of each compound simultaneously. This may result in an overestimation of the risk for the maximally exposed individual.

6.5.2 Dose-Response Uncertainty

Uncertainty exists in the toxicity values for each substance (USEPA 1989b). Dose-response relationships for most of the chemicals of concern are based on animal experimentation, and

uncertainty results from extrapolating observations in animals to humans. This uncertainty may be due to the selection of an appropriate animal model; difficulties in measuring health endpoints in animals; differences between species in absorption, metabolism, and susceptibility; application of scaling factors for differences in sizes, dose, and exposure duration and lifespan; extrapolation from a dose causing a statistically observable effect or lack of effect to a dose that would cause an acceptable effect or no effect; and individual variability in humans. This uncertainty is addressed by the USEPA, in different ways, in the derivation of reference doses and slope factors. In general, human RfDs are extrapolated from animal experiments using scaling by weight and application of specified uncertainty factors and/or modifying factors, while slope factors are extrapolated by calculating an upperbound cancer potency in animals and scaling by surface area (USEPA 1989b). The USEPA's derivation of these dose-response data generally is a conservative estimate of the dose-response relationship.

Lack of available dose-response data is a related source of uncertainty. The lack of RfDs and/or slope factors for a number of chemicals evaluated at the site affects the quantitative assessment. For instance, while vinyl chloride may contribute to liver toxicity other than cancer (ATSDR 1989, 1988a), there is no available reference dose to evaluate exposure to vinyl chloride other than as a carcinogen. Likewise, benzene affects blood cell formation and nervous system functioning (USEPA 1987c), but there is no reference dose to enable consideration of the neurotoxicity of benzene along with xylenes and other nervous system toxins. Other chemicals, such as chloroethane and lead, have no accepted reference dose. In each case, the inability to quantify potential effects may lead to an underestimation of quantitative risks. Route-to-route extrapolation introduces additional uncertainty.

For noncarcinogenic effects, hazard ratios are assumed to be additive if the critical effects are similar between chemicals. Otherwise, it is assumed that there is no interaction. There may be unknown synergistic effects between site contaminants. However, the use of large uncertainty factors in generating RfDs is sufficiently conservative that it is unlikely that noncarcinogenic risks are underestimated.

The reference dose used here for manganese was derived from an epidemiologic study in Greece, in which manganese in drinking water correlated with adverse central nervous system effects. Much higher doses of manganese in the diet are considered safe, as reflected by the much higher RfD for manganese in food. The dose-response relationship for the manganese present at the site study area is an important source of uncertainty in the risk assessment.

Carcinogenic PAHs are not all equally potent. The use of benzo(a)pyrene slope factors may overestimate site risks from the other carcinogenic PAHs (USEPA 1984). The sensitivity of skin tumor formation from dermal contact with carcinogenic PAHs is not addressed in the quantitative assessment. Since dose-response data are not currently available for dermal exposures to any compounds, the oral slope factor for benzo(a)pyrene was used to evaluate dermal exposure to all of the carcinogenic PAHs. This may not be a good predictor of the dermal toxicity of PAHs, which are contact carcinogens as well as systemic toxins.

6.5.3 Exposure Uncertainty

There is significant uncertainty in the exposure assumptions in each scenario. Future use of the site study area can only be speculated upon. There are large uncertainties about the amount of time people spend swimming, visiting the site study area, or working outdoors at the site study area, and about the time people will spend at the site study area in the future. The amount of soil that would be ingested on an average visit has not been determined, so a standard assumption of the daily soil ingestion rate was used. Assumptions about the percentage of soil contaminants absorbed through the skin, and the rate at which aqueous solutes are absorbed, have not been verified for most chemicals. The question of whether on-site groundwater consumption would be an exposure route is one of the most significant areas of uncertainty. It is very unlikely that groundwater from below the disposal areas, or from the immediate vicinity, would be used as a drinking water supply. If no groundwater is consumed from the vicinity of the disposal area, total site human health risks, with the exception of soil gas inhalation, are quite close to USEPA target risk levels.

There is uncertainty in the exposure estimate for future inhalation of vinyl chloride at 220 Rose Hill Road. The construction of the former residence at 220 Rose Hill Road, including an earth floor and fieldstone walls, may have led to high vinyl chloride concentrations measured in the structure. The dwelling has been demolished and it is unlikely that a future dwelling at this location would have a similar construction.

The assessment is oriented toward a hypothetical most-exposed person in each of three target populations. Therefore, it is not necessary to fully characterize the exposed populations (i.e., by precisely enumerating the number of site visitors). There is no indication that the most-exposed individuals at the site study area have greater susceptibility to toxic agents beyond the order-of-magnitude range of variability assumed by the USEPA for most chemicals.

Risk estimates for a nearby resident from inhalation of residential ambient and indoor air are separate from the risk estimates for a nearby resident visiting the landfill from inhalation of ambient air at the disposal areas. Risk may be underestimated for a nearby resident if this receptor is exposed to contaminants in residential ambient and indoor air, and also visits the site study area and is exposed to contaminants in ambient air at the disposal areas.

6.5.4 Uncertainty in Risk Characterization

Most of the toxicological data are based on exposures to single chemicals of interest; information on combined exposures is limited. Combined effects may be additive, synergistic, or antagonistic. This risk assessment assumes that similar risks and hazard indices are additive, and that dissimilar risks are independent. This assumption may be inaccurate, such as if there are both cancer initiators and cancer promoters among site contaminants. The assumption of linear non threshold dose-response among carcinogens may also be inaccurate. Given the variety of uncertainties associated with each step of the risk assessment process, no numerical estimate of uncertainty is made. The evaluation should not be considered as a determination of absolute risks but rather as an aid for identifying the areas of greatest concern and developing remediation alternatives.

SECTION 7.0
ECOLOGICAL RISK ASSESSMENT

An ecological risk assessment is a qualitative and/or quantitative appraisal of the actual or potential effects of a hazardous waste site on plants and animals other than humans or domesticated animals (USEPA 1989e). The baseline ecological risk assessment was conducted consistent with applicable USEPA guidance documents on ecological assessments and ecological risk assessments (USEPA 1989e, 1989f, 1989g, 1989h). No additional guidance documents applicable to the state of Rhode Island are currently available.

The baseline ecological risk assessment for the Rose Hill site consists of five major parts:

- **Hazard Identification** - identifies chemicals and media of potential concern to ecological resources
- **Exposure Assessment** - identifies exposure pathways; species or species groups potentially at risk of exposure; assessment endpoints; and measurement endpoints
- **Toxicity Assessment** - characterizes the toxicological properties of the chemicals of ecological concern for the identified exposure pathways
- **Risk Characterization** - quantitatively or qualitatively characterizes the baseline risk to potential ecological receptors from exposure to the chemicals of ecological concern
- **Uncertainty** - discusses the uncertainties of the baseline ecological risk assessment

The results of the baseline ecological risk assessment combined with the results of the human health risk assessment (section 6) can be used as a guide to determine the necessity for, the types of, and the areal extent of remedial activities.

7.1 OBJECTIVES AND METHODS

The major objective of the baseline ecological risk assessment was to evaluate potential adverse effects to ecological resources from exposure to site contaminants. The baseline ecological risk assessment provides quantitative risk estimates for aquatic communities, since information on the nature and extent of contamination suggested that potential impacts to ecological resources were most likely to occur in aquatic areas; thus, data (e.g., quantitative benthic surveys and toxicity testing) were collected to support a full quantitative assessment. The baseline ecological risk assessment provides a qualitative evaluation for terrestrial communities, since risks were expected to be small and data collection to support a quantitative assessment was thus not considered necessary.

Risks were evaluated through the development of media-specific ecological effect levels, which are defined as the concentration of a particular contaminant in a particular medium below which no adverse effects to ecological receptors are likely to occur. Ecological effect levels were developed based on established numerical criteria (e.g., USEPA and RIDEM ambient water quality criteria; USEPA 1986b and RIDEM 1988) or on information obtained from the literature. These effect levels can be used to assess baseline risks to ecological receptors by comparing the effect levels to existing contaminant levels in the on-site media. In addition, toxicity testing with on-site sediments and leachate served to more fully define baseline risks to aquatic receptors.

Information from section 4, nature and extent of contamination, and from section 3.4, ecological assessment, was essential for conducting the baseline ecological risk assessment. Information on the nature and extent of contamination was instrumental in determining the chemicals and media of ecological concern. The ecological assessment provided data on the types of organisms and habitats at the site, which allowed identification of potential sensitive receptors at risk of exposure.

7.2 HAZARD IDENTIFICATION

The purpose of the hazard identification was to identify the potential chemicals and media of concern to ecological receptors at the site study area. To accomplish this, the hazard identification involved the following:

- An assessment of the types of organisms and habitats present on site and in areas potentially affected by migration of site contaminants in order to identify sensitive ecological receptors (see section 3.4)
- A review of data from on-site sampling of environmental media to determine the nature and extent of contamination (see section 4)
- An assessment of the toxicity and bioavailability of the detected contaminants to determine if existing levels in particular media are known to cause adverse effects

The hazard assessment process allows the various contaminants and media to be preliminarily screened, thereby identifying potential chemicals and media of concern. In this section, the methodology and results of the media and contaminant screening are discussed.

7.2.1 Media of Potential Concern

Media that were investigated as part of this remedial investigation included surface water, groundwater, leachate, surface sediment, surface soil, subsurface soil, and landfill gas. Based on likely exposure pathways (see section 7.3.1) for species observed or expected to occur on site, the following media are of potential concern to ecological resources:

- Surface water in the Saugatucket River and Mitchell Brook, as well as in downgradient surface waters fed by these water bodies
- Leachate from landfill seeps
- Surface sediment in the Saugatucket River and Mitchell Brook
- Surface soil, especially in the three disposal areas

- Landfill gas, especially in the solid waste disposal area

Groundwater and subsurface soils (soils at depths greater than two feet) were eliminated as media of ecological concern since organisms on site have limited direct contact with these media. However, indirect exposure to groundwater may occur when groundwater flows into surface water bodies, is exposed at the surface as leachate, or seeps into the pore water of sediments. These potential exposures, however, are addressed in the evaluation of surface water, leachate, and sediments. Since the majority of the plants on the landfill are shallow-rooted grasses, plant exposure to groundwater in the root zone is evaluated through an analysis of surface soils.

7.2.2 Chemicals of Potential Ecological Concern

Screening of contaminants and selection of chemicals of ecological concern considered a number of variables: observed contaminant concentrations in the media of concern, frequency of detection, mobility and persistence, toxicity (based on published effect levels), background levels, and existing guidelines, standards, or criteria. Effect levels were determined based upon literature review, while existing guidelines, standards, or criteria used in the analysis were derived from several federal or state agency programs. It should be noted that criteria values do not exist for all of the contaminants identified on site for each media of concern.

For the protection of aquatic life, USEPA and RIDEM have established ambient water quality criteria (AWQC) for a number of chemicals (USEPA 1986b; RIDEM 1988). The AWQC were compared to maximum and mean concentrations of contaminants in surface water and leachate samples from the site. Where appropriate, sample concentrations were adjusted for water hardness or other parameters as specified in the chemical-specific AWQC. Where applicable, contaminant levels in surface sediments were compared to low effect range levels (ER-Ls) from the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program (Long and Morgan 1990), USEPA guidelines for the pollution classification of Great Lakes harbor sediments (USEPA 1977), and sediment criteria for metals proposed by the New York State Department of Environmental Conservation (NYSDEC 1989). The ER-Ls

provided by NOAA are based primarily on marine and estuarine sediment concentrations although some freshwater sediments have also been included. The NOAA concentrations are based on chemical analyses of sediment samples collected annually throughout the United States. While the chemical data provide indications of the relative degree of contamination among the sampling sites, they provide neither a measure of adverse biological effects nor an estimate of potential effects. The data collected were evaluated from three basic approaches to the establishment of effects-based criteria. These approaches included the equilibrium-partitioning approach, the spiked-sediment bioassay approach, and various methods of evaluating synoptically collected biological and chemical data in field surveys. The lower 10th percentile of concentrations in the data was identified as Effects Range-Low (ER-L), and the median was identified as Effects Range-Median (ER-M). These ER-Ls and ER-Ms are not to be construed as standards or criteria (Long and Morgan 1990). The USEPA sediment values are unpublished guidelines. The NYSDEC-proposed sediment criteria are in draft form. Surface soils were compared to guidelines and standards in Fitchko (1989) and Beyer (1990), as well as to effect levels found in the literature.

For surface soils, maximum observed concentrations were utilized when screening compounds to allow for a conservative evaluation since criteria values were often lacking and effect level data were often imprecise. Use of maximum observed contaminant levels in surface soils is conservative since maximum levels are only likely to occur within a small portion of the site study area and would represent a worst-case scenario of possible exposure levels to terrestrial receptors. Use of worst-case assumptions, however, is consistent with USEPA guidance, especially when available information is limited.

In the following subsections, the results of the contaminant screening process are presented by media (surface water, leachate, surface sediment, surface soil, and landfill gas). Each compound detected in at least one on-site sample for the media of concern is screened against criteria or effect levels to determine if it should be retained as a chemical of concern. Compounds remaining after the screening process are summarized at the end of each media discussion and at the end of this section.

7.2.2.1 Surface Water. Table 7-1 summarizes the occurrence of chemicals detected in the surface water of the site study area in each of the five sampling rounds. Of the compounds for which AWQC exist, six chemicals (aluminum, iron, arsenic, antimony, ammonia, and cyanide) measured in surface water exceeded chronic AWQC in at least one sample. Both aluminum and iron occurred frequently during sampling. Aluminum was detected in 30 out of 56 samples, while iron was detected in 48 out of 56 samples. The mean concentration of aluminum exceeded AWQC during all sampling rounds and the mean concentration of iron exceeded AWQC during four of the five sampling rounds. Arsenic was infrequently detected (2 of 56 samples) and exceeded RIDEM chronic criteria in only one sample by a small amount. Antimony was also detected relatively infrequently (4 of 56 samples) and exceeded RIDEM (but not USEPA) chronic AWQC in all four of the samples it was detected in. However, antimony was not detected in leachate samples and may not be attributable to the site.

Cyanide was detected infrequently during sampling (3 out of 56 samples). During laboratory analysis of the three samples with detected cyanide, these samples had a color in the distillate that may have interfered with the colormetric detection; as a result, the results are suspect. Ammonia was detected in 17 of 19 samples but exceeded chronic AWQC (assuming a pH between 6.5 and 7.5 and a water temperature between 10 and 15 C) only once by a small increment.

The concentration of aluminum in surface water often exceeded measured background concentrations, although all upstream samples considered to be background also exceeded AWQC. In general, the concentration of iron in surface water exceeded measured background concentrations by an order of magnitude. For iron, the background concentrations did not exceed AWQC. No arsenic, antimony, or cyanide was detected in background samples. Because aluminum and iron exceeded AWQC, occurred frequently, and exceeded background levels, they are considered chemicals of ecological concern. Cyanide is not considered a chemical of ecological concern because of its relatively infrequent detection and suspect laboratory results. Arsenic and antimony were also eliminated as potential chemicals of ecological concern due to their infrequent detection and only marginal exceedence of RIDEM

chronic AWQC in a small number of samples. In addition, antimony was not detected in leachate samples. Ammonia was eliminated as a potential chemical of ecological concern since it exceeded AWQC in only one sample by a small amount.

For volatile organics, water-soluble organics, semivolatile organics, and pesticides having no AWQC, the frequency of detection was very low (generally only 1 or 2 of 56 samples; Table 7-1) and the maximum observed concentrations were low. Therefore, these compounds are not considered chemicals of ecological concern.

The six inorganic chemicals with no AWQC were detected frequently. Calcium, magnesium, potassium, and sodium are naturally occurring chemicals that were measured at similar concentrations in background samples. These four compounds are not generally considered toxic and are essential elements for most organisms (Bysshe 1988). Therefore, calcium, magnesium, potassium, and sodium are not considered chemicals of ecological concern. Experimental data indicate that the soluble barium concentrations would have to exceed 50 mg/L before toxic effects to aquatic biota would be expected. In most natural waters, there are sufficient quantities of sulfate or carbonate to precipitate aqueous barium to an insoluble, non-toxic form (USEPA 1986b). Barium was detected in surface water at concentrations well below 1 mg/L (Table 7-1). Manganese was frequently detected (54 of 56 samples) and was present in surface water at levels above background. Manganese is therefore considered a chemical of ecological concern.

In summary, the chemicals of ecological concern for surface water at the site study area are aluminum, iron, and manganese.

7.2.2.2 Leachate. Table 7-2 summarizes the occurrence of chemicals detected in leachate at the site study area. For the ten volatile organics detected in leachate, four had existing AWQC. Of these four volatile organics, only toluene exceeded AWQC (in 3 of 9 samples). Since aquatic receptors are not likely to be directly exposed to leachate (exposure would likely occur when the leachate was discharged to surface waters) and since toluene was detected in only 1 of 56 surface water samples at a low concentration, toluene is not considered a chemical of ecological concern.

For other ecological receptors likely to directly contact leachate (such as white-tailed deer who may drink this liquid), calculated hazard ratios were well below one for toluene (Table 7-3), suggesting low risk from exposure to this compound in leachate. Of the six volatile organics without existing AWQC, all were detected infrequently and/or were detected at low concentrations; these compounds are thus not considered chemicals of ecological concern.

Of the three semivolatile organic compounds detected in leachate, only one (bis(2-ethylhexyl) phthalate) exceeded AWQC, but only in a single sample (Table 7-2). Since this compound was only detected in 1 of 56 surface water samples at a low concentration and is not considered particularly toxic, it was eliminated as a potential chemical of ecological concern.

Of the inorganic compounds for which AWQC exist, eleven (aluminum, arsenic, beryllium, chromium, copper, iron, lead, mercury, zinc, ammonia, and cyanide) exceeded criteria in at least one sample. Both aluminum and iron exceeded their chronic criteria values by one to three orders of magnitude and were frequently detected. Aluminum also exceeded acute criteria in two samples. These two compounds are therefore considered chemicals of ecological concern. Arsenic, mercury, and zinc were each measured slightly above chronic criteria in only one sample and are therefore not considered chemicals of ecological concern in leachate. These three chemicals also had deer ingestion hazard ratios of less than one (Table 7-3). Although beryllium levels in leachate were relatively high, this compound was not detected in surface water samples and had a deer ingestion hazard ratio well below one. Thus, beryllium is not likely to pose an unacceptable risk to ecological receptors and is not considered a chemical of ecological concern.

Chromium and copper exceeded AWQC in leachate but not in surface water. These two compounds also had deer ingestion hazard ratios of less than one. Based on these factors, chromium and copper are not considered chemicals of ecological concern. Lead exceeded chronic AWQC in 3 of 9 leachate samples but did not exceed criteria in surface water samples. However, based on deer ingestion exposures, hazard ratios exceeded one for lead (Table 7-3). For this reason, lead is considered a chemical of ecological concern in leachate.

Cyanide exceeded acute and chronic AWQC in 2 of 9 leachate samples but was infrequently detected in surface water. In addition, deer ingestion exposure modeling for leachate resulted in a hazard ratio much less than one for cyanide (Table 7-3). For these reasons, cyanide was eliminated as a chemical of ecological concern. Ammonia exceeded chronic criteria in leachate but exceeded AWQC only once in surface waters. In addition, the maximum concentration in leachate (21.75 mg/L) was less than the subchronic reference dose (34 mg/L), suggesting low risks from deer ingestion of leachate. For these reasons, ammonia was also eliminated as a potential chemical of ecological concern.

Of the inorganic chemicals that occurred frequently and for which there are no AWQC, calcium, magnesium, sodium, and potassium are not generally considered toxic and are therefore not considered to be chemicals of ecological concern. Maximum concentrations of barium in leachate were well below 50 mg/L, the effect level for this compound, thus eliminating it as a potential chemical of ecological concern. Cobalt and vanadium were not detected in surface water samples and are thus not likely to pose a risk to aquatic receptors. The calculated hazard ratio for deer ingestion of leachate was well below one for vanadium; no reference dose was available for cobalt (Table 7-3). Based on these factors, cobalt and vanadium were also eliminated as potential chemicals of ecological concern. Manganese was also detected frequently at relatively high concentrations and had deer ingestion hazard ratios which exceeded one (Table 7-3). As with surface water, manganese is considered a chemical of ecological concern.

In summary, chemicals of ecological concern for leachate are aluminum, iron, lead, and manganese.

7.2.2.3 Surface Sediment. Table 7-4 summarizes the occurrence of chemicals detected in surface sediment samples. Of the 11 volatile organics detected, eight were screened out based on low frequency of occurrence (fewer than three detections) and low concentrations. The remaining three volatile organics (xylene, acetone, and trichloroethene) were detected more frequently and sediment criteria values were not available. Acetone was screened out due to its low toxicity to ecological receptors (USEPA 1985a). Xylene and trichloroethene were screened

out based on their relatively low detected concentrations and low acute toxicities to aquatic organisms.

None of the six detected semivolatile organics with existing criteria values exceeded criteria. The remaining four detected semivolatiles were screened out based on low frequency (all four were detected in only a single sample) and low concentrations.

Eight pesticides were detected in site sediment samples. Of the three compounds without criteria values, two (methoxychlor and endosulfan) were screened out based on low frequencies (1 of 37 samples) and low concentrations. DDT and chlordane did not exceed existing criteria values. DDE and dieldrin exceeded the most stringent criteria in only a single sample and DDD exceeded the most stringent criteria in only two samples. All were screened out on this basis. Delta-BHC was frequently detected (11 of 37 samples) and had no existing criteria values. However, this compound is an isomer of lindane, which does have an existing interim sediment quality criteria (7.85 μg/kg at five percent total organic carbon). Assuming that the two isomers have similar toxicities, delta-BHC was screened out since its maximum detected concentration (1.3 μg/kg) was less than the criteria value calculated for lindane.

A total of 23 inorganic compounds were detected in site sediments (Table 7-4) of which criteria values were available for 12. Of these 12, chromium, nickel, and ammonia did not exceed criteria values. Cadmium, antimony, and copper each exceeded criteria in only one sample by a small amount and were also screened out. Arsenic, lead, manganese, and zinc exceeded the most stringent of their respective criteria values in only two samples and were also screened out. Barium exceeded criteria in 9 of 40 samples although six of these exceedences were marginal. Since much of this barium is likely to be present in insoluble, non-toxic forms (USEPA 1986b), barium was also eliminated as a potential chemical of ecological concern. Iron exceeded criteria values by over a factor of four and mean levels were well above background. Thus, iron is considered a chemical of ecological concern in sediments.

Since soil (see section 7.2.2.4) and sediment criteria were similar for inorganic compounds with

both sets of criteria (Tables 7-4 and 7-5), soil criteria were used to screen inorganic compounds in sediments for chemicals without existing sediment criteria. Using this approach, magnesium, potassium, beryllium, selenium, cobalt, and vanadium were screened out since maximum sediment concentrations were at or below soil criteria. Calcium, sodium, and sulfide are not considered toxic and were also eliminated. Thallium was screened out based on low frequency of detection (2 of 40 samples) and low concentrations. Aluminum did not have existing sediment or soil criteria but was detected in all samples at levels well above background. For this reason, aluminum is retained as a chemical of ecological concern in sediments.

In summary, iron and aluminum are the chemicals of ecological concern for sediments.

7.2.2.4 Surface Soil. Surface soils were sampled for volatile organic compounds, semivolatile organic compounds, pesticides, and inorganics at 24 locations (see section 4). This section discusses the screening procedure used for this medium, by major chemical subdivision, to obtain the chemicals of ecological concern. This screening is also summarized in Table 7-5.

Few quantitative data are available relating soil concentrations directly to wildlife exposure and/or toxic effects, and terrestrial models for predicting wildlife exposure from this medium are generally unavailable (USEPA 1989f). What little data do exist are mainly from laboratory studies utilizing various species of rodents or earthworms.

A number of jurisdictions and agencies have developed soil quality criteria. Almost all of these criteria are guideline values as opposed to enforceable regulatory levels. However, numerical guidelines specifying levels of chemical contaminants in soils that are significant to ecological resources have been established for relatively few compounds and are summarized in Fitchko (1989) and Beyer (1990). Thus, the screening process for contaminants in surface soil is strictly qualitative but is based upon the best information currently available.

Volatile Organic Compounds. A total of 16 volatile organics was detected in surface soil samples (Table 7-5). Information on criteria levels in surface soil and/or known effect levels

are available for all but four of these compounds (1,1-dichloroethene, 2-hexanone, 4-methyl-2-pentanone, and trichloroethene). These four compounds were eliminated as chemicals of ecological concern in surface soil since they were each detected in only a single sample at relatively low concentrations. Of the remaining 12 compounds, the maximum observed concentrations did not exceed the effect levels. Although acetone was frequently detected at relatively high concentrations, this compound has a very low toxicity to terrestrial plants and animals, and no adverse chronic effects from exposure to this chemical are known (USEPA 1985a). Thus, no volatile organics are considered chemicals of ecological concern in surface soils.

Semivolatile Organic Compounds. Fourteen semivolatile organic compounds were detected in surface soils; most were polynuclear aromatic hydrocarbons (PAHs) (Table 7-5). Information on criteria levels in surface soil and/or known effect levels were available for all but one of these compounds (4-chloroanaline). This compound was eliminated as a chemical of ecological concern in surface soil since it was detected in only a single sample (at 490 μg/kg). Of the remaining 13 compounds, only benzo(a)pyrene had a maximum observed concentration that exceeded an effect level. However, benzo(a)pyrene was detected in only 4 of 24 samples, and Sims and Overcash (1983) report natural background concentrations for this compound in surface soils at between 5 and 10 μg/kg, which is very close to the most conservative effect level for benzo(a)pyrene (20 μg/kg) thought to be protective of biological resources. Calculated effect levels for benzo(a)pyrene in surface soils to protect reproduction of small mammals were at least 330 μg/kg in a similar risk assessment (Kappleman 1993), a value well above observed maximum concentrations at the site study area. For these reasons, benzo(a)pyrene was also eliminated as a chemical of ecological concern. Thus, no semivolatile organics are considered chemicals of ecological concern in surface soils.

Pesticides. Seven pesticides (including two metabolites of DDT) were detected in surface soil samples (Table 7-5). All were eliminated as ecological chemicals of concern; four compounds (DDT, DDE, DDD, and endrin ketone) had effect levels that were higher than the maximum observed soil concentration, while the remaining three compounds were each detected in only

one surface soil sample at relatively low concentrations.

Inorganic Compounds. A total of 22 inorganic compounds were detected in surface soil samples (Table 7-5). Information on criteria levels in surface soil and/or known effect levels were available for all but four of these compounds (aluminum, calcium, iron, and thallium). In addition, all inorganic compounds were evaluated against background concentrations in U.S. soils, where available (Table 7-6).

Of the 18 compounds with criteria/effect levels, six had maximum reported concentrations that exceeded effect levels (antimony, selenium, copper, lead, manganese, and arsenic). Antimony and selenium were eliminated as chemicals of ecological concern since they were each detected in only one surface soil sample (Table 7-5). Copper, lead, and manganese were retained as chemicals of ecological concern in surface soil. For arsenic, a few sensitive plant species have shown effects at levels between 3.4 and 9.5 mg/kg total soil arsenic in some types of soil, although most terrestrial plants for which data are available show depressed crop yields at levels of 25 to 85 mg/kg total soil arsenic (Eisler 1988a). Plants growing in soils with up to 80 mg/kg of arsenic are considered nonhazardous to grazing ruminants. Terrestrial soil microbiota showed reduced diversity and abundance at levels of 150 to 165 mg/kg in soils (Eisler 1988a). Since the lowest effect level (3.4 mg/kg) was very close to the maximum observed soil concentration (3.5 mg/kg) and was based on sublethal effects to only a few very sensitive plant species not likely to occur on site, arsenic was eliminated as a chemical of ecological concern.

Of the four compounds without known effect levels, aluminum, calcium, and thallium were well within background levels (Table 7-6) and were screened out as chemicals of ecological concern. Mean iron concentrations were also comparable to background levels, although maximum iron concentrations were somewhat elevated (Tables 7-5 and 7-6). This was due to a single elevated iron concentration at SS-23, which is associated with a leachate seep. Since iron is an essential element and is unlikely to cause ecological toxicity in terrestrial habitats unless present at very high levels (USEPA 1985a), iron was also eliminated as a chemical of ecological concern in surface soil.

In summary, chemicals of ecological concern in surface soils are copper, lead, and manganese.

7.2.2.5 Landfill Gas. Ambient air concentrations (at 0.3 m above ground level) were modeled based on maximum observed concentrations of eight volatile organics in landfill gas (see section 6.4.2.6). These air concentrations were compared to acute and chronic effect levels for inhalation exposures to laboratory animals (Table 7-7). Modeled air concentrations did not exceed acute or chronic effect levels for any of the eight compounds. Thus, no compounds are considered of ecological concern in landfill gas and this medium was eliminated from further consideration.

7.2.2.6 Summary of the Chemicals of Ecological Concern. In summary, chemicals of ecological concern for surface water are aluminum, iron, and manganese (Table 7-8). For leachate, aluminum, iron, lead, and manganese are the chemicals of ecological concern while aluminum and iron are the chemicals of ecological concern in surface sediments. For surface soil, chemicals of ecological concern are copper, lead, and manganese. No compounds are of ecological concern in landfill gas.

7.3 EXPOSURE ASSESSMENT

This section analyzes potential exposure pathways and identifies potential terrestrial and aquatic receptors for the site study area using data on the existing site conditions, coupled with additional information on the life histories of biota utilizing the site study area (see section 3.4). For those species, or species groups, with a perceived potential risk, ecological assessment and measurement endpoints are identified. Assessment endpoints are evaluated against measurement endpoints using empirical data obtained from field investigations in section 7.5, risk characterization.

7.3.1 Exposure Pathways

The following is a discussion of potential exposure pathways to the media of concern.

7.3.1.1 Plants. Terrestrial, wetland, and aquatic plants rooted in contaminated soils or sediments may uptake, through their root surfaces, some of the contaminants present in the pore water of these media during water and nutrient uptake. A secondary exposure route, absorption through leaf surfaces of gaseous contaminants or contaminants deposited on these surfaces by air or water, is not likely to be important at the site due to the lack of exposed contaminated soils and low deposition rates. Unrooted, floating aquatic plants, such as duckweed (*Lemna* spp.), may uptake contaminants directly from surface water.

Terrestrial, wetland, and aquatic plants are not considered at risk, since the on-site floral communities did not exhibit any signs of stress that could be attributed to the contamination at the site, with the exception of several small groups of trees which appeared to have been killed by elevated methane levels in soil gas. Thus, plants are addressed in this assessment only as a potential medium, uptaking contaminants from soil, sediment, leachate, and/or water, and transferring them to herbivorous animals who consume their tissues.

7.3.1.2 Animals. There are four major ways fauna might be exposed to contaminants: (1) direct ingestion of contaminated abiotic media, (2) the consumption of contaminated animal or plant tissues, (3) direct inhalation, and (4) absorption through skin or gill surfaces. These pathways are discussed, in general terms, below.

Direct Ingestion of Contaminated Abiotic Media. Among the media of potential concern identified in section 7.2.1 were surface soil, surface sediment, surface water, and leachate. Direct ingestion of contaminated soil or sediment could occur while animals grub for food, feed on plant matter covered with contaminated soil, filter feed in areas where sediments have been resuspended in the water column, or preen or groom themselves. In addition, aquatic deposit feeders and earthworms directly ingest large quantities of bulk sediment or soil in order to obtain the energy-rich fraction; these organisms would likely have a significant exposure from this pathway. Surface water or leachate may also be directly ingested by organisms to obtain dietary water or during feeding activities.

Ingestion of Contaminated Tissues. It is possible that terrestrial, wetland, and aquatic plants rooted in contaminated soils or sediments, or exposed to contaminated surface water or leachate seeps, could uptake contaminants from these media and incorporate these compounds into their tissues, thereby presenting a possible risk to animals (primary consumers) feeding upon those plants. Predatory organisms (secondary consumers) may be at risk when feeding upon prey containing elevated levels of contaminants in their tissues. The risk of exposure to predators would depend upon the concentration of contaminants in the particular tissues consumed and the rate of food consumption. The dose received would also depend upon the rate of assimilation of the contaminants (or toxic metabolites resulting from chemical changes in the compounds) from the digestive tract during digestion and the rate of metabolism.

Various common food species (e.g., earthworms) for upper-level consumers in terrestrial environments are known to bioaccumulate some metals to levels above those found in the environment. Although no site-specific data on tissue concentrations of contaminants exist for earthworms, these organisms have been shown to bioaccumulate certain metals, such as copper and lead, from surface soils (Roberts and Dorough 1985; Bysshe 1988). Thus, prey organisms on site may pose a potential exposure risk to predators that consume them.

Inhalation Exposure. Volatile organic compounds and, to a lesser extent, semivolatile compounds, tend to volatilize from surface soils or surface water. At landfills, these compounds may also be present in soil gas trapped between the waste and the cap layers. In vapor form, these compounds may become bioavailable to organisms during respiration, which becomes an important exposure route. The lungs, with their large surface area for gas exchange, readily absorb many chemicals and pass them directly into the bloodstream. Most hazards from volatile organic compounds are associated with inhalation exposure (USEPA 1985a); for metals and semivolatile compounds with higher molecular weights (e.g., benzo(a)pyrene), there is a reduced exposure risk from inhalation because these compounds tend to remain adhered to surface particles. However, these particles may be inhaled as dust, depending upon conditions at the site. Since most of the site study area is vegetated, exposure via the inhalation of dust is not likely to be an important exposure pathway.

Exposure via inhalation would be most important to organisms that burrow in contaminated soils, especially those that bear their young in below-ground burrows (e.g., woodchucks). Contaminants present in the soil or in landfill gas could volatilize into the confined airspace of the burrow, where they could reach relatively high concentrations. This exposure risk would be most severe for prenatal and postnatal animals, as they would have continuous exposure during the early period of their life, prior to their exit from the burrows, when they may be most susceptible to the effects of the contaminants because of the high rate of growth experienced at this life stage. Exposure of the pregnant mother to contaminants in the burrow air may also have effects at the fetal stage, resulting in fetal death, birth defects, or reduced birth weight.

However, volatile organics are not present in on-site surface soils at levels considered to be hazardous to terrestrial organisms. Also, landfill gas levels on the sewage sludge area, the only disposal area with suitable soils (based upon soil type and soil depth) for most burrowing animals were very low (see section 6, Table 6-18). Landfill gas levels on the solid waste and bulky waste areas were higher, but the soil cover is very shallow, especially on the solid waste area, which would likely discourage most animals from burrowing. In addition, contaminants in above-ground ambient air resulting from landfill gas are not present at concentrations considered harmful to ecological receptors (see section 7.2.2.5). Thus, inhalation is not likely to be a significant exposure pathway on the site.

Dermal Exposure. Direct exposure to surface soils or surface sediments is another exposure pathway important to some species. This could result from direct dermal contact with the soils or sediments on unprotected surfaces (e.g., gill membranes [from suspended sediments] or exposed skin). Contact with surface water or leachate is another potential dermal exposure for aquatic and semiaquatic organisms.

Dermal exposure is likely to be most important to burrowing mammals (such as woodchucks), amphibians and reptiles that hibernate in the sediments (such as frogs and turtles), benthic invertebrates, and fish. These taxa all have extensive contact with sediments, soils, and/or surface water during all or part of their lives.

7.3.2 Potential Ecological Receptors

This section discusses the various species groups considered to be potentially at risk of exposure to site contaminants, based on their life history attributes. Species groups most likely to receive potential exposure by one or more of the pathways listed in section 7.3.1 are those whose activities frequently bring them into direct contact with surface sediments, wetland or upland surface soils, surface water, or leachate; who directly consume plants growing on or in these media; or who feed upon species possessing one or both of these characteristics. These species groups are evaluated in this section to determine those considered to be at risk of significant exposure. For those determined to be at risk of significant exposure, assessment and measurement endpoints are developed for use in the risk characterization.

7.3.2.1 Benthic Invertebrates. Benthic organisms living in the sediments of the Saugatucket River and Mitchell Brook are potentially at risk because of their direct contact with contaminants in this medium. Exposure could result from direct contact with exposed outer membranes and respiratory surfaces, the direct ingestion of sediments during feeding activities, and the consumption of contaminated prey or organic matter, depending upon the species' feeding habits. These organisms could also be directly exposed to contaminants in surface water by the same pathways.

Since most benthic organisms are relatively sedentary, off-site transfer of contaminants by those species closely associated with the sediments is considered minimal. Benthic organisms more closely associated with the water column may be carried off site by currents, but this transfer mechanism is not likely to be significant.

7.3.2.2 Fish. Fish are potentially at risk due to exposure to contaminants in the sediments and water column. Species that utilize the bottom sediments for feeding, spawning, or nursery areas, or that burrow into sediments to rest and hide from predators, may receive significant exposure. In addition to dermal exposure, bottom-feeding species may also directly ingest sediments and contaminated prey living in or on the sediments. Sediments suspended by feeding activities may

also come in contact with gill membranes, providing additional exposure. Fish may also be exposed to contaminants from direct contact with and ingestion of surface water.

7.3.2.3 Amphibians. Salamanders, newts, toads, and frogs are potentially at risk of exposure because of their close association with sediments, soils, and water either as immature forms, adults, or both. Most newts, toads, and salamanders are terrestrial hibernators, whereas most species of frogs hibernate under water in mud (DeGraaf and Rudis 1983). Thus, exposure to contaminants in sediments or soils continues even during hibernation (although metabolism is greatly slowed), because of direct absorption through their relatively unprotected membranous skin; these organisms conduct considerable metabolite exchange directly through their skin (Schmidt-Nielsen 1983). Salamanders, newts, toads, and frogs consume earthworms, aquatic insects, and small fish or tadpoles (DeGraaf and Rudis 1983). These prey are among the most likely to contain elevated levels of contaminants in their tissues.

7.3.2.4 Reptiles. Turtles and, to a lesser degree, snakes are potentially at risk of exposure based upon their life history characteristics. Turtles are mostly aquatic and spend considerable time on the bottom sediments of water bodies. Many snakes are sensitive to pollutants and have frequent contact with water, soil, or sediment (Hall 1980; DeGraaf and Rudis 1983).

Turtles consume tadpoles, small fish, crustaceans, and some carrion (DeGraaf and Rudis 1983). Semiaquatic snakes also consume fish, frogs, aquatic insects, and salamanders, while more terrestrial species may consume large numbers of soil invertebrates, especially earthworms (DeGraaf and Rudis 1983). These food items are likely to contain the highest levels of contaminants of available food items present on the site.

7.3.2.5 Mammals. Several mammalian primary consumers are potentially at risk of exposure to site contaminants. These include, for wetland and aquatic areas, species such as muskrat, and for upland areas, species such as woodchuck and other small rodents (e.g., mice, moles, and voles).

Muskrats spend considerable time in potentially contaminated water and in contact with the contaminated sediments and wetland soils. Muskrats may build lodges utilizing emergent vegetation (Allen and Hoffman 1984) or use bank burrows dug directly into the contaminated soils. The floor of the lodge or burrow is at least partly composed of bare soils and/or sediments. Young animals (which are born hairless) would have considerable dermal exposure to these sediments before emerging from the lodge or burrow. This species may directly ingest contaminated soils, sediments, and/or water in the course of lodge or burrow construction, during grooming activities, and as they forage. Muskrats may be exposed to contaminants from the plants they eat. Muskrats prefer emergent vegetation (especially cattails [*Typha* spp.]), which root directly on potentially contaminated sediments (Allen and Hoffman 1984). Some species of plants are known to bioconcentrate metals from the growth medium, but none of the chemicals of ecological concern are known to biomagnify within the food chain (Wren et al. 1983).

Upland burrowing mammals, such as woodchuck and moles, could be at some risk of exposure through dermal contact with the soil. Soil could also be directly ingested by these species during feeding and grooming activities. Species such as white-tailed deer could be exposed to contaminants in leachate if they drink this liquid.

Mammal secondary consumers with a possible risk of exposure include mink and raccoon. Mink and, to a lesser degree raccoon, preferentially feed upon aquatic animals (e.g., fish, frogs, and tadpoles) and small mammals, depending upon relative prey abundances (Linscombe et al. 1982; Kaufmann 1982). These prey species are among the organisms most likely to contain significant levels of contaminants in their tissues. Mink and raccoon will also consume carrion, particularly if it is not extensively decomposed (Linscombe et al. 1982; Kaufmann 1982). If the dead animals consumed died because of acute effects of contaminants, consumption of the carcasses could result in a significant exposure.

Since mink and raccoon have relatively large home ranges, the percentage of time spent on site and the percentage of food obtained on site would influence the potential exposure. Raccoon

home ranges vary between 0.6 and 1.8 miles in diameter (400 to 1,200 acres), while mink home ranges vary between 0.6 and 3.0 miles of river or up to 2,000 acres (Linscombe et al. 1982; Kaufmann 1982; DeGraaf and Rudis 1983; Eagle and Whitman 1987).

7.3.2.6 Birds. Among avian primary consumers, certain species (such as dabbling ducks) may be at risk of exposure to site contaminants, as these species directly ingest wetland soils or sediments as they forage. The consumption of bottom sediments during foraging is well documented for dabbling ducks, from studies concerning the ingestion of spent lead shot from sediments (Eisler 1988b). These species primarily consume submerged vegetation, floating vegetation (e.g., duckweed), and aquatic invertebrates (Bellrose 1980). Additional exposure may occur if these food items contain elevated levels of contamination in their tissues, and from consumption of contaminated water. Ducks may be dermally exposed to contamination through direct contact with water and sediments; these contaminants may also be ingested during preening activities.

Avian secondary consumers at potential risk of exposure include species such as belted kingfishers and American robins. Belted kingfishers consume small fish, while American robins consume earthworms (DeGraaf and Rudis 1983; Ehrlich et al. 1988). These prey species are among the most likely to contain contaminants in their tissues. These secondary consumers are unlikely to be exposed along any other exposure route.

7.3.3 Assessment and Measurement Endpoints

Assessment endpoints relate to the expected or normal use of a site by fish and wildlife in terms of presence, diversity, and/or abundance. The selection of these endpoints is based upon the premise that the on-site contamination will have a demonstrable effect on a species either through its avoidance of the habitat (resulting in absence or relative scarcity) or increased on-site mortality (resulting in reduced population numbers [USEPA 1989h]). The assessment endpoint of presence is applied to species groups whose mobility allows them to easily travel between the site and off-site areas, or for which the site represents a relatively small portion of their normal

home range. The presence of a species on site is not evidence of no effect but is likely to indicate the absence of acute effects. The assessment endpoint of diversity/abundance is applied to species (or communities) who are mostly sessile and would therefore be expected to be present on site through various life stages. It also applies to species with home ranges less than or equal to the area of suitable habitat present on the site. Measurement endpoints are techniques by which assessment endpoints are evaluated.

The chosen measurement endpoints are specific to particular assessment endpoints. The assessment endpoint of presence is evaluated based upon the observed use of the site (the measurement endpoint). The assessment endpoint of diversity/abundance is evaluated by comparison of the abundance or diversity of a species group to an upstream ("reference") location. Field observations, quantitative sampling data, and toxicity testing provide the measurements by which the specific assessment endpoints are evaluated.

Table 7-9 lists the assessment and measurement endpoints for selected species groups for which a potential exposure risk has been identified and for which quantitative data exist. Since only the aquatic system was studied in detail, assessment and measurement endpoints are established only for benthic invertebrates and fish. Terrestrial and semiaquatic taxa will be evaluated qualitatively in section 7.5.

7.4 TOXICITY ASSESSMENT

This section summarizes the available information on acute and chronic effects of the chemicals of ecological concern on aquatic and terrestrial fauna. Considerable information exists on the general effects of several compounds on laboratory animals, but this information does not relate concentrations in surface soils directly to effects on biota. Little toxicity data relating the concentrations of these contaminants to effects in terrestrial wildlife exist since the direct effects of contaminants on many wild mammal and other terrestrial or semiaquatic wildlife species are difficult to observe. These organisms frequently occur at relatively low densities, are secretive, often range widely, and dead and sick individuals are seldom found in the wild (Wren 1987).

In this section, the correlation between benthic communities and contaminant concentrations is also presented. Because of the potential synergistic effects of contaminants in sediments and the overall lack of existing sediment toxicity information in the literature, toxicity tests were conducted on sediment samples from three locations at the site as described in section 2.5.7.6. Additionally, toxicity testing was conducted for water column organisms on leachate samples from the site.

7.4.1 Toxicity of the Chemicals of Ecological Concern

In this section, relevant information on the toxicity of the five chemicals of ecological concern (iron, aluminum, manganese, copper, and lead) to ecological receptors is summarized.

7.4.1.1 Iron. USEPA (1986b) has established a chronic AWQC for iron in freshwater at 1,000 μg/L. Iron is an essential element required by both plants and animals. Ferrous, or bivalent (Fe^{++}), and ferric, or trivalent (Fe^{+++}) iron are the primary forms of iron of concern in the aquatic environment. The ferrous (Fe^{++}) form can persist in anaerobic waters and usually originates from groundwater. Iron can exist in natural organometallic, humic compounds, or in colloidal forms. Black or brown swamp waters may contain iron concentrations of several mg/L in the presence or absence of dissolved oxygen, but this form of iron has little effect on aquatic life (USEPA 1986b). For sediments, ecological effect levels for iron have been estimated at 24,000 mg/kg (NYSDEC 1989) and 17,000 mg/kg (USEPA 1977).

Iron is an essential element and is unlikely to cause ecological toxicity in terrestrial habitats unless present at very high levels (USEPA 1985a). Iron is not known to biomagnify within food chains (Wren et al. 1983), and soil-to-plant conversion factors are very low (0.001 to 0.004) (Bysshe 1988). Grazing animals can tolerate between 500 and 3,000 mg/kg of iron in plant tissue (Bysshe 1988).

7.4.1.2 Aluminum. According to 53 FR 168, freshwater aquatic organisms should not be adversely affected when the pH is between 6.5 and 9.0 if the four-day average concentration of

aluminum does not exceed 87 μg/L more than once every three years on the average (chronic criteria) and if the one-hour average concentration does not exceed 750 μg/L more than once every three years on the average (acute criteria). There is no available information on the toxicity effects of aluminum in sediments.

The direct toxic potential of aluminum is low compared to that of many other metals. Mammals and birds can effectively limit the absorption of aluminum and effectively excrete any excess (Scheuhammer 1987). Significant accumulation in tissues of mice required dietary doses in excess of 200 mg/kg body weight (Scheuhammer 1987). Oral LD_{50} values for several animal species range from 380 to 780 mg/kg (USEPA 1985a). Thus, the toxic potential of dietary aluminum in healthy birds and mammals is low.

Aluminum is not known to biomagnify in terrestrial or aquatic food chains (Wren et al. 1983). Soil-to-plant conversion factors are very low (0.00065 to 0.004) (Bysshe 1988), indicating a low probability of significant plant uptake from soil.

7.4.1.3 Manganese. There are no established water quality criteria for manganese. In most natural aquatic systems, manganese is expected to be present predominantly in the suspended particulates and sediments as MnO_2 and Mn_3O_4 or both. The soluble chelated manganese in aquatic systems is likely to be less soluble than free manganese ions. Thus, although manganese may undergo speciation through chemical and microbial reactions in systems, it may persist for a long period. The bioconcentration factor (BCF) for manganese in striped bass (*Marone saxatilis*) has been reported to be less than 10. Significant bioaccumulation of manganese may not occur in organisms at higher trophic levels (USEPA 1984a).

This compound may, however, be significantly bioaccumulated at lower trophic levels, but biomagnification in food chains is not likely to be significant (Wren et al. 1983; ATSDR 1990j). Plants may uptake manganese from soils and translocate this compound from the roots to the edible portions of the plant. Soil-to-plant conversion factors are 0.05 to 0.25 (Bysshe 1988). Toxic thresholds in plants have been estimated at 300 to 2,000 ppm manganese in soils, and

grazing animals can tolerate between 400 and 2,000 mg/kg of manganese in plant tissue (Bysshe 1988). Levels of manganese in soils will generally kill plants before plants can accumulate, in their tissues, levels that are toxic to most grazing animals (Bysshe 1988).

Only one soil criterion for this compound has been reported (Beyer 1990); this value, 1,500 mg/kg, is thought to protect biological resources.

7.4.1.4 Copper. Copper is an essential nutrient and is accumulated by plants and animals, although it is not generally biomagnified (USEPA 1985a). Plants may uptake copper from soils and translocate this compound from the roots to the edible portions of the plant. Soil-to-plant conversion factors are 0.25 to 0.40 (Bysshe 1988). Toxic thresholds in plants have been estimated at 20 to 50 ppm in soils, and grazing animals can tolerate between 25 and 300 mg/kg of copper in plant tissue (Bysshe 1988). Levels of copper in soils will generally kill plants before plants can accumulate, in their tissues, levels that are toxic to most grazing animals (Bysshe 1988).

Because earthworms probably regulate the levels of copper in their tissues, BCFs vary with soil concentration (Beyer 1990). It is not known how readily available copper in earthworm tissues is to predators. A LC_{50} for earthworms exposed to copper in soils has been reported at 643 ppm (Beyer 1990). Soil levels of 100 mg/kg have been reported to cause decreased growth and reproduction in earthworms (M&E 1992c).

Acute oral values for copper have been reported at approximately 200 mg/kg in sheep and 250 mg/kg in swine (USEPA 1985a). Available soil criteria levels for copper have been reviewed by Fitchko (1989) and Beyer (1990) and range from 100 to 500 mg/kg.

7.4.1.5 Lead. Lead is a nonessential element and is largely immobile in soils (Bysshe 1988). There is little translocation from plant roots to edible plant parts, and soil-to-plant conversion factors are estimated at 0.009 to 0.045 (Bysshe 1988). Adverse effects to terrestrial plants have been reported at levels of 12 to 500 mg/kg of lead in soils (Eisler 1988b; Bysshe 1988).

LC_{50} values for earthworms in soil have been reported at 5,941 mg/kg and earthworm bioconcentration factors at 0.66 (Beyer 1990) and 0.95 (Roberts and Dorough 1985). Lead levels in soils of 4,000 mg/kg have caused decreased reproduction in earthworms (M&E 1992c).

Reports of lead poisoning in terrestrial wildlife are common, but poisoning is usually caused by the ingestion of lead shot, most often by ducks and raptors. Adverse effects due to other exposures or dietary routes, such as the consumption of plant and animal tissues, are less likely to occur (Eisler 1988b). Levels below 100 mg/kg in the diets of birds cause few significant reproductive effects (Scheuhammer 1987), while grazing animals can tolerate up to 30 mg/kg of lead in ingested plant tissue (Bysshe 1988). Food chain biomagnification is negligible (Eisler 1988b).

Available soil criteria values for lead have been reviewed by Fitchko (1989) and Beyer (1990) and range from 20 to 800 mg/kg. The lowest value in this range is thought to protect biological resources.

7.4.2 Correlation of Contaminants to Benthic Communities

In order to determine the influence of contaminants on the benthic community structure, a correlation analysis (as described in section 2.5.7.6) was conducted for species densities versus various chemical and physical parameters. Species density was used since it was the only parameter that showed a distinct spatial trend, upstream to downstream, with respect to the disposal areas. Iron was used in this analysis as a representative chemical of concern in the sediments, and both iron and aluminum were used for surface water. Chemical and biological data used in this analysis were taken during the same sampling event. The results of this analysis show that there were no significant correlations between total species densities in the sediments, and iron concentrations or sediment type in the Saugatucket River or Mitchell Brook (Table 7-10).

There was a significant negative correlation between species densities on the artificial substrates and the concentration of iron in the surface water of the Saugatucket River (Table 7-11). This indicates that, although the concentration of iron is not acutely toxic, the concentration of iron is affecting secondary productivity in the water column in the river. The correlation between species densities and aluminum concentration in the water column for the Saugatucket River was low and not statistically significant from zero.

A correlation analysis was conducted to determine if the density and relative abundance of dominant species was related to contaminant concentrations (Tables 7-12 and 7-13). The results of this analysis indicate that, in the sediments of the Saugatucket River, there is a near-significant ($P = 0.063$) positive correlation between the total density of the dominant species, *Conchapelopia*, and sediment iron concentration (Table 7-12). There was, however, a significant negative correlation in the surface water between *Conchapelopia* density and iron concentration (Table 7-13) in the Saugatucket River. This corresponds to the same correlation between total species density and iron concentration (Table 7-11).

A correlation analysis between chemicals and dominant species was not run on Mitchell Brook sediments since no species occurred at all three sampling locations. In the water column, there was no significant correlation between dominant species and iron concentration (Table 7-14), although the correlation coefficient between *P. fallax* density and total iron was high ($r = 0.9451$). It should be noted that the sample size for the Mitchell Brook analysis was very small (three). More significant results may have been obtained if the sample size had been larger.

In summary, the results of the correlation analyses indicate that, at least in the water column, total species densities and community structure (occurrence of dominant species) are directly correlated to iron concentration in the Saugatucket River. Total densities and densities of dominant species decrease with increasing iron concentration in the Saugatucket River. This indicates that iron in the water column, although not acutely toxic, is resulting in decreased productivity. The concentration of aluminum does not appear to negatively affect the macrobenthic community.

7.4.3 Aquatic Toxicity Testing

Toxicity tests were conducted on sediments and leachate from the site. The methodologies used in the toxicity testing are described in detail in sections 2.5.7.3 and 2.7.5.4. Detailed reports of the tests can be found in Appendix F.

7.4.3.1 Sediment Toxicity Testing. Since only limited information is available on sediment toxicity from the literature and no criteria have been approved, toxicity tests were conducted on sediments from the site. Table 7-15 summarizes the concentrations of the chemicals of ecological concern in the sediments used in the toxicity testing. These tests were conducted on two aquatic invertebrates, *Hyalella azteca* and *Ceriodaphnia dubia*, and on the fathead minnow, *Pimephales promelas*. Originally, the *P. promelas* test was designed to be a chronic test. However, because the mortality rate was greater than 20% in the reference sample, only survival at 48- and 96-hour intervals was examined. For *C. dubia* and *H. azteca*, 7- and 10-day chronic static renewal tests were performed, respectively.

Hyalella azteca. The *H. azteca* test produced some anomalous final counts, which prevented statistical analysis of survival data. However, on a qualitative basis, there appeared to be markedly lower survival in sediment taken from location SE-07, directly adjacent to the disposal areas in Mitchell Brook.

Table 7-16 summarizes the mean weight of surviving organisms in the ten-day growth test. Dunnett's Test was used to evaluate differences in growth of organisms between test samples and the reference samples. There was variability in growth among samples, but no statistically significant difference in growth was found between samples. The mean weight of surviving organisms in the Saugatucket River was lowest in samples from locations SE-05 and SE-06 (downstream of the leachate seeps), suggesting that the growth of these organisms may be adversely influenced by contamination from the seeps. Sediments from these locations also contained the highest iron concentrations. The highest mean weights of surviving organisms in

the river samples were from the most upstream and most downstream stations (Table 7-16). In Mitchell Brook, the mean weight of surviving organisms was lowest (although not statistically significant) at the two downstream locations (Table 7-16), suggesting that contamination from the disposal areas may be affecting growth in these organisms.

Ceriodaphnia dubia. During the first two days of the *Ceriodaphnia dubia* test, the *C. dubia* neonates were exceedingly difficult to see because of their small size and interference from a floating layer of sediment particles on the surface of the overlying water. During the third day of the test and beyond, however, the organisms were much easier to observe, and the renewals and counts went more smoothly.

There was a 30% mortality of *C. dubia* in the reference sediment samples. This prevented the use of this sample as a reference for the statistical analysis. Instead, the laboratory controls containing 60 mg/L as $CaCO_3$ culture water were used for the statistical analysis. Mortality in all site samples was 20% or less. There was no statistically significant difference in survival between the laboratory control and any site sample.

In general, percent survival of organisms in the Saugatucket River was slightly lower (although not statistically significant) in the samples from locations downstream of the major leachate seep (SE-05, SE-06, SE-11; Table 7-17), suggesting some potential influence on survival of organisms from the leachate contaminants. In Mitchell Brook, survival was slightly higher in the samples from the two downstream locations (SE-07 and SE-12; Table 7-17). In general, however, it does not appear that the contamination from the site significantly affected the survival rate of the test organisms, since mortality at all locations was very low and not statistically difference from the laboratory control samples.

Pimephales promelas. Test protocols for this species recommend against aeration of the overlying water because this might cause loss of volatile compounds from the sample. For this reason, the test was initiated without aeration. On day 4, it was discovered that the dissolved

oxygen had rapidly declined from concentrations observed on the preceding three days, and aeration was initiated. It was felt that mortality after day 4 may have been attributable to low dissolved oxygen levels, so only 48- and 96-hour survival was used.

During the first three days of the test, it was very difficult to count the organisms due to the turbidity of the water and the tendency of the young minnows to lie still in the upper layer of sediment. It was decided that definitive counts would be taken only at times corresponding to commonly used statistical endpoints (i.e., 48 and 96 hours).

In the Saugatucket River, the survival rate was lowest at the most upstream sample location (SE-02) and highest at the most downstream sample location (SE-11). Survival in the intermediate locations varied (Table 7-18), suggesting that no distinct correlation between survival rate and contamination was associated with the disposal areas adjacent to the river for these organisms. In Mitchell Brook, the survival rate was lower in samples from the two downstream locations (Table 7-18), suggesting that the survival rate in the brook samples may be influenced by site contamination. Sediments from these two locations contained higher levels of contaminants than the upstream location. As with the other two test organisms, there was no statistical difference in survival rate between the reference sample and any of the test samples.

Based on the statistical results of these tests, it was concluded that there was no significant difference between the reference and study area samples in sediment toxicity. This indicates that the sediments at the site do not exhibit acute or chronic toxicity to representative, sensitive species.

7.4.3.2 Leachate Toxicity Testing. Toxicity tests were performed using composite leachate samples from the site and the test organisms *C. dubia* and *P. promelas*. Results from these tests are summarized in Tables 7-19 and 7-20. The tests included the 48-hour acute test and the 7-day chronic, static-renewal test. *P. promelas* and *C. dubia* were exposed to various concentrations of leachate, and various parameters were measured to assess the sensitivity and response of these organisms to the leachate. For the acute test, the statistical endpoints determined from the data

included the median lethal concentration (LC_{50}) and the no observed acute effects level (NOAEL). For chronic tests, the endpoints were determined for survival and growth/reproduction parameters including inhibition concentration levels (IC_{25} and IC_{50}), 7-day LC_{50}, no observable effects concentration (NOEC), and lowest observable effects concentration (LOEC).

The *C. dubia* acute test identified an acute effect from the leachate sample, with the LC_{50} occurring at a leachate concentration of 67.8% and the NOAEL occurring at a leachate concentration of 25% (Table 7-19). The chronic test data for *C. dubia* did not indicate a statistically significant effect on survival for the sample even though percent survival was zero at the 100% leachate concentration (Table 7-20). While this may appear to be contradictory, it should be noted that there are procedural differences to be considered (i.e., feeding and renewal in the chronic test) which may account for some of this discrepancy. Reproductive effects were indicated, with a LOEC occurring at 100% leachate and a NOEC at 50% leachate, based on the Wilcoxon Rank Sum Test with Bonferroni Adjustment.

Acute test data for *P. promelas* indicated a visual NOAEL at the 50% leachate concentration. A median lethal concentration (LC_{50}) could not be determined from this acute test because there was no concentration that resulted in the death of at least 50% of the organisms (Table 7-20). The chronic 7-day survival test data indicated a LC_{50} at the 58.1% leachate concentration based on the Spearman-Karber analysis. The Dunnett's Test run with the chronic survival data indicated a NOEC at 50% leachate and a LOEC at 100% leachate. Statistical analysis of the growth data for *P. promelas* resulted in a growth IC_{25} at 33.8% leachate and an IC_{50} at 56.8% leachate. The Dunnett's Test run on the same data indicated a NOEC at 25% leachate and a LOEC at 50% leachate (Table 7-19).

The leachate samples were rust-colored on arrival at the laboratory. When the dilutions were in preparation, a precipitate was noticeable and tended to floc in the containers used for testing. The fathead minnows occasionally seemed to get caught up in the floc as it settled. From these

observations, it would appear that the effects observed may be caused by a combination of chemical toxicity and physical stress on the test organisms.

In summary, test results indicate that the leachate was acutely toxic to *C. dubia* and also caused reproductive effects. Some chronic toxicity also occurred in the fathead minnow (*P. promelas*).

7.5 RISK CHARACTERIZATION

This section quantitatively (aquatic communities) or qualitatively (terrestrial communities) characterizes the baseline risk to ecological resources in the site study area.

7.5.1 Comparison to Assessment Endpoints

Assessment and measurement endpoints were established in section 7.3.3 for benthic invertebrates and fish. Use of measurement endpoints to evaluate assessment endpoints for these taxa will allow the risk to these organisms to be preliminarily evaluated.

7.5.1.1 Benthic Invertebrates. The benthic community inhabiting a water body is generally a good indicator of the long-term environmental condition and health of the aquatic system. The benthos is primarily composed of slow-moving, relatively sessile organisms that cannot easily escape stressful conditions, such as changes in the quality of sediments and/or water. Because some species are more sensitive to these types of stresses than others, the species composition of the community and the relative abundance of various organisms can serve as a good indicator of the typical conditions at a particular sampling point.

As discussed in section 3.4, the benthic community in the Saugatucket River is generally diverse. However, community composition and relative abundance of organisms appear to be influenced by the proximity to the landfill and leachate seeps. The benthic grab samples from the sediments adjacent to the largest leachate seep were distinctly different from samples at upstream and downstream locations, indicating that the community structure at this location may be the result

of adaption to the chemical influence of the sediments, and thus, is different from the community structure that would be expected in the absence of the chemical influence. Concentrations of the chemicals of ecological concern in the sediments were generally higher at the two locations immediately downstream of the major leachate seep (SE-05 and SE-06) than at the most upstream (SE-02) and most downstream (SE-11) locations. This trend is especially evident for iron, where the concentration at SE-05 and SE-06 is two orders of magnitude greater than at the upstream location. This difference in iron concentration, and to a lesser degree aluminum, may be directly influencing the benthic community structure. Results of the sediment toxicity tests also indicate that contamination in the sediments may result in lower survival rates for sensitive organisms, resulting in a shift in community structure.

In the water column of the Saugatucket River, the density of macroinvertebrates appears to be directly influenced by the disposal areas. The density of organisms significantly decreases downstream of the disposal areas where contaminant concentrations in the surface water are higher. Additionally, the occurrence of pollution-sensitive taxa decreases downstream of the disposal areas, indicating that these species are less able to tolerate the more stressful environmental conditions. This increase in densities of organisms corresponds to an increase in the concentrations of the chemicals of ecological concern in surface water from upstream to downstream locations, especially with respect to iron and manganese.

In Mitchell Brook, as with the Saugatucket River, the benthic community structure associated with contaminated sediments was distinctly different from the structure at locations less influenced by the disposal area contamination. Total species densities were lower downstream of the disposal areas even though the physical characteristics of the sediments were similar. This corresponds to an increase in the concentrations of the chemicals of ecological concern immediately downstream of the disposal areas (SE-09). This indicates that chemical contamination from the disposal areas may be affecting densities. The macrobenthic community in the water column in Mitchell Brook exhibits this same trend of decreased species densities downstream of the disposal areas associated with increased concentrations of the chemicals of ecological concern.

7.5.1.2 Fish. No quantitative assessment of the fish community in the water bodies of the site study area was conducted. However, based on the physical characteristics of the water bodies (such as water flow and sediment type), these areas would be expected to support both resident and migratory fish populations.

Based on observations made during aquatic sampling, Mitchell Brook and the Saugatucket River do not appear to support a healthy fish community on the site, since few fish were observed during aquatic sampling. The lack of fish may be related to chemical contamination in the water column since both aluminum and iron exceeded AWQC. AWQC are designed to protect most aquatic organisms from the toxic effects of contaminants. Additionally, results of the leachate toxicity tests indicate that this media can produce chronic toxicity in fathead minnows. Sediment toxicity tests also suggest that there may be decreased survival rates in minnows at sediment contaminant levels associated with the study area. It is important to note that larval fish were observed in the unnamed tributary of Mitchell Brook upstream of the disposal areas where the surface waters are relatively clean. In addition to direct sublethal or toxic effects, fish may also be affected by decreased invertebrate densities (their primary food source), since these densities appear to be affected by chemical contamination.

Given that alewives (*Alosa pseudoharengus*) occur in the Saugatucket River system, there may be a potential for iron floc on the sediments to smother alewife eggs. However, according to Rhode Island Fish and Wildlife (1992), alewives have been observed returning to the river only as far upstream as Saugatucket Pond (upstream of the Main Street, Wakefield, and Peacedale Palisades fish ladders). Since alewives are pond spawners, they are not spawning in the headwaters of the Saugatucket River, but are primarily using the first two impoundments above the previously mentioned fish ladders. If they migrate further upstream, it is likely they would return downstream to the impoundments to spawn and would not spawn in the vicinity of the site study area. The State of Rhode Island has no current plans for restoration of alewife spawning upstream of the Peacedale Palisades impoundment, i.e., in the vicinity of the site (Rhode Island Fish and Wildlife 1992).

To address this issue, further assessment of iron in surface water and sediment in the Saugatucket River was conducted to ascertain whether other sources, in addition to the disposal areas, could be causing the elevated iron concentrations observed in the lower portions of the river. The results of that evaluation are discussed in Appendix F. Evidence suggests that higher iron concentrations than observed in the background location (SW/SD-02) river are naturally occurring in other parts of the site study area. This is supported by the chemical composition of the geologic formations in the vicinity of the site study area as well as elevated iron concentrations in surface water and sediment for two tributaries (Mitchell Brook and the unnamed brook) that intersect the river below the disposal areas. The two primary mechanisms that could facilitate higher iron concentrations in downstream sections are considered to be sediment/flocculent transport and chemical precipitation. While transport is expected to occur to some extent, elevated iron concentrations in sediment that were associated with disposal areas were largely attenuated prior to its confluence with Mitchell Brook. The general absence of flocculent in the lower reaches of the river also indicate that floc is not necessarily prevalent throughout the length of the river. Potential precipitation (i.e., flocculation) of iron from surface water was also evaluated and was not found to be a contributing process based on the water quality conditions that existed. In consideration of this information, it appears that unusually different or higher iron floc in sediments in the lower reaches of the Saugatucket River isn't occurring to any appreciable extent. Therefore, impact to alewife eggs by changes (i.e., increases) in iron floc conditions is not supported.

Blueback herring *(Alosa aestivalis)* are being stocked in the Saugatucket River on an experimental basis. They prefer larger, slow-moving rivers but have mixed successfully with alewives in New England. It is highly unlikely that they are spawning anywhere upstream as far as the Rose Hill Regional Landfill site (Rhode Island Fish and Wildlife 1992).

7.5.2 Evaluation of Baseline Risk

Baseline risk to ecological receptors from exposure to the chemicals of ecological concern can be characterized by comparing the calculated ecological effect levels with observed contaminant concentrations in the media of ecological concern and by evaluating the results of toxicity testing on sediments and leachate.

7.5.2.1 Aquatic Receptors. Section 7.5.1 characterizes the risk to aquatic biota from site contamination based upon the results of field and laboratory toxicity studies. The *in-situ* benthic community exhibits some apparent effects from site contamination particularly with respect to community structure (as described in sections 3.4 and 7.5.1.1). However, the results of the correlation analyses suggest that there is no significant linear correlation between species densities and sediment contamination. Also, the results of the sediment toxicity tests indicate that the sediments do not produce acute or chronic toxicity in sensitive aquatic organisms. These results suggest that the effects on the benthic community are likely to be attributable to surface water contamination and not sediment contamination. This is supported by the fact that concentrations of the chemicals of ecological concern in surface water and leachate exceed AWQC and that the leachate is acutely toxic in toxicity tests.

Ecological risk from the chemicals of ecological concern in surface water and leachate can be characterized by comparing contaminant concentrations to known ecological effect levels. For iron and aluminum, the ecological effect levels were based on ambient water quality criteria for protecting aquatic life. For iron, the chronic effect level is 1,000 μg/L in surface water, and for aluminum is 87 μg/L. Iron was measured at up to 65 times the criteria in surface water while aluminum was measured at up to 13 times its criteria value. Concentrations of these chemicals in surface waters throughout the site frequently exceeded criteria levels, especially in areas downstream of leachate seeps. Thus, there is a risk to aquatic organisms in the surface waters from exposure to these chemicals of ecological concern. Concentrations of iron and aluminum in leachate also exceeded AWQC by up to four orders of magnitude for iron and up to three orders of magnitude for aluminum. The risk to aquatic organisms is confirmed by

results from the leachate toxicity testing, which indicated that the leachate is acutely toxic to aquatic organisms. Additionally, the correlation analysis shows significant negative correlation between iron concentration and species densities in the surface water.

There is no AWQC for manganese, a chemical of ecological concern in surface water and leachate, and very little aquatic toxicological information is available for this compound. It can only be inferred that, since this compound was frequently detected throughout the surface waters of the site at greater than an order of magnitude above background concentrations, it may be posing a risk to aquatic organisms.

In summary, baseline risk to aquatic organisms may occur as a result of exposure to the chemicals of ecological concern in the surface water and leachate. There does not appear to be an existing risk to aquatic organisms due to exposure to sediments.

7.5.2.2 Terrestrial Receptors. In this section, risks to terrestrial receptors are qualitatively evaluated based on ecological field data from the reconnaissance survey and by comparing on-site contaminant concentrations in surface soils to effect levels.

A number of species of frogs are common in the site study area and are usually associated with areas containing semipermanent or permanent water (DeGraaf and Rudis 1983). Other important habitat characteristics include the presence of aquatic vegetation, overhead cover, and densely vegetated banks; food items include insects, crustaceans, and fish. These conditions are largely absent from the site study area except in the Saugatucket River.

Several species of turtles are common in the region, although the site study area, except for portions of the Saugatucket River, does not provide suitable habitat for these organisms. Snapping turtles were observed on site only once and no other species of turtles were observed. Mitchell Brook and associated wetlands do not provide deep, permanent water and basking locations are largely absent.

Both adult and juvenile (tadpole) frog life stages were observed on site, although in very small numbers. Based upon qualitative observations, salamanders and frogs were generally absent from most of the site study area, as were turtles. This is likely to be the result of poor habitat conditions rather than the presence of contamination, except in the Saugatucket River. In the Saugatucket River, however, these organisms may be adversely affected by degraded water quality, as described previously for fish.

No overt signs of contaminant effects on the on-site avifauna were apparent. The species observed on site were typical of those expected based upon geographical area and habitat present. American robins were often observed foraging on the disposal areas, presumably for earthworms. Although these prey species were likely contaminated to some degree, no overt or acute effects on the predatory birds were evident; American robins are known to have bred on site. Based upon known effect levels for the chemicals of ecological concern in surface soils, adverse effects to earthworms and birds (including state-listed bird species) would not be expected, except possibly in heavily contaminated areas associated with leachate seeps (see Comparison to Effect Levels below).

No overt contaminant effects were observed for the on-site mammalian community. The mammals using the site were those expected based upon habitat present and existing land uses. Most of the site study area, except for the Saugatucket River, provides poor habitat for wetland-associated mammal species such as mink, whose habitat is characterized by permanent or semipermanent water bodies bordered by woody and emergent wetland vegetation and other shoreline cover such as downed logs and rocks (Allen 1986). Favored prey items, including fish, amphibians, muskrats, and small mammals, appear to be uncommon. The site study area, except possibly along the Saugatucket River, also does not provide suitable emergent wetland habitat, characterized by vegetation such as cattail, preferred by muskrats and other wetland species. Muskrat sign was rarely observed along Mitchell Brook. Permanent water and stable water levels are among the most important habitat features for this species (Allen and Hoffman 1984), and Mitchell Brook and associated wetlands undergo significant seasonal fluctuations in water levels. Suitable emergent vegetation for food and cover is also sparse.

Peromyscus mice are common rodents in New England, utilizing a variety of wooded or shrubby habitat types (DeGraaf and Rudis 1983). Suitable habitat for these organisms occurs in the non-inundated woody areas in the site study area. Based upon known effect levels for the chemicals of ecological concern in surface soils, adverse effects to mice and other rodents would not be expected, except possibly in heavily contaminated areas associated with leachate seeps (see Comparison to Effect Levels below).

Comparison to Effect Levels. Direct effects to terrestrial biota from exposure to surface soils are not likely to occur over most of the site study area. The chemicals of ecological concern in surface soils (copper, lead, and manganese) rarely exceeded their effect levels. Manganese exceeded its effect level (300 mg/kg) only twice; both locations were associated with leachate seeps. The effect level for copper (20 mg/kg) was based on a conservative value for effects to plants; no overt effects to plants were observed on site except in several small areas with high methane concentrations in soil gas. Effect levels for earthworms, a representative soil biota, and the lowest published soil criterion for copper were both 100 mg/kg. Copper exceeded 100 mg/kg in only one surface soil sample; this location was associated with a leachate seep. Lead levels in surface soils rarely exceeded 30 mg/kg, levels not expected to have adverse effects except to the most sensitive plant species; no overt effects were observed to plants on site, however, except in several small areas with high methane concentrations in soil gas. The highest lead level (124 mg/kg) was associated with a leachate seep.

Terrestrial receptors may also be directly exposed to contaminants in the leachate if they drink this liquid. Utilizing a deer exposure model (M&E 1989) for exposure to the chemicals of ecological concern in leachate, worst-case exposure resulted in a hazard ratio above 1.0 at the maximum observed on-site concentration for lead and manganese, and near 1.0 (0.73) for aluminum (Table 7-3). Comparable values for iron were not available. Thus, some small risk exists to ecological receptors from consumption of leachate. This risk, which was based on worst-case exposures, is unlikely to be realized due to the small area of the leachate seeps relative to the home range size of species such as the white-tailed deer.

Food chain effects are not likely to occur for terrestrial or semiaquatic birds and mammals. For aquatic food chains, the chemicals of ecological concern in surface water (iron, aluminum, and manganese) have low toxicity to birds and mammals and are not known to be biomagnified in food chains. Thus, direct effects to these organisms from consumption of fish, frogs, and other aquatic prey species are not likely to occur. However, indirect effects, primarily reduced prey density from contaminants in the water column, may occur for birds and mammals.

For terrestrial food chains, the chemicals of ecological concern in surface soils (copper, lead, and manganese) are also unlikely to pose significant risks. Plants generally die before accumulating levels of copper and manganese in their tissues known to be harmful to grazing animals (Bysshe 1988). Lead is poorly translocated from the root zone into edible plant portions (Bysshe 1988). None of these contaminants are known to bioconcentrate at higher trophic levels and are not known to biomagnify within food chains.

In summary, baseline risks to terrestrial and semiaquatic organisms are not likely to be significant over most of the site study area. Areas of soil associated with leachate seeps, and the leachate itself, may pose some risks to biota. Due to the small areas affected, however, this risk is not likely to be significant. Food chain effects are not of concern, although indirect effects from reduced prey abundance in aquatic areas may be occurring. Small areas of dead trees associated with high methane levels in soil gas are also not considered significant, due to the extremely limited areas over which these effects have been observed.

7.6 UNCERTAINTY

There are many sources of uncertainty associated with an ecological risk assessment. Each component of an ecological risk assessment (i.e., receptor selection, toxicity assessment, and exposure assessment) has some uncertainty associated with it (USEPA 1988e). The principal uncertainty associated with this analysis involves the determination of ecological effect levels. For many chemicals, especially for the terrestrial assessment, toxicity data were very limited and

criteria values were often unavailable. To compensate for this, the most conservative values were generally used to represent a reasonable worst-case scenario.

A second uncertainty involves using chemical-specific effect levels for individual compounds to assess toxicity. This approach fails to account for multiple exposure pathways, exposures to multiple chemicals, and potential additive or synergistic effects. This uncertainty is most evident for the terrestrial portion of the ecological risk assessment; the aquatic portion included toxicity testing with on-site media, which accounts for these factors.

SECTION 8.0
SUMMARY AND CONCLUSIONS

This section summarizes the findings and conclusions of the remedial investigation conducted at the Rose Hill Regional Landfill Superfund site. The purpose of the RI was to determine the effects of contamination on human health and the environment.

8.1 SUMMARY

The site study area contains three inactive disposal areas and an active transfer station for municipal and industrial waste disposal. Current and future uses of the site study area include a town-owned refuse transfer station, dog training and hunting facilities, fishing, wading and/or swimming in surface water, a target range, and residential properties. Habitats of ecological value in the site study area include forested and open field areas, surface water bodies, and forested wetlands. These habitats support a variety of aquatic and terrestrial organisms, including several rare species.

8.1.1 Site Characteristics

The principal geologic, hydrogeologic and ecological features of the site study area were identified and evaluated during the RI.

8.1.1.1 Geology and Hydrogeology. The behavior of bedrock groundwater was found to be influenced by the bedrock topography in the site study area. Recharge and discharge of bedrock groundwater occurs at the bedrock high and low areas, respectively. The predominant hydraulic gradient for the bedrock flow system is southeast, and the dominant transport media for bedrock groundwater are southeast-trending fractures. Although the impact of weathered and fractured bedrock south and west of the solid waste area was not fully defined, transport of contamination west of the solid waste area was evident.

The overburden consists of ablation till, glacial lacustrine, and glacial outwash sediments. The hydraulic conductivities of the till and outwash were similar and permit unconfined groundwater flow to the south-southeast. Lacustrine deposits in the south-southeastern portion of the site study area between the till and outwash strata are less permeable and act as a confining layer restricting groundwater movement between the shallow and deep overburden. Runoff infiltration through the cover materials is expected to be high because of the permeability of the cover material and flat surface topography of the disposal areas. The combination of this infiltration, the heterogeneous nature of the solid waste refuse, and a bedrock high appears to have created localized mounding in the northwest corner of the solid waste area.

Groundwater and surface water interaction across the Saugatucket River and Mitchell Brook is believed to play an important role in the fate and transport of site contaminants. The Saugatucket River was observed to gain water from the shallow and deep overburden and bedrock flow systems along the east-southeast portions of the site study area. The fluctuations of Mitchell Brook were dependent upon precipitation and the responsiveness of groundwater to recharge.

8.1.1.2 Ecological Resources. Significant ecological habitats within the site study area include the Saugatucket River and Mitchell Brook, their associated tributaries and forested wetlands, and the adjacent forested and old field upland habitats. Rare plant species known to occur within the site study area include a species of state interest, tickseed sunflower, and a species of concern, bloodroot. A probable sighting of an avian species of concern, red-bellied woodpecker, also occurred within the site study area. Two avian species of state interest, glossy ibis and great egret, were also observed within the site study area. However, the state designation applies only to breeding sites for these two species, and suitable breeding habitat does not exist within the site study area, except possibly along the Saugatucket River.

The Saugatucket River appears to support balanced benthic communities. The species composition of organisms living in the sediments at locations adjacent to the disposal areas appears to be different from that at upstream or downstream locations, although these areas are

still productive and diverse. Organisms in the water column appear to be more directly influenced by the disposal areas and leachate seeps. Densities of organisms in the water column downstream of the disposal areas and leachate seeps are significantly lower than at upstream locations. There also appears to be a scarcity of fish in this section of the river, where resident and migratory fish would be expected to occur. The benthic community in Mitchell Brook does not appear to be as diverse as that of the Saugatucket River. Species density and diversity were especially low adjacent to the disposal areas. In the brook, as in the Saugatucket River, few fish were observed.

As indicated by a single, reconnaissance-level survey, the site study area is utilized by a variety of terrestrial species. Avian species observed were mostly passerines utilizing the old field and edge habitats; relatively few waterfowl, raptors, and shorebirds were observed. The extensive running of dogs and hunting on the site have influenced the use of the site by mammalian species. Reptiles and amphibians utilizing the site study area are likely to be confined largely to terrestrial species, as Mitchell Brook does not appear to support large numbers of these organisms or other prey species, such as fish. However, the Saugatucket River likely supports a more diverse assemblage of wildlife and aquatic species.

8.1.2 Nature and Extent of Contamination

During the RI, over 132 compounds were detected. Contaminants were detected in all media, with the highest concentrations generally within and downgradient of the disposal areas. Those detected most frequently and in the highest concentrations included volatile organics, primarily chlorinated and aromatic volatiles and ketones, and elevated metals. Some of the organic compounds detected were solvents known to be disposed of during landfill operations (TCE, toluene, MEK, and *N,N*-DMF). Other chemicals detected were typical landfill wastes. Other compounds detected less frequently include phthalates, PAHs, phenols, pesticides, and PCBs.

8.1.2.1 Surface Soil. The detection of organic compounds and elevated metals was related to location. The most prevalent volatile organics included 1,2-DCE, 1,1-DCA, vinyl chloride and

chloroethane, BTEX compounds, and ketones. The highest volatile organic concentrations were found in the solid waste and bulky waste areas, and elevated metal concentrations were commonly found near leachate seeps. Several organic compounds (PAHs and phthalates) were detected in surface soil throughout the study area including background soil samples.

8.1.2.2 Subsurface Soil. The chemical data collected during the RI were representative of the types of waste landfilled in each of the disposal areas. In the sewage sludge area, sludge was encountered along the eastern side. A few organic compounds (ketones and toluene) and elevated metal concentrations were found in soils associated with sludge material. In the bulky waste area, 6 feet of refuse was evident and several organic compounds were detected in low concentrations. In the solid waste area, refuse 20 feet thick was encountered in the southern end. The chemicals detected (pesticides, phthalates, and dichlorobenzenes) are typical components of municipal waste. Volatile organics were also present based on landfill gas results.

8.1.2.3 Leachate. Leachate seeps were evident around the bulky waste and solid waste areas. Large leachate seeps along the eastern perimeter of the bulky waste area were characterized by orange floc and stained ground cover. Elevated metals and low concentrations of a few organics were detected in the leachate.

8.1.2.4 Groundwater. Numerous organic compounds, primarily volatile organics, were detected in the three groundwater flow zones (shallow and deep overburden and bedrock). The highest concentration found in the site study area occurred in and around the solid waste area, while lower concentrations were found near the bulky waste and sewage sludge areas. Groundwater contamination decreased south-southeast (downgradient) of the disposal areas. Movement of contaminants into bedrock groundwater was evident. The impact of contamination, if any, on residential wells east of the Saugatucket River and south of the disposal areas was minimal. However, some residential wells immediately north and northeast of the solid waste area exhibited low concentrations of volatile organics. The detection of *N,N*-DMF is a strong indicator that contaminant transport west of Rose Hill Road and north of

the solid waste area is occurring, since the compound is known to have been disposed of with industrial wastes in this area.

8.1.2.5 Surface Water and Sediment. Contamination in surface water was limited to elevated metals and a few organic compounds at low concentrations. In Mitchell Brook, contamination was primarily found adjacent to and downgradient of the solid waste area. In the Saugatucket River, contamination was most evident east of the bulky waste area near several large leachate seeps. Below the confluence of Mitchell Brook and the Saugatucket River, contamination increased to some extent compared to the Saugatucket River. Contaminants in the unnamed brook did not appear to be related to the disposal areas.

8.1.2.6 Landfill Gas. Contaminants and levels of contamination in landfill gas varied from one disposal area to another. In the sewage sludge area, volatile organics were not detected, with the exception of low concentrations of acetone. Methane, CO_2, and hydrogen sulfide were occasionally identified. In the bulky waste area, numerous chlorinated and aromatic volatile organics, including vinyl chloride, 1,2-DCE, 1,1-DCE, BTEX compounds, styrene, and dichlorofluoromethane, were the major components of landfill gas. Elevated concentrations of hydrogen sulfide were evident in this area. The highest concentrations of methane and CO_2 were detected in the central portions of this area. Throughout the solid waste area, elevated methane and CO_2 levels were detected. The northern portion of this area was characterized by elevated concentrations of chlorinated volatiles while the southern portion was characterized by elevated levels of aromatic volatiles. Hydrogen sulfide was also detected. Landfill gas contamination was also present around the perimeter of the solid waste area.

8.1.3 Contaminant Fate and Transport

The predominant transport processes for contaminants include leachate runoff, landfill gas migration, groundwater flow through the shallow and deep overburden and fractured bedrock, and surface water and sediment movement.

8.1.3.1 Unsaturated Zone Transport. The primary transport mechanism in this zone is leachate runoff and landfill gas migration. Volatile organic and metal concentrations, especially iron, were elevated in leachate samples compared to background groundwater. Surface soil, surface water, and sediment contamination was evident in areas near leachate seeps.

In landfill gas, chlorinated and aromatic volatiles were predominately found in the solid waste and bulky waste areas. In addition, migration of landfill gas to the north, west, and south of the solid waste area was evident. Volatilization of organic compounds from subsurface soils and disposal area contents and subsequent adsorption to surface soil or release to the ambient air may be occurring.

8.1.3.2 Saturated Zone Transport. In overburden groundwater, the highest concentration of contaminants was found in wells adjacent to the disposal areas. Although the groundwater flow is predominately to the south-southeast, mounding of groundwater in the northwest corner of the solid waste area may have facilitated radial migration to the north, east, and west. The interception of shallow overburden groundwater and the presence of glacial lacustrine deposits in portions of the site study area may have decreased contamination in the shallow overburden compared to the deep overburden groundwater. The retention of contaminants by soil may be an important factor in limiting mobility.

Highly fractured bedrock west and south of the site study area allows interaction between overburden and bedrock groundwater. Lateral transport of contaminants in bedrock groundwater from west of the Saugatucket River to residential wells east of the river was not evident. In the central and eastern portions of the site study area, contaminant transport may be lateral along the dipping bedrock surface.

Although variations were observed in the concentrations and number of chemicals detected, seasonal trends were not evident based on the data collected.

8.1.3.3 Surface Water and Sediment. The contamination of surface water and sediment increased in areas of leachate outbreaks. Low organic content in sediment facilitates the transport of contaminants from groundwater to surface water. However, the retention of less soluble organics in sediments may be occurring, since these compounds were detected more often in sediments than in associated surface water. The low velocity of surface water in many areas may decrease downstream transport. Although variations in the number and concentrations of chemicals detected were observed, seasonal trends were not evident based on the data collected.

8.1.4 Human Health Risk Assessment

The baseline risk assessment was performed to evaluate the potential adverse health effects to human populations who may come into contact with chemicals associated with the site study area. Chemicals of concern were selected for the following media: landfill gas, leachate, surface soil, site groundwater, surface water, sediment, residential groundwater, residential ambient air, and residential indoor air.

Six media (surface soil, leachate, groundwater, surface water, landfill gas, and air were evaluated quantitatively under various exposure scenarios. Possible human exposure to the selected chemicals of concern was characterized through exposure pathways for current and future land use. Surface soil, leachate, groundwater, and landfill gas were evaluated by disposal area.

The potential for adverse health effects was evaluated by comparing the calculated cancer risks to the target risk range of 10^{-6} to 10^{-4} and calculated the hazard index to the target index of 1.0 as recommended by USEPA.

Site study area media for which all evaluated pathways are below USEPA's target risk range for carcinogens and noncarcinogens are:

- sewage sludge area soil gas
- Mitchell Brook surface water
- Saugatucket River surface water

Site study area media for which one or more exposure pathways are within USEPA's target risk range for carcinogens and/or noncarcinogens are:

- solid waste area surface soil
- sewage sludge area surface soil
- bulky waste area soil gas

Site study area media for which one or more pathways are above USEPA's target risk range for carcinogens and/or noncarcinogens are:

- bulky waste area surface soil
- solid waste area groundwater
- bulky waste area groundwater
- sewage sludge area groundwater
- residential well groundwater
- residential ambient and indoor air
- residential indoor air at 220 Rose Hill Road
- solid waste area landfill gas

The chemicals responsible for the majority of the risk under current and future land-use conditions were:

- manganese (in surface soil, site groundwater, and residential well groundwater)
- vinyl chloride (in solid waste area landfill gas, site groundwater, and residential and ambient and indoor air)
- 1,2-DCE, acrylamide, arsenic, cadmium, antimony, beryllium, and zinc (in site groundwater)

- benzene and 1,1,2,2-tetrachloroethane (in residential ambient and indoor air)

8.1.5 Ecological Risk Assessment

Potential risks could occur to organisms associated with on-site habitats from exposure to contaminated media including surface water, leachate, sediments, and surface soils (the media of concern). Potential exposure pathways include dermal contact, ingestion of contaminated media, and ingestion of contaminated food; inhalation exposures were not deemed important.

Chemicals of ecological concern to aquatic receptors are iron, aluminum, and manganese, in surface water, iron, aluminum, manganese, and lead in leachate, and iron and aluminum in surface sediments. Benthic organisms and fish were identified as potential receptors for exposure to the chemicals of ecological concern. Results of sediment toxicity testing indicate that the chemicals of ecological concern in sediments are not toxic to benthic organisms or fish. Chemicals of ecological concern in surface water do, however, pose a risk to aquatic receptors based on a comparison of ecological effect levels with observed concentrations in surface water, the negative correlation of species densities with chemical concentrations, and the toxicity of the leachate. Risks from manganese in surface water could not be quantitatively evaluated because toxicological information was not available, but concentrations were more than an order of magnitude higher than background levels, suggesting that this compound is also contributing to the risk to aquatic receptors.

Chemicals of ecological concern to terrestrial receptors are lead, copper, and manganese present in surface soils. Amphibians, reptiles, birds, and mammals were identified as potential receptors for exposure to the chemicals of ecological concern in this medium. Based upon on-site observations, plants do not appear to be stressed from exposure to on-site contaminants, except in small areas with high concentrations of methane in landfill gas, and were not considered important receptors. Based upon a qualitative assessment and comparison to known ecological effect levels, significant adverse effects are not expected to birds or mammals. Certain aquatic reptiles and amphibians, however, may be adversely impacted by contact with contaminated

surface water, as described for fish. High levels of contaminants in soils and leachate in the vicinity of leachate seeps may pose some risk to ecological receptors, since maximum concentrations exceed effect levels. Due to the limited extent of these leachate seeps, however, these risks are not likely to be significant. Adverse effects to state-listed species are not expected to occur.

8.2 CONCLUSIONS

The remedial investigation indicated that 1) contaminants were detected in all media, including groundwater, surface water, soil, sediment, leachate, and landfill gas; 2) contaminant transport mechanisms were influenced by groundwater flow, geologic features, groundwater/surface water interaction, and leachate and landfill gas migration; and 3) increased human health and ecological risks were evident. Detailed conclusions are presented below.

- 1,2-DCE, 1,1-DCA, vinyl chloride, chloroethane, BTEX compounds, and ketones were the most prevalent organic compounds detected throughout the site study area. Elevated metal concentrations were evident in different media.

- Seasonal trends in groundwater and surface water contamination were not evident, although variations in concentrations and the types of contaminants occurred.

- Leachate seeps along the eastern perimeter of the bulky waste area are impacting surface water, sediment, and surface soil quality.

- Landfill gas is impacting surface soil and groundwater north, west, and south of the solid waste area and within the solid waste and bulky waste areas.

- A combination of the rise in the surface elevation of the bedrock and the presence of thick lacustrine deposits on the eastern side of the Saugatucket River plays a significant role in the increased horizontal groundwater gradient and the strong upward gradients observed south of the bulky waste area adjacent to the river. This lacustrine layer serves to restrict contaminant transport from deep to shallow overburden in these areas.

- Fractured and weathered bedrock along the west and southwest portion of the site study area impacts localized flow and contaminant transport in bedrock. This

fracture zone demonstrates limited storage capacity, but is believed to be directly connected to runoff pathways and surface water receptors.

- A combination of highly permeable cover materials, the bedrock topographic high located along the northeastern portion of the solid waste area, and the presence of heterogeneous solid waste refuse appears to create localized mounding of the shallow overburden flow system. This mounding is contributing to contaminant transport to the north and west of the solid waste area as supported by the detection of *N,N*-DMF in wells in these areas.

- Residential bedrock wells east of the Saugatucket River did not indicate site-related contamination.

- Vertical groundwater gradients of the deep overburden and bedrock flow systems indicate discharge of groundwater from these systems to the Saugatucket River. However, the river is not considered a boundary for eastward flow.

- The groundwater and surface water interaction across the Saugatucket River and Mitchell Brook plays an important role in fate and transport of contaminants. Contaminants found in the shallow overburden groundwater system discharge to the surface water along most of the Saugatucket River adjacent to the site study area and along the southern portion of Mitchell Brook. The greatest outlet for the shallow groundwater and hence contamination was along the eastern perimeter of the bulky waste area.

- Although flooding that occurs along the Saugatucket River east of the bulky waste area during high flow periods may provide for redistribution of contaminants found in surface water and shallow groundwater to the sediments along the river banks, chemical data to support this are inconclusive.

- Excess lifetime cancer risk for human receptors may exceed USEPA's target range for the following pathways: direct ingestion of chemicals in groundwater from all three disposal areas; inhalation of chemicals in landfill gas in the solid waste area; and inhalation of chemicals in residential ambient air and indoor air.

- Noncarcinogenic risk for human receptors may exceed USEPA's target hazard index of 1.0 for the following pathways: direct ingestion of chemicals in groundwater from all three disposal areas and from residential wells; and ingestion of chemicals in the bulky waste area surface soil.

- Chemicals of ecological concern in surface water pose a risk to aquatic receptors based on a comparison of ecological effect levels with observed concentrations in surface water and the results of toxicity testing. Results of sediment toxicity

testing indicate that the chemicals of ecological concern in sediments are not adversely impacting benthic organisms or fish.

- Based upon a qualitative assessment and comparison to known ecological effect levels, significant adverse effects on birds or mammals are not expected. Certain aquatic reptiles and amphibians, however, may be adversely impacted by contact with contaminated surface water.

SECTION 9.0

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REMEDIAL INVESTIGATION FINAL REPORT

Volume II
Tables

Rose Hill Regional Landfill Superfund Site
South Kingstown, Rhode Island

May 1994

Prepared by:

Metcalf & Eddy
An Air & Water Technologies Company

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Year	Activity Affecting Landfill Operations
1967	Solid waste landfill begins operation in an abandoned gravel quarry off Rose Hill Road.
	Court order limits use of landfill by prohibiting disposal of combustibles.
1970	State Division of Solid Waste Management suggests to South Kingstown director of public works that liquid waste from Peacedale Processing be spread over the other waste if the town continued to accept Peacedale waste for disposal.
1971	State Division of Solid Waste Management notifies South Kingstown town manager that liquid waste from Peacedale Processing is improperly being disposed of; again, town is told to spread liquid waste on top of other waste if it continues to accept Peacedale waste.
1973	Town of Narragansett enters into an agreement with South Kingstown to engage in a regional landfill and disposal program concerning Rose Hill and West Kingston landfill facilities.
1975	Town of South Kingstown retains independent professional engineer to conduct groundwater study because the landfill facility has been found to be the source of objectionable groundwater in off-site private well. A new well is installed by town to this residence.
1976	South Kingstown Town Council votes to lease additional property (Lots OL16A and OL16 on Block 93A) for landfill facility from private resident.
1977	Town of South Kingstown retains engineering firm to conduct site analysis and develop operation plans for solid waste activities to comply with state regulations. Engineering report deems site suitable for bulky waste disposal and sludge landfill and recommends monitoring of water quality at four wells close to site.
	State Water Resource Board notifies State Division that site is not adequate as a landfill site; leachate formation and drainage noted as reasons for disapproval.
	Sewage sludge landfill begins operations.
	Town of South Kingstown recommends Rose Hill Regional Landfill as disposal site for refuse, bulky waste, and sewage sludge, if acceptable to state health authorities.
1978	Bulky waste disposal area opens.
	Town of South Kingstown initiates monitoring of seven residential wells in landfill area for water quality parameters.

TABLE 1-1 (Continued). CHRONOLOGY OF ACTIVITIES AT THE ROSE HILL REGIONAL LANDFILL

Year	Activity Affecting Landfill Operations
	Monitoring well installation begins at landfill. By 1982, eleven monitoring wells have been installed.
1979	State orders cities and towns to provide for collection of waste oil.
	RIDEM collects sample from drum at landfill; analysis shows presence of trichloroethylene. The glue waste is also known to contain dimethyl formamide and cellosolve solvent. State bans glue waste from Rose Hill Regional Landfill because industrial waste should not have been dumped at refuse facility.
1980	State Department of Waste Management official is quoted in newspaper, stating that Peacedale Processing glue wastes must be exposed to air and in solid form before disposal.
1981	Peacedale Processing notifies EPA Region I that laminating adhesive containing trichloroethylene was disposed of at the Rose Hill Regional Landfill from 1971 to 1979.
	Results of sampling document high copper and zinc concentrations in sludge; this is consistent with test results of December 1978 and October 1979. Origin of source is not resolved.
1982	Solid waste landfill closes; solid waste is disposed of in bulky waste area until transfer station is completed.
	Highest concentration of volatile organic compounds is reported; 1,2-dichloroethene is substance having highest concentration level.
	Town of South Kingstown redelivers a $\pm$6-acre parcel to private resident and votes to purchase 15.03-acre parcel from same resident.
1983	Town of South Kingstown declares zone change to accommodate transfer station.
	Court order prohibits disposal of combustibles at Rose Hill Regional Landfill.
	EPA conducts identification and preliminary assessment; potential hazards to human health through contaminated well and contaminated water supply, groundwater, and soil are identified.
	Sampling in Saugatucket River below confluence with Mitchell Brook shows presence of substance susceptible to biological and chemical oxidation, qualitatively indicating contamination.
	Bulky waste disposal area and sewage sludge landfill close.

TABLE 1-1 (Continued). CHRONOLOGY OF ACTIVITIES AT THE ROSE HILL REGIONAL LANDFILL

Year	Activity Affecting Landfill Operations
1984	Landfill rental payments from town of South Kingstown to Frisella cease as of June 30, 1984.
	Consultant site inspection shows volatile organic compounds at detectable levels in groundwater on site, in bedrock and overburden residential wells, and in soils in bulky waste disposal area. Sampling of surface water shows no contamination from volatile organic compounds.
	Later sampling is conducted by the town for iron, phosphate, total Kjeldahl nitrogen, and chemical oxygen demand (COD); COD shows levels indicative of contamination.
1985	Town of South Kingstown extends municipal water supply line to residents on Rose Hill Road.
	Sampling analysis indicates that volatile organic compounds continue to be released to underlying groundwater on site. Compounds are not detected in Saugatucket River, Mitchell Brook, or downgradient at groundwater and surface water locations.
	Consultant recommends that monitoring of water and soil continue even though low contamination releases do not appear to adversely affect water quality.
1986	Neither heavy metals nor volatile organic compounds are detected in RIDEM monitoring wells; high conductivity appears in some groundwater monitoring wells but not in others.
1987	Volatile organic compounds are detected in breathing zone at bulky waste and solid waste disposal areas; concentrations detected higher than background levels. Low resistivity survey indicates likely contamination of overburden.
	Rose Hill Regional Landfill is ranked for inclusion on the NPL (score 38.11).
	Consulting team observes leachate pools in solid waste landfill area.
	Consultants learn that portion of landfill area has been rezoned; action may allow development of property.
	Rose Hill Regional Landfill is proposed on NPL update #7 on 6/24/88.
1989	Rose Hill Regional Landfill is placed on NPL 10/4/89.

TABLE 1-2. HISTORICAL GROUNDWATER CONTAMINATION AT THE ROSE HILL REGIONAL LANDFILL SUPERFUND SITE

Contaminant	Highest Concentration (ppb) and Sampling Date	Concentration (ppb) and Last Sampling Date
1,2-Dichloroethene	80,300 (7/82)	9 (6/84)
Benzene	12,220 (3/82)	8 (6/84)
Chloroform	3,250 (7/82)	ND (6/84)
Methylene chloride	980 (7/82)	2 (6/84)
1,1-Dichloroethane	976 (7/82)	17 (6/84)
Ethylbenzene	565 (3/83)	12 (6/84)
Toluene	500 (9/82)	57 (6/84)
Total Xylenes	357 (7/82)	47 (6/84)
Trichloroethene	23 (4/81)	2 (6/84)
Barium	8,600 (9/81)	ND (6/84)
Cadmium	165 (6/81)	ND (6/84)
Lead	100 (7/82)	ND (6/84)

Source: Agency for Toxic Substances and Disease Registry 1990a

TABLE 2-1. CHRONOLOGY OF THE RI FIELD INVESTIGATION AT THE ROSE HILL REGIONAL LANDFILL SITE, SOUTH KINGSTOWN, RI

DATE			ACTIVITY
4/12/91	-	4/15/91	Residential Well Field Survey
5/27/91	-	6/19/91	Mobilization Activities
	5/15/91		Clearing of Geophysical Lines
5/21/91	-	6/13/91	Geophysical Survey
5/20/91	-	5/31/91	Existing Well Survey/Development
5/28/91	-	5/31/91	Wetland Delineation
5/30/91	-	5/31/91	Wildlife Survey
6/5/91	-	6/18/91	Staff Gauge and Mini-Piezometer Installation
6/3/91	-	6/7/91	Field and Benthic Survey
	6/14/91		Residential Well Development
6/17/91	-	7/12/91	Soil Gas Survey - Landfill Temporary Points and Installation of Permanent Points
6/18/91	-	6/28/91	Round 1 - Environmental Sampling
	7/9/91		Site Surveying Began
7/21/91	-	9/9/91	Monitoring Well Installation
8/15/91	-	9/9/91	New Well Development
8/20/91	-	8/26/91	Landfill Analytical Soil Boring drilling and sampling
	8/27/91		Permeability Test Boring drilling
9/3/91	-	9/5/91	Settlement Platform Installation
	9/18/91		Settlement Platforms surveyed
9/23/91	-	10/9/91	Round 2 - Environmental Sampling
9/23/91	-	9/25/91	Soil Gas Survey - Analysis of Temporary and Permanent Points
9/30/91	-	10/2/91	Seepage Meter and Mini-Piezometer Readings
10/28/91	-	11/1/91	Slug Testing
11/4/91	-	11/6/91	Additional Geophysical Survey Activities
11/21/91	-	5/11/92	Long Term Monitoring
12/16/91	-	12/20/91	Soil Gas Survey - Installation of Residential Points and Temporary Point Analysis

TABLE 2-1 (Continued). CHRONOLOGY OF THE RI FIELD INVESTIGATION AT THE ROSE HILL REGIONAL LANDFILL SITE, SOUTH KINGSTOWN, RI

DATE			ACTIVITY
1/22/92	-	1/23/92	Soil Gas Survey - Residential and Permanent Point Analysis
1/27/92	-	2/5/92	Round 3 - Environmental Sampling
2/19/92	-	2/20/92	Soil Gas Survey - Residential and Permanent Point Analysis
3/20/92	-	3/24/92	Soil Gas Survey - Residential and Permanent Point Analysis
4/6/92	-	4/15/92	Round 4 - Environmental Sampling
	4/15/92		Settlement Platforms surveyed
4/21/92	-	4/24/92	Soil Gas Survey - Residential and Permanent Point Analysis
5/7/92	-	5/13/92	Soil Gas Survey - SUMMA Cannisters and Reduced Sulfur Analysis
5/20/92	-	5/23/92	Artifical Substrate Removal and Benthic Sampling
5/26/92	-	6/1/92	Round 5 - Environmental Sampling
9/21/93	-	9/23/93	Round 6 - Environmental Sampling

TABLE 2-2. SPECIFICATIONS OF RESIDENTIAL WELLS

WELL LOCATION (1)	FLOW ZONE (2)	TOC TO BOTTOM (feet)	RECHARGE (3)	PURGE/ SAMPLE TECHNIQUE	WELL DIAMETER (inches)
Resident #1	Bedrock	>100	Good	SPIGOT	--
Resident #2	Bedrock	52.2	Good	HOSE	--
Resident #3	Bedrock	31.3	Good	BKB	6
Resident #4	Overburden	23.5	Good	SPIGOT	--
Resident #5	Overburden	13.5	Good	SPIGOT	--
Resident #6	Overburden	13.16	Good	BAILER	6
Resident #7	Bedrock	>100	Good	SPIGOT	--
Resident #8	Bedrock	>100	Good	SPIGOT	--
Resident #9	Bedrock	52.5	Good	SPIGOT	--
Resident #10	Bedrock	>100	Good	SPIGOT	--
Resident #11	Bedrock	>100	Good	SPIGOT	--

NOTES:

1. Screened interval of residential wells is unknown.
2. Flow zone designations and depths are approximate and are based on information compiled from the well survey (Appendix A).
3. The recharge of the residential wells was sufficient to sample continuously.
4. During September 1993, Residential well #6 was sampled from a spigot.

TOC - Top of Casing

BKB - Brainard/Kilman->Bailer

-- - Well was sampled from spigot or hose, therefore well diameter was not noted.

TABLE 2-3. ON-SITE EXISTING WELL INFORMATION

Well Number	Well Diameter/Type	Total Depth (ft below top of PVC)	Condition for Analytical Sampling
OW-25	1.5 inch/PVC pipe	36.1	Well was secured with a locking cap and was assumed to be adequate for sampling
OW-30	1.5 inch/PVC pipe	15.5	Well was secured with a locking cap and was assumed to be adequate for sampling
OW-27	1.5 inch/PVC pipe	17.1	Well was secured with a locking cap and was assumed to be adequate for sampling
MW-I	1.5 inch/PVC pipe	26.4	Well was secured with a locking cap and was assumed to be adequate for sampling
MW-II	1.5 inch/PVC pipe	30.9	Well was secured with a locking cap and was assumed to be adequate for sampling
MW-III	1.5 inch/PVC pipe	19.7	Well was secured with a locking cap and was assumed to be adequate for sampling
MW-IV	1.5 inch/PVC pipe	19.3	Well was secured with a locking cap and was assumed to be adequate for sampling
MW-V	1.5 inch/PVC pipe	28.9	Well was secured with a locking cap and was assumed to be adequate for sampling
RIDEM-I	4 inch/perforated PVC pipe	15.9	Not adequate for sampling because of well construction
RIDEM-II	4 inch/perforated PVC pipe	13.7	Not adequate for sampling because of well construction
RIDEM-IV	4 inch/perforated PVC pipe	5.9	Not adequate for sampling because of well construction

TABLE 2-3 (Continued). ON-SITE EXISTING WELL INFORMATION

Well Number	Well Diameter/Type	Total Depth (ft below top of PVC)	Condition for Analytical Sampling
OW-A	4 inch/perforated PVC pipe	5.5	Not adequate for sampling because of well construction (artisan conditions were noted)

TABLE 2-4. LANDFILL GAS DEPTH PROFILE AT BW (02+100)

Depth	Total-VOC	Methane	CO_2	O_2
3 feet	0 mg/m^3	5%	3%	19%
4.5 feet	750 mg/m^3	54%	45%	2%
6 feet	590 mg/m^3	56%	44%	3%

VOC - Volatile Organic Compounds

TABLE 2-5. WETLAND FUNCTIONS AND VALUES EVALUATED BY THE WET II MODEL

Wetland Function or Value	Social Significance[1]	Effectiveness[1]	Opportunity[1]
Groundwater Recharge	X	X	
Groundwater Discharge	X	X	
Floodflow Alteration	X	X	X
Sediment Stabilization	X	X	
Sediment/Toxicant Retention	X	X	X
Nutrient Removal/Transformation	X	X	X
Production Export		X	
Wildlife Diversity/Abundance	X		
Breeding		X	
Migrating		X	
Wintering		X	
Aquatic Diversity/Abundance	X	X	
Uniqueness/Heritage	X		
Recreation	X		

[1]See text for definitions of these terms.

TABLE 2-6. BENTHIC TAXA OBSERVED IN MITCHELL BROOK DURING RECONNAISSANCE SURVEYS

Upstream → Downstream

SW/SD-13	SW/SD-14	SW/SD-15	SW/SD-09	SW/SD-07	SW/SD-12
Coleoptera	Chironomidae	Coleoptera	Caudata	Sphaeridae	Chironomidae
Diptera	Coleoptera	Diptera	Chironomidae		Trichoptera
Ephemeroptera	Isopoda	Sphaeridae	Coleoptera		
Gastropoda	Odonata	Tadpole	Diptera		
Isopoda	Simuliidae		Isopoda		
	Larval Fish		Plecoptera		
			Trichoptera		

TABLE 2-7. BENTHIC TAXA OBSERVED IN THE SAUGATUCKET RIVER DURING RECONNAISSANCE SURVEYS

Upstream → Downstream

SW/SD-02	SW/SD-03	SW/SD-04	SW/SD-05	SW/SD-06	SW/SD-11	SW/SD-08
Amphipoda	Coleoptera	Amphipoda	Coleoptera	Coleoptera	Coleoptera	Chironomidae
Bateidae	Heptageneidae	Bateidae	Sphaeridae	Trichoptera	Tadpole	Coleoptera
Coleoptera	Isopoda	Coleoptera	Tubificidae			Isopoda
Diptera	Plecoptera	Diptera				
Ephemeroptera	Tibanidae	Heptageneidae				
Heptageneidae		Hydropsychidae				
Isopoda		Isopoda				
Odonata		Megaloptera				
Simuliidae		Plecoptera				
		Trichoptera				
		Larval Fish				

TABLE 2-8. RATIONALE FOR MONITORING WELL LOCATIONS AND MODIFICATIONS

Well Cluster Location	Rationale	Modifications Based Upon Site Reconnaissance Findings	Modifications Based Upon Field Observation During Drilling Activities
MW-01	To evaluate water quality and stratigraphy north of the disposal areas (inferred upgradient of disposal areas).	The proposed location was moved northwest along the sand/gravel road due to the proximity of the police firing range and possible contamination in the northern portion of the sewage sludge area.	Increased screen length of MW-01-01 from 10 feet to 15 feet to provide a larger screen interval of the saturated overburden.
MW-02	To evaluate water quality and stratigraphy within the sewage sludge area.	The well was located within the sewage sludge area based on elevated landfill gas readings.	a) Increased screen length of MW-02-01 from 10 feet to 15 feet to provide a larger screen interval in the saturated overburden. b) Added a deep overburden well, MW-02-02, to provide hydraulic and water quality data from the lower portion of the saturated overburden. Bedrock was 28.5 feet deeper than expected.

TABLE 2-8 (Continued). RATIONALE FOR MONITORING WELL LOCATIONS AND MODIFICATIONS

Well Cluster Location	Rationale	Modifications Based Upon Site Reconnaissance Findings	Modifications Based Upon Field Observation During Drilling Activities
MW-03	To evaluate water quality and stratigraphy south of the bulk waste area (inferred downgradient of bulky waste area).	The proposed location was moved to the northwest edge of the landfill due to visual observation of leachate outbreaks in this area.	a) Added a deeper overburden well, MW-02-02, because of thickness of overburden (similar to MW-02-02). b) Increased depth of the bedrock well, MW-03-03, from 50 feet to approximately 143 feet into bedrock because no significant water bearing fractures were encountered in the upper 50 feet of bedrock.
MW-04	To evaluate water quality and stratigraphy between the bulky waste area and the solid waste.	The proposed location was moved to marker 900 of surface geophysic line EM-5B to evaluate EM (electromagnetic) anomalies.	a) Added a deeper overburden well, MW-04-02, because of the thickness of overburden (similar to MW-02-02).

TABLE 2-8 (Continued). RATIONALE FOR MONITORING WELL LOCATIONS AND MODIFICATIONS

Well Cluster Location	Rationale	Modifications Based Upon Site Reconnaissance Findings	Modifications Based Upon Field Observation During Drilling Activities
			b) Increased depth of the bedrock well, MW-04-03, from 50 feet to greater than 100 feet into bedrock since no significant water bearing fractures were encountered in the upper 50 feet of bedrock.
MW-05	To evaluate water quality and stratigraphy south of all three disposal areas (inferred downgradient).	The proposed location was moved to marker 0 of seismic line S-7 to characterize surface leachate seeps observed and expected bedrock surface low.	
MW-06	To evaluate water quality and stratigraphy between the bulky waste area and the solid waste area, west of Mitchell Brook.	The proposed location was moved to the southeast side of the solid waste area to replace well OW-C, which was never located.	a) Increased the screen length of MW-06-01 from 10 feet to 15 feet to provide better coverage of the overburden aquifer.

TABLE 2-8 (Continued). RATIONALE FOR MONITORING WELL LOCATIONS AND MODIFICATIONS

Well Cluster Location	Rationale	Modifications Based Upon Site Reconnaissance Findings	Modifications Based Upon Field Observation During Drilling Activities
			b) Added a deeper overburden well, MW-06-02, due to the thickness and lithology variations of the overburden.
MW-07	To evaluate water quality and stratigraphy northwest of the solid waste area.	The proposed location was moved to marker 1200 of EM line EM-1 to evaluate EM anomalies and elevated landfill gas readings.	a) Increased the screen length of MW-07-01 from 10 feet to 15 feet to provide a larger screen interval of the overburden. b) Completed bedrock well, MW-07-02, with a 4-inch PVC screen and riser due to the highly fractured nature of the bedrock.

TABLE 2-8 (Continued). RATIONALE FOR MONITORING WELL LOCATIONS AND MODIFICATIONS

Well Cluster Location	Rationale	Modifications Based Upon Site Reconnaissance Findings	Modifications Based Upon Field Observation During Drilling Activities
MW-08	To evaluate water quality and stratigraphy southwest of the solid water area.	The proposed located was moved approximately 100 feet west of Rose Hill Road due to drill rig accessibility problems.	Added a shallow 2-inch PVC bedrock well close to the bedrock overburden interface. A hydraulic connection is assumed to exist between the overburden and bedrock groundwater due to the extremely fractured nature of the bedrock at this location.
MW-09	To evaluate water quality and stratigraphy east of all three disposal areas (east of Saugatucket River).	The proposed location was moved northward for better areal coverage and accessibility. The bedrock well originally planned for this location was moved to location MW-11.	None
MW-10	To evaluate water quality and stratigraphy southeast of all three disposal areas (east of Saugatucket River).	The proposed location was moved to market 0 of EM line EM-16 to evaluate conductivity anomalies.	None

TABLE 2-8 (Continued). RATIONALE FOR MONITORING WELL LOCATIONS AND MODIFICATIONS

Well Cluster Location	Rationale	Modifications Based Upon Site Reconnaissance Findings	Modifications Based Upon Field Observation During Drilling Activities
MW-11	To evaluate elevated landfill gas readings and surface EM anomalies detected during site reconnaissance activities.	This well was added based upon site reconnaissance findings.	Location moved approximately 100 feet east due to assessibility. b) Added a deeper overburden well, MW-11-02, due to thickness and lithology changes of the overburden. Completed bedrock well MW-11-03 with a 4-inch-PVC screen because the nature of the highly fracture rock prevented the construction of an open borehole well.

TABLE 2-8 (Continued). RATIONALE FOR MONITORING WELL LOCATIONS AND MODIFICATIONS

Well Cluster Location	Rationale	Modifications Based Upon Site Reconnaissance Findings	Modifications Based Upon Field Observation During Drilling Activities
MW-12	To replace well OW-A and characterize potential groundwater/leachate seeps.	This well was added as a result of site reconnaissance findings.	Added a deeper well, MW-12-02, due to thickness and lithology changes in the overburden.
MW-13	To evaluate potential localized northward groundwater movement due to mounding within the solid waste landfill area, and to evaluate observed groundwater seeps and EM anomalies.	This was well added as a result of site reconnaissance findings.	Added a deeper well, MW-13-02, due to thickness and lithology changes in the overburden and elevated organic vapor readings in soil removed from the lower overburden.
MW-14	To evaluate water quality along the southern toe of the solid waste landfill and to investigate elevated soil gas readings.	This well was drilled as soil boring BH-07. It was then installed as a monitoring well.	This well was added based upon field observations during the advancement of analytical soil boring BH-07.

TABLE 2-9. SPECIFICATIONS OF TEST BORINGS AND LANDFILL ANALYTICAL SOIL BORINGS

	BORING LOCATION	WELL TYPE	GROUND SURFACE ELEVATION (ft NGVD)	FINAL BORING DEPTH (ft bgs)	BOTTOM ELEVATION OF BORING (ft NGVD)	DEPTH TO BEDROCK (feet)	BEDROCK ELEVATION (feet)	CORED INTERVAL (feet)	RANGE RQD (%)	SAMPLES COLLECTED DEPTH (feet)	SAMPLES COLLECTED ANALYSIS
Test Borings	MW-01-01	Shallow OB	54.44	18.50	35.94	27.55	26.89	25.40	54-98	NSC	--
	MW-01-02	Bedrock	54.89	79.87	-24.98	28.00	26.89	--	--	NSC	--
	MW-02-01	Shallow OB	69.10	34.12	34.98	--	--	--	--	18-22	TCO,GS
	MW-02-02	Deep OB	68.18	68.63	-0.45	68.50	-0.32	5.20	76	NSC	--
	MW-03-01	Shallow OB	36.42	14.20	22.22	--	--	--	--	16.2-20.5	TCO,GS
										25-39.5	TCO,GS
	MW-03-02	Deep OB	36.21	44.68	-8.47	44.50	-8.29	25.20	45-90	NSC	--
	MW-03-03	Bedrock	41.81	143.40	-101.59	44.50	-2.69	--	--	NSC	--
	MW-04-01	Shallow OB	45.08	15.85	29.23	--	--	--	--	NSC	--
	MW-04-02	Deep OB	44.87	34.05	10.82	31.90	12.97	28.10	85-95	NSC	--
	MW-04-03	Bedrock	45.43	135.70	-90.27	35.50	9.93	--	--	NSC	--
	MW-05-01	Shallow OB	38.51	17.00	21.51	--	--	--	--	NSC	--
	MW-05-02	Deep OB	38.60	28.00	10.60	29.00	9.60	5.40	87	NSC	--
	MW-06-01	Shallow OB	42.54	20.30	22.24	--	--	--	--	NSC	--
	MW-06-02	Deep OB	42.12	34.00	8.12	34.00	8.12	5.50	7	NSC	--
	MW-07-01	Deep OB	73.29	34.00	39.29	42.00	31.29	24.60	0-12	26-32	TCO,GS
	MW-07-02	Bedrock	73.35	85.70	-12.35	42.00	31.35	--	--	NSC	--
	MW-08-01	Deep OB	46.31	16.00	30.31	16.00	30.31	3.20	45	NSC	--
	MW-08-02	Bedrock	46.36	25.26	21.10	16.00	30.36	--	--	NSC	--
	MW-09-01	Deep OB	58.96	35.30	23.66	34.00	24.96	5.00	44	16-26	TCO,GS
	MW-10-01	Deep OB	40.42	37.10	3.32	36.00	4.42	6.50	73	6-14	TCO,GS
	MW-11-01	Shallow OB	42.21	20.45	21.76	--	--	--	--	8-13	TCO,GS
	MW-11-02	Deep OB	41.31	44.70	-3.39	44.70	-3.39	27.30	8-40	NSC	--
	MW-11-03	Bedrock	40.37	78.20	-37.83	44.70	-4.33	--	--	NSC	--
	MW-12-01	Shallow OB	39.75	19.70	20.05	--	--	--	--	26.9-32	TCO,GS
	MW-12-02	Deep OB	40.83	45.20	-4.37	43.30	-2.47	5.70	89	NSC	--
	MW-13-01	Shallow OB	60.64	30.00	30.64	--	--	--	--	9-17	TCO,GS
										21-29.5	TCO,GS
	MW-13-02	Deep OB	61.02	28.25	32.77	27.63	33.39	7.50	34-58	NSC	--
Landfill Analytical Soil Borings	BH-01	--	66.32	20	46.32	--	--	--	--	2-8	K,AL,TCO
	BH-02	--	68.95	20	48.95	--	--	--	--	NSC	--
	BH-03	--	68.31	20	48.31	--	--	--	--	16-20	K,AL,TCO
	BH-04	--	71.78	20	51.78	--	--	--	--	NSC	--
	BH-05	--	65.53	20	45.53	--	--	--	--	10-16	K,AL,TCO
	BH-06	--	53.00	12	41.00	--	--	--	--	6-10	K,AL,TCO
	BH-07(MW-14-01*)	Deep OB	65.29	34	31.29	--	--	--	--	4-14	K,AL,TCO

NOTES:

msl - Mean Sea Level
bgs - Below Ground Surface
OB - Overburden
AL - Atterberg Limits
GS - Grain Size
K - Permeability
TCO - Total Combustible Organics
NSC - No Sample Collected
-- - Not Applicable
RQD - Rock Quality Designation
NGVD - National Geodetic Vertical Datum (1929)

* BH-07 was originally advanced as a landfill analytical soil boring. It was subsequentially developed into a monitoring well and renamed MW-14-01.

TABLE 2-10. SPECIFICATIONS OF OVERBURDEN AND BEDROCK MONITORING WELLS

WELL NUMBER	WELL TYPE	TOTAL DEPTH (ft bgs)	GROUND LEVATION (ft NGVD)	TOC ELEVATION (ft NGVD)	SCREEN ENGTH (feet)	SCREEN ELEVATION INTERVAL (ft NGVD)	SCREENED STRATA	SAND PACK THICKNESS (feet)	BENTONITE SEAL THICKNESS (feet)	GROUT THICKNESS (feet)	DEPTH OF CASING (feet)	BORING DIAMETER (inches)
MW-01-01	Shallow OB	18.50	54.44	56.62	15	50.94-36.46	Outwash/Till	15.00	1.00	1.98	--	8/4 (3)
MW-01-02	Bedrock	79.87	54.89	56.20	--	18.89-(-24.98)	Bedrock	--	8.00	28.00	36.0 (1)	6
MW-02-01	Shallow OB	34.12	69.10	70.89	15	49.88-34.88	Outwash	20.00	2.00	14.50	--	--
MW-02-02	Deep OB	68.63	68.18	70.68	10	9.55-(-0.42)	Outwash	12.80	3.50	52.20	--	8/4 (3)
MW-03-01	Shallow OB	14.20	36.42	39.58	10	34.87-24.87	Outwash	13.20	0.50	0.50	--	--
MW-03-02	Deep OB	44.68	36.21	39.36	10	1.28-(-8.12)	Outwash/Till	11.87	1.00	31.63	--	8/4 (3)
MW-03-03	Bedrock	143.40	41.81	42.98	--	-11.19-(-101.59)	Bedrock	--	9.00	44.00	53.0 (1)	6
MW-04-01	Shallow OB	15.85	45.08	47.46	10	40.08-30.08	Outwash	13.85	1.15	0.85	--	--
MW-04-02	Deep OB	34.05	44.87	47.20	10	24.87-14.87	Outwash	13.55	2.08	16.00	--	8/4 (3)
MW-04-03	Bedrock	135.70	45.43	46.63	--	4.43-(-90.27)	Bedrock	--	10.00	31.00	41.0 (1)	6
MW-05-01	Shallow OB	17.00	38.51	40.59	10	32.31-22.31	Outwash	13.00	2.00	2.00	--	--
MW-05-02	Deep OB	28.00	38.60	40.76	10	22.52-12.52	Till	14.77	4.00	10.08	--	8/4 (3)
MW-06-01	Shallow OB	20.30	42.54	44.27	15	39.54-24.54	Outwash	18.30	1.00	1.00	--	--
MW-06-02	Deep OB	34.00	42.12	44.08	10	20.12-10.12	Till	13.10	5.00	16.00	--	4
MW-07-01	Deep OB	34.00	73.29	74.79	15	55.29-40.29	Outwash/Till	18.00	5.00	11.00	--	8
MW-07-02	Bedrock	85.70	73.35	75.63	30	28.35-0.73	Bedrock	40.70	2.00	43.00	--	6
MW-08-01	Deep OB	16.00	46.31	48.23	10	42.80-32.80	Outwash/Till	11.00	1.00	2.00	--	6
MW-08-02	Bedrock	25.26	46.36	49.32	5	26.10-21.10	Bedrock	6.26	2.00	17.00	--	5
MW-09-01	Deep OB	35.30	58.96	61.29	10	35.96-25.96	Outwash/Till	14.30	2.00	19.00	--	8/4 (3)
MW-10-01	Deep OB	37.10	40.42	42.52	10	14.99-4.99	Till	14.50	2.50	20.00	--	8/4 (3)
MW-11-01	Shallow OB	20.45	42.21	44.36	15	36.76-21.76	Outwash/Lacustrine	17.00	2.00	1.45	--	--
MW-11-02	Deep OB	44.70	41.31	43.78	10	7.31-(-2.69)	Till/boulders	13.70	3.50	28.50	--	4
MW-11-03	Bedrock	78.20	40.37	41.98	30	-6.07-(-36.07)	Bedrock	32.20	2.00	44.00	46.0 (1)	6
MW-12-01	Shallow OB	19.07	39.75	41.82	15	36.75-21.75	Outwash	17.70	1.00	1.00	--	--
MW-12-02	Deep OB	45.20	40.83	43.32	10	7.03-(-2.97)	Till	14.70	2.00	28.50	--	8/6
MW-13-01	Shallow OB	30.00	60.64	62.94	15	57.14-42.14	Outwash	17.50	1.00	1.00	--	--
MW-13-02	Deep OB	28.25	61.02	63.02	10	42.52-32.52	Outwash/Till	13.00	2.41	12.67	--	6/4
MW-14-01 (BH-07)	Deep OB	65.29	65.29	67.64	10	42.49-32.49	Lacustrine/Till	15.00	2.38	17.42	--	--
MW-I *	Shallow OB	25.15	NS	59.33	10	~43.03-33.03 (2)	Outwash/Till	NDA	NDA	NDA	--	--
MW-II *	Shallow OB	29.4	NS	67.67	10	~47.71-37.71 (2)	Outwash/Till	NDA	NDA	NDA	--	--
MW-III *	Shallow OB	18.9	NS	56.37	10	~46.72-36.72 (2)	Outwash/Till	NDA	NDA	NDA	--	--
MW-IV *	Shallow OB	18.8	NS	58.45	10	~49.15-39.15 (2)	Outwash/Till	NDA	NDA	NDA	--	--
MW-V *	Shallow OB	35.05	NS	67.24	10	~48.39-38.39 (2)	Outwash/Till	NDA	NDA	NDA	--	--
OW-27 *	Deep OB	16.7	71.83	73.83	10	~66.23-56.23 (2)	Outwash/Till	NDA	NDA	NDA	--	--
OW-30 *	Deep OB	13.1	55.22	57.22	10	~51.22-41.22 (2)	Outwash	NDA	NDA	NDA	--	--

NOTES:

1. Permenant 6 inch steel casing used in this well.
2. From Site Reconnaisance Well Survey (estimated).
3. Boring diameters described by 8/4 represent use of 6 1/4" augers with 4" spun casing.

TOC - Top of Casing

Overburden

ese wells were installed by RIDEM and were existing on-site at the beginning of the RI.

NDA - No Data Available

NGVD - National Geodetic Vertical Datum (1929)

NS - Not Surveyed

-- - Not Applicable

FIGURE 2-11. SUMMARY OF DECEMBER 1991 DELINEATION OF OFF-SITE LANDFILL GAS PLUME

Location	Type of Point	Final Depth (ft)	Area Type	GC Analysis (Y/N)
LFG-AD	NP	5.7	residential	Y
LFG-ETR	NP	8.7	residential	Y
LFG-GT	NP	4.2	residential	Y
LFG-JB	NP	5.6	residential	Y
LFG-JF	NP	6.4	residential	Y
LFG-LHR	NP	5.4	residential	Y
LFG-NG	NP	4.8	residential	Y
LFG-RK	NP	5.6	residential	Y
LFGF-3	PP	3	north	Y
LFGF-4	PP	3	north	N
LFGF-8	PP	3	north	Y
TP-F1	T	3	north	Y
TP-F2	T	3	north	Y
TP-F3	T	3	north	Y
TP-F4	T	2.5	north	N
TP-F5	T	4	north	Y
TP-F6	T	3	north	Y
LFGT-6	TP	5.3	south	N
LFGT-7	TP	3.2	south	Y
LFGT-8	TP	5.3	south	Y
TP-T1	T	3	south	N
TP-T2	T	6	south	Y
TP-T2	T	3	south	N
TP-T3	T	3	south	Y
TP-T4	T	3	south	Y
TP-T5	T	3	south	Y
TP-T5	T	6	south	N

Location	Type of Point	Final Depth (ft)	Area Type	GC Analysis (Y/N)
LFGR-10	PP	3	west	Y
LFGR-20	TP	8.8	west	Y
LFGR-21	TP	5.0	west	N
LFGR-22	TP	2.7	west	Y
LFGR-23	TP	6	west	Y
LFGR-5-9	NP	8.7	west	Y
LFGR-8	PP	3	west	Y
TP-R1	T	6	west	Y
TP-R1	T	3	west	N
TP-R10	T	3	west	N
TP-R10	T	6	west	Y
TP-R11	T	3	west	N
TP-R11	T	6	west	N
TP-R12	T	3	west	Y
TP-R13	T	3	west	N
TP-R13	T	3	west	Y
TP-R14	T	4	west	Y
TP-R2	T	3	west	Y
TP-R2	T	6	west	Y
TP-R3	T	6	west	Y
TP-R4	T	3	west	N
TP-R5	T	3	west	N
TP-R6	T	3	west	N
TP-R7	T	6	west	N
TP-R7	T	3	west	Y
TP-R8	T	3	west	N
TP-R9	T	3	west	Y

Notes:
T - temporary point, sampled using KV apparatus.
TP - Tempoary point that was subsequently installed as a permenant point. It will be resampled in the future.
PP - Previously existing permenant point. These points were installed in the summer of 1991.
They were sampled for confirmation of previous results and comparison with results obtained this round.
NP - Newly installed permanent points. These points were installed in locations determined prior to field work.

TABLE 2-12. SUMMARY OF SOIL BORING SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples	FIELD QA/QC SAMPLES					Total Submitted
			Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	
SOIL BORINGS								
August 1991								
Volatile Organics	CLP - RAS	14	--	1	--	--	2	17
Semivolatile Organics	CLP - RAS	14	--	1	--	--	2	17
Pesticides/PCBs	CLP - RAS	14	--	1	--	--	2	17
Total Metals	CLP - RAS	14	--	1	--	--	2	17
Cyanide	CLP - RAS	14	--	1	--	--	2	17
Total Combustible Organics	SUBCONTRACTED	20	--	--	--	--	2	22
Grain Size	SUBCONTRACTED	20	--	--	--	--	2	22
Atterberg Limits	SUBCONTRACTED	10	--	--	--	--	2	12
Permeability	SUBCONTRACTED	10	--	--	--	--	1	11

TABLE 2-13. SUMMARY OF SURFACE SOIL SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples	FIELD QA/QC SAMPLES Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	Total Submitted
SURFACE SOILS								
September/October 1991								
Volatile Organics	CLP - RAS	13	--	--	2	--	2	17
Semivolatile Organics	CLP - RAS	13	--	--	2	--	2	17
Pesticides/PCBs	CLP - RAS	13	--	--	2	--	2	17
Total Metals	CLP - RAS	13	--	--	2	--	2	17
Cyanide	CLP - RAS	13	--	--	2	--	2	17
Total Combustible Organics	SUBCONTRACTED	13	--	--	--	--	2	15
April 1992								
Volatile Organics	CLP - RAS	11	--	1	1	--	1	14
Semivolatile Organics	CLP - RAS	11	--	1	1	--	1	14
Pesticides/PCBs	CLP - RAS	11	--	1	1	--	1	14
Cyanide	CLP - RAS	11	--	1	1	--	1	14
Total Metals	SUBCONTRACTED	11	--	1	1	--	1	14

TABLE 2-14. SUMMARY OF GROUNDWATER SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples (Existing Wells)	Number of Samples (Residential Wells)	Number of Samples (New Wells)	Total Number of Wells	FIELD QA/QC SAMPLES Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	Total Submitted
GROUNDWATER											
June 1991											
Volatile Organics	CLP - SAS	--	9	--	9	4	1	1	--	1	16
Volatile Organics	CLP - RAS	8	1	--	9	7	--	2	--	1	19
Semi-Volatile Organics	CLP - RAS	8	9	--	17	--	--	3	--	2	22
Pesticides/PCBs	CLP - RAS	7	9	--	16	--	--	3	--	2	21
Total Metals	CLP - RAS	8	9	--	17	--	--	3	--	2	22
Dissolved Metals	CLP - RAS	8	9	--	17	--	--	2	--	2	21
Sulfides	CLP - SAS	8	9	--	17	--	--	3	--	2	22
Cyanide	CLP - RAS	7	9	--	16	--	--	3	--	2	21
Total Organic Carbon	CLP - SAS	7	9	--	16	--	--	3	--	2	21
BOD	CLP - SAS	7	9	--	16	--	--	3	--	2	21
September/October 1991											
Volatile Organics	CLP - SAS	--	9	--	9	13	1	1	--	1	25
Volatile Organics	CLP - RAS	7	--	28	35	5	1	4	--	4	49
Water Soluble Organics	CLP - SAS	7	9	28	44	--	1	5	--	5	55
Semi-Volatile Organics	CLP - RAS	7	9	28	44	--	1	5	--	5	55
Pesticides/PCBs	CLP - RAS	7	9	28	44	--	1	5	--	5	55
Total Metals	CLP - RAS	7	9	28	44	--	1	5	--	5	55
Dissolved Metals	CLP - RAS	7	9	28	44	--	1	6	--	5	56
Sulfides	CLP - SAS	7	9	28	44	--	1	5	--	5	55
Cyanide	CLP - RAS	7	9	28	44	--	1	5	--	5	55
Total Organic Carbon	CLP - SAS	7	9	28	44	--	1	5	--	5	55
BOD	CLP - SAS	7	9	28	44	--	1	5	--	5	55
January/February 1992											
Volatile Organics	CLP - SAS	--	3	--	3	2	1	--	--	--	6
Volatile Organics	CLP - RAS	2	--	16	18	6	1	2	--	2	29
Water Soluble Organics	CLP - SAS	2	3	16	21	--	1	2	--	2	26
Semi-Volatile Organics	CLP - RAS	2	3	16	21	--	1	2	--	2	26
Pesticides/PCBs	CLP - RAS	2	3	16	21	--	1	2	--	2	26
Total Metals	CLP - RAS	2	3	16	21	--	1	2	--	2	26
Dissolved Metals	CLP - RAS	2	3	16	21	--	1	2	--	2	26
Sulfides	CLP - SAS	2	3	16	21	--	1	2	--	2	26
Cyanide	CLP - RAS	2	3	16	21	--	1	2	--	2	26
Total Organic Carbon	CLP - SAS	2	3	16	21	--	1	2	--	2	26
BOD	CLP - SAS	2	3	16	21	--	1	2	--	2	26
April 1992											
Volatile Organics	CLP - RAS	3	--	12	15	5	1	2	--	2	25
Water Soluble Organics	CLP - SAS	3	--	12	15	--	1	2	--	2	20
Semi-Volatile Organics	CLP - RAS	3	--	12	15	--	1	2	--	2	20
Pesticides/PCBs	CLP - RAS	3	--	12	15	--	1	2	--	2	20
Total Metals	CLP - RAS	3	--	12	15	--	1	2	--	2	20
Dissolved Metals	CLP - RAS	3	--	12	15	--	1	2	--	2	20
Cyanide	CLP - RAS	3	--	12	15	--	1	2	--	2	20
Ammonia	CLP - SAS	3	--	12	15	--	1	2	--	2	20
Total Organic Carbon	CLP - SAS	3	--	12	15	--	1	2	--	2	20
BOD	CLP - SAS	3	--		15	--	1	2	--	2	20

TABLE 2-14. SUMMARY OF GROUNDWATER SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples (Existing Wells)	Number of Samples (Residential Wells)	Number of Samples (New Wells)	Total Number of Wells	FIELD QA/QC SAMPLES Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	Total Submitted
GROUNDWATER cont.											
September 1993											
Volatile Organics	CLP - RAS	--	--	3	3	2	1	--	--	1	7
Water Soluble Organics	CLP - SAS	--	--	2	2	--	1	--	--	1	4
Semi-Volatile Organics	CLP - RAS	--	--	1	1	--	1	--	--	1	3
Pesticides/PCBs	CLP - RAS	--	--	1	1	--	1	--	--	1	3
Total Metals	CLP - RAS	--	--	7	7	--	1	--	--	1	9
Dissolved Metals	CLP - RAS	--	--	7	7	--	1	1	1	1	11
Total Antimony	CLP - SAS	--	--	7	7	--	1	--	--	1	9
Dissolved Antimony	CLP - SAS	--	--	7	7	--	1	1	1	1	11
Cyanide	CLP - RAS	--	--	1	1	--	1	--	--	1	3

TABLE 2-15. SUMMARY OF LEACHATE SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples	FIELD QA/QC SAMPLES					Total Submitted
			Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	
LEACHATE								
June 1991								
Volatile Organics	CLP - RAS	6	1	--	--	--	1	8
Semivolatile Organics	CLP - RAS	6	--	--	--	--	1	7
Pesticides/PCBs	CLP - RAS	6	--	--	--	--	1	7
Total Metals	CLP - RAS	6	--	--	--	--	1	7
Dissolved Metals	CLP - RAS	6	1	--	--	--	1	8
Cyanide	CLP - RAS	6	--	--	--	--	1	7
Total Organic Carbon	CLP - SAS	6	--	--	--	--	1	7
BOD	CLP - SAS	10	--	--	--	--	2	12
April 1992								
Volatile Organics	CLP - RAS	3	--	--	1	--	1	5
Water Soluble Organics	CLP - SAS	3	--	--	1	--	1	5
Semivolatile Organics	CLP - RAS	3	--	--	1	--	1	5
Pesticides/PCBs	CLP - RAS	3	--	--	1	--	1	5
Total Metals	CLP - RAS	3	--	--	1	--	1	5
Dissolved Metals	CLP - RAS	3	--	--	1	--	1	5
Cyanide	CLP - RAS	3	--	--	1	--	1	5
Ammonia	CLP - SAS	3	--	--	1	--	1	5
Total Organic Carbon	CLP - SAS	3	--	--	1	--	1	5
BOD	CLP - SAS	3	--	--	1	--	1	5

TABLE 2-16. SUMMARY OF SURFACE WATER SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples	FIELD QA/QC SAMPLES Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	Total Submitted
SURFACE WATER								
June 1991								
Volatile Organics	CLP - RAS	14	--	1	--	--	2	17
Semivolatile Organics	CLP - RAS	14	--	1	--	--	2	17
Pesticides/PCBs	CLP - RAS	14	--	1	--	--	2	17
Total Metals	CLP - RAS	14	--	1	--	--	2	17
Dissolved Metals	CLP - RAS	14	--	--	2	--	3	19
Sulfides	CLP - SAS	14	--	1	--	--	2	17
Cyanide	CLP - SAS	14	--	1	--	--	3	18
Total Organic Carbon	CLP - SAS	14	--	1	--	--	2	17
BOD	CLP - SAS	16	--	1	--	--	2	19
September/October 1991								
Volatile Organics	CLP - RAS	15	--	--	--	--	2	17
Water Soluble Organics	CLP - SAS	15	--	--	--	--	2	17
Semivolatile Organics	CLP - RAS	15	--	--	--	--	2	17
Pesticides/PCBs	CLP - RAS	15	--	--	--	--	2	17
Total Metals	CLP - RAS	15	--	--	--	--	2	17
Dissolved Metals	CLP - RAS	15	--	--	2	--	2	19
Sulfides	CLP - SAS	15	--	--	--	--	2	17
Cyanide	CLP - RAS	15	--	--	--	--	2	17
Total Organic Carbon	CLP - SAS	15	--	--	--	--	2	17
BOD	CLP - SAS	15	--	--	--	--	2	17
January/February 1992								
Volatile Organics	CLP - RAS	8	--	--	--	--	1	9
Water Soluble Organics	CLP - SAS	8	--	--	--	--	1	9
Semivolatile Organics	CLP - RAS	8	--	--	--	--	1	9
Pesticides/PCBs	CLP - RAS	8	--	--	--	--	1	9
Total Metals	CLP - RAS	8	--	--	--	--	1	9
Dissolved Metals	CLP - RAS	8	--	--	1	--	1	10
Sulfides	CLP - SAS	8	--	--	--	--	1	9
Cyanide	CLP - RAS	8	--	--	--	--	1	9
Total Organic Carbon	CLP - SAS	8	--	--	--	--	1	9
BOD	CLP - SAS	8	--	--	--	--	1	9
April 1992								
Volatile Organics	CLP - RAS	8	5	--	--	--	1	14
Water Soluble Organics	CLP - SAS	8	--	--	--	--	1	9
Semivolatile Organics	CLP - RAS	8	--	--	--	--	1	9
Pesticides/PCBs	CLP - RAS	8	--	--	--	--	1	9
Total Metals	CLP - RAS	8	--	--	--	--	1	9
Dissolved Metals	CLP - RAS	8	--	--	1	--	1	10
Cyanide	CLP - RAS	8	--	--	--	--	1	9
Ammonia	CLP - SAS	8	--	--	--	--	1	9
Total Organic Carbon	CLP - SAS	8	--	--	--	--	1	9
BOD	CLP - SAS	8	--	--	--	--	1	9

TABLE 2-16 (Continued). SUMMARY OF SURFACE WATER SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples	FIELD QA/QC SAMPLES Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	Total Submitted
SURFACE WATER								
May 1992								
Volatile Organics	CLP - RAS	11	--	1	--	--	1	13
Semivolatile Organics	CLP - RAS	11	--	1	--	--	1	13
Pesticides/PCBs	CLP - RAS	11	--	1	--	--	1	13
Total Metals	CLP - RAS	11	--	1	--	--	1	13
Dissolved Metals	CLP - RAS	11	--	1	2	--	1	15
Cyanide	CLP - RAS	11	--	1	--	--	1	13
Ammonia	CLP - SAS	11	--	1	--	--	1	13

TABLE 2-17. SUMMARY OF SEDIMENT SAMPLES COLLECTED AND ANALYZED

Parameter		Number of Samples	FIELD QA/QC SAMPLES Trip Blanks	Bottle Blanks	Equipment Blanks	Field Blanks	Duplicates	Total Submitted
SEDIMENTS								
June 1991								
Volatile Organics	CLP - RAS	14	--	--	2	--	2	18
Volatile Organics	CLP - SAS	--	1	1	--	--	--	2
Semivolatile Organics	CLP - RAS	14	--	1	2	--	2	19
Pesticides/PCBs	CLP - RAS	14	--	1	2	--	2	19
Total Metals	CLP - RAS	14	--	1	2	--	2	19
Sulfides	CLP - SAS	14	--	1	2	--	2	19
Cyanide	CLP - RAS	14	--	1	2	--	2	19
Total Combustible Organics	SUBCONTRACTED	14	--	--	--	--	2	16
Grain Size	SUBCONTRACTED	14	--	--	--	--	2	16
September/October 1991								
Volatile Organics	CLP - RAS	15	--	1	2	--	2	20
Semivolatile Organics	CLP - RAS	15	--	1	2	--	2	20
Pesticides/PCBs	CLP - RAS	15	--	1	2	--	2	20
Total Metals	CLP - RAS	15	--	1	2	--	2	20
Sulfides	CLP - SAS	15	--	1	2	--	2	20
Cyanide	CLP - RAS	15	--	1	2	--	2	20
Total Combustible Organics	SUBCONTRACTED	15	--	1	--	--	2	18
Grain Size	SUBCONTRACTED	15	--	--	--	--	2	17
May 1992								
Volatile Organics	CLP - RAS	11	--	1	2	--	1	15
Semivolatile Organics	CLP - RAS	11	--	1	2	--	1	15
Pesticides/PCBs	CLP - RAS	11	--	1	2	--	1	15
Total Metals	CLP - RAS	11	--	1	2	--	1	15
Cyanide	CLP - RAS	11	--	1	2	--	1	15
Ammonia	CLP - SAS	11	--	1	2	--	1	15
Total Combustible Organics	SUBCONTRACTED	11	--	--	--	--	1	12
Grain Size	SUBCONTRACTED	11	--	--	--	--	1	12

TABLE 2-18. LANDFILL ANALYTICAL SOIL BORING SAMPLES COLLECTED IN AUGUST, 1991

BORING LOCATION	SAMPLE DEPTH (FEET)				BORING LOCATION	SAMPLE DEPTH (FEET)			
LANDFILL ANALYTICAL BORINGS (1)									
BH-01	2	-	8	(VOCS FROM 4-6)	BH-07	4	-	14	(VOCS FROM 4-6)
	8	-	12			14	-	18	(VOCS FROM 14-16)
BH-02	8	-	10		PERMEABILITY TEST BORINGS (2)				
	16	-	18		PT-01	0	-	2	
BH-03	2	-	4			2	-	4	
	16	-	20	(VOCS FROM 18-20)	PT-02	0	-	2	
BH-04	4	-	6			2	-	4	
	8	-	10		PT-03	0	-	2	
BH-05	0	-	4	(VOCS FROM 0-2)		2	-	4	
	10	-	16	(VOCS FROM 12-14)	PT-04	0	-	2	
BH-06	2	-	4			2	-	4	
	6	-	10	(VOCS FROM 8-10)	PT-05	0	-	2	
						2	-	4	

NOTE:

1. Samples were collected using the California split-spoon modified method, therefore samples for volatile analysis were submitted from a single intact sample liner.
2. Permeability test borings were submitted for geotechnical analyses only.

VOCs -- Volatile Organic Compounds

TABLE 2-19. SURFACE SOIL SAMPLES COLLECTED IN SEPTEMBER/OCTOBER 1991 AND APRIL 1992

SEPTEMBER/OCTOBER 1991		APRIL 1992	
SS-01 (0 - 6 INCHES)	SS-08 (0 - 6 INCHES)	SS-14 (0 - 6 INCHES)	SS-20 (0 - 6 INCHES)
SS-02 (0 - 6 INCHES)	SS-09 (0 - 6 INCHES)	SS-15 (0 - 6 INCHES)	SS-21 (0 - 6 INCHES)
SS-03 (0 - 6 INCHES)	SS-10 (0 - 6 INCHES)	SS-16 (0 - 6 INCHES)	SS-22 (0 - 6 INCHES)
SS-04 (0 - 6 INCHES)	SS-11 (0 - 6 INCHES)	SS-17 (0 - 6 INCHES)	SS-23 (0 - 6 INCHES)
SS-05 (0 - 6 INCHES)	SS-12 (0 - 6 INCHES)	SS-18 (0 - 6 INCHES)	SS-24 (0 - 6 INCHES)
SS-06 (0 - 6 INCHES)	SS-13 (0 - 6 INCHES)	SS-19 (0 - 6 INCHES)	
SS-07 (0 - 6 INCHES)			

TABLE 2-20. RATIONALE FOR SURFACE SOIL LOCATIONS

LOCATION NUMBER	AREA	SAMPLING DEPTH (INCHES)	RATIONALE
SS-01	BACKGROUND	0 - 6	This is an apparently undisturbed area.
SS-02	BACKGROUND	0 - 6	This is an apparently undisturbed area.
SS-03	SOLID WASTE	0 - 6	Exposed garbage is present here. 700 ppm measured on the OVA at the ground suface during landfill gas survey.
SS-04	SOLID WASTE	0 - 6	Elevated VOC concentrations and unusual compounds were identified here during landfill gas survey.
SS-05	SOLID WASTE	0 - 6	Elevated VOC concentrations were identified here during the landfill gas survey.
SS-06	NON-DISPOSAL	0 - 6	Located south of the Transfer Station Road to characterize the area. Exact location was chosen based on visual observation. Undisturbed location selected.
SS-07	NON-DISPOSAL	0 - 6	Elevated VOC concentrations were identified here during the landfill gas survey. This is a likely area of human exposure.
SS-08	NON-DISPOSAL	0 - 6	TCE was found here during the landfill gas survey. This is a likely area of human exposure.
SS-09	BULKY WASTE	0 - 6	Elevated VOC concentrations and high cis-1,2-DCE, PCE, and TCE detected here during landfill gas survey.
SS-10	BULKY WASTE	0 - 6	Location chosen to characterize the area.
SS-11	SEWAGE SLUDGE	0 - 6	Location chosen to characterize the area.
SS-12	SEWAGE SLUDGE	0 - 6	Location chosen to characterize the area.
SS-13	SOLID WASTE	0 - 6	Glue waste was found here during initial site walkover.
SS-14	BACKGROUND	0 - 12	This is an apparently undisturbed area.
SS-15	SEWAGE SLUDGE	0 - 12	Location chosen to characterize the area.
SS-16	SOLID WASTE	0 - 12	Location chosen to characterize the area.
SS-17	SOLID WASTE	0 - 12	Location chosen to characterize the area.
SS-18	NON-DISPOSAL	0 - 12	Location chosen to characterize the area for the ecological assessment.
SS-19	NON-DISPOSAL	0 - 12	Location chosen to characterize the area for the ecological assessment.
SS-20	NON-DISPOSAL	0 - 12	Location chosen to characterize the area for the ecological assessment.
SS-21	NON-DISPOSAL	0 - 12	Location chosen to characterize the area for the ecological assessment. Leachate staining is present here.
SS-22	NON-DISPOSAL	0 - 12	Location chosen to characterize the area for the ecological assessment. Close proximity to leachate seep.
SS-23	NON-DISPOSAL	0 - 12	Location chosen to characterize the area for the ecological assessment. Close proximity to leachate seep.
SS-24	BULKY WASTE	0 - 12	Location chosen to characterize the area.

NOTES:

VOC = Volatile Organic Compound
OVA = Organic Vapor Analyzer
TCE = Trichloroethene
cis - 1,2-DCE = cis - 1,2- dichloroethene
PCE = Tetrachloroethene

TABLE 2-21. RESIDENTIAL WELL LOCATIONS SAMPLED AND COLLECTION DATES

JUNE 1991	
RES#1	RFJ-04-00
RES#2	RNG-07-00
RES#3	RJF-06-00
RES#4	RFS-03-00
RES#5	RET-05-00
RES#6	RTK-09-00
RES#7	RCG-02-00
RES#8	RDC-01-00
RES#9	RJM-08-00
SEPTEMBER/OCTOBER 1991	
RES#1	RFJ-04-00
RES#2	RNG-07-00
RES#3	RJF-06-00
RES#4	RFS-03-00
RES#5	RET-05-00
RES#6	RTK-09-00
RES#7	RCG-02-00
RES#8	RDC-01-00
RES#9	RJM-08-00
JANUARY/FEBRUARY 1992	
RES#7	RCG-02-00
RES#8	RDC-01-00
RES#10	RDW-10-00
SEPTEMBER 1993	
RES#5	RET-05-00
RES#6	RTK-06-00
RES#7	RCG-07-00
RES#8	RDC-08-00
RES#9	RJM-09-00
RES#10	RDW-10-00
RES#11	RDW-11-00

TABLE 2 - 22. SUMMARY OF RESIDENTIAL SAMPLE COLLECTION POINT AND METHODS

RESIDENT	SAMPLING POINT	PURGING TECHNIQUE	SAMPLING TECHNIQUE
RESIDENT #1	SPIGOT BEHIND HOUSE, EAST OF BASEMENT ENTRANCE	SPIGOT	SPIGOT
RESIDENT #2 *	INSIDE SPIGOT	INSIDE SPIGOT	INSIDE SPIGOT
RESIDENT #3	BLUE WELL LOCATED NORTH OF HOUSE	BRAINARD KILMAN	BAILER
RESIDENT #4	SPIGOT INSIDE KENNEL	INSIDE SPIGOT	INSIDE SPIGOT
RESIDENT #5 **	SPIGOT INSIDE PUMP HOUSE	SPIGOT	BAILER
RESIDENT #6 **	OUTSIDE SPIGOT ON SOUTH SIDE OF HOUSE	OUTSIDE SPIGOT	BAILER
RESIDENT #7	OUTSIDE SPIGOT BY HORSE CORRAL	OUTSIDE SPIGOT	OUTSIDE SPIGOT
RESIDENT #8	OUTSIDE SPIGOT BY BACK OF HOUSE	OUTSIDE SPIGOT	OUTSIDE SPIGOT
RESIDENT #9 **	OUTSIDE SPIGOT ON SE CORNER OF HOUSE	OUTSIDE SPIGOT	OUTSIDE SPIGOT
RESIDENT #10	OUTSIDE SPIGOT BY GARDEN	OUTSIDE SPIGOT	OUTSIDE SPIGOT
RESIDENT #11	FRONT SPIGOT UNDER PICTURE WINDOW	OUTSIDE SPIGOT	OUTSIDE SPIGOT

NOTES:

* - During September/October 1991, resident #2 well was purged using a BRAINARD KILMAN and sampled using a bailer.

** - During September 1993 sampling, resident #5 was purged and sampled from a spigot on side of the house; resident #6 was purged and sampled from the spigot on the south side of the house; resident #9 was purged and sampled from the spigot on the west side or back of the house

TABLE 2-23. MONITORING WELL LOCATIONS SAMPLED AND COLLECTION DATES

JUNE 1991		JANUARY/FEBRUARY 1992	
MW-I		MW-14-01	MW-04-02
MW-II		OW-27	MW-04-03
MW-III		OW-30	MW-07-01
MW-IV		MW-01-01	MW-07-02
MW-V		MW-01-02	MW-10-01
OW-25		MW-02-01	MW-11-01
OW-27		MW-03-01	MW-11-02
OW-30		MW-03-03	MW-11-03
		MW-04-01	MW-13-02
SEPTEMBER/OCTOBER 1991		**APRIL 1992**	
MW-I	MW-05-02	MW-II	MW-06-02
MW-II	MW-06-01	OW-27	MW-07-01
MW-III	MW-06-02	OW-30	MW-07-02
MW-IV	MW-07-01	MW-01-01	MW-08-01
MW-V	MW-07-02	MW-01-02	MW-08-02
OW-27	MW-08-01	MW-05-01	MW-12-01
OW-30	MW-08-02	MW-05-02	MW-12-02
MW-01-01	MW-09-01	MW-06-01	
MW-01-02	MW-10-01		
MW-02-01	MW-11-01		
MW-02-02	MW-11-02		
MW-03-01	MW-11-03		
MW-03-02	MW-12-01		
MW-03-03	MW-12-02		
MW-04-01	MW-13-01		
MW-04-02	MW-13-02		
MW-04-03	MW-14-01		
MW-05-01			

TABLE 2 - 24. SUMMARY OF MONITORING WELL SAMPLING METHODS

WELL LOCATION	WELL TYPE	PURGING TECHNIQUE	SAMPLING TECHNIQUE	DATES SAMPLED
MW-I	Overburden	Bailer	Bailer	6/91, 9/91
MW-II	Overburden	Bailer	Bailer	6/91, 9/91, 4/92
MW-III	Overburden	Wattera	Wattera/Bailer	6/91, 9/91
MW-IV	Overburden	Wattera	Wattera/Bailer	6/91, 9/91
MW-V	Overburden	Wattera	Wattera/Bailer	6/91, 9/91
OW-25	Overburden	Wattera	Wattera/Bailer	6/91
OW-27	Overburden	Wattera	Wattera/Bailer	6/91, 9/91, 1/92, 4/92
OW-30	Overburden	Wattera	Wattera/Bailer	6/91, 9/91, 1/92, 4/92
MW-01-01	Overburden	Bailer	Bailer	9/91, 1/92, 4/92
MW-01-02	Bedrock	Submersible pump	Bailer	9/91, 1/92, 4/92
MW-02-01	Overburden	Bailer	Bailer	9/91, 4/92
MW-02-02	Overburden	BRAINARD KILMAN	Bailer	9/91
MW-03-01	Overburden	Bailer	Bailer	9/91, 1/92
MW-03-02	Overburden	Bailer	Bailer	9/91
MW-03-03	Bedrock	Submersible pump	Bailer	9/91, 1/92
MW-04-01	Overburden	Bailer	Bailer	9/91, 1/92
MW-04-02	Overburden	Bailer	Bailer	9/91, 1/92
MW-04-03	Bedrock	Submersible pump	Bailer	9/91, 1/92
MW-05-01	Overburden	Bailer	Bailer	9/91, 4/92
MW-05-02	Overburden	Bailer	Bailer	9/91, 4/92
MW-06-01	Overburden	Bailer	Bailer	9/91, 4/92
MW-06-02	Overburden	Bailer	Bailer	9/91, 4/92
MW-07-01	Overburden	Bailer	Bailer	9/91, 1/92, 4/92
MW-07-02	Bedrock	BRAINARD KILMAN	Bailer	9/91, 1/92, 4/92
MW-08-01	Overburden	Bailer	Bailer	9/91, 4/92
MW-08-02	Bedrock	Bailer	Bailer	9/91, 4/92
MW-09-01	Overburden	Bailer	Bailer	9/91
MW-10-01	Overburden	Bailer	Bailer	9/91, 1/92
MW-11-01	Overburden	Bailer	Bailer	9/91, 1/92
MW-11-02	Overburden	Bailer	Bailer	9/91, 1/92
MW-11-03	Bedrock	BRAINARD KILMAN	Bailer	9/91, 1/92
MW-12-01	Overburden	Bailer	Bailer	9/91, 4/92
MW-12-02	Overburden	Bailer	Bailer	9/91, 4/92
MW-13-01	Overburden	Bailer	Bailer	9/91
MW-13-02	Overburden	Bailer	Bailer	9/91, 1/92
MW-14-01	Overburden	Bailer	Bailer	9/91, 1/92

TABLE 2-25. LEACHATE SAMPLES COLLECTED IN JUNE 1991 AND APRIL 1992

JUNE 1991	
LE-01	LE-04
LE-02	LE-05
LE-03	LE-06
APRIL 1992	
LE-05	

TABLE 2-26. SURFACE WATER LOCATIONS SAMPLED AND COLLECTION DATES

JUNE 1991		APRIL 1992	
SW-01	SW-08	SW-02	SW-07
SW-02	SW-09	SW-04	SW-09
SW-03	SW-10	SW-05	SW-11
SW-04	SW-12	SW-06	SW-12
SW-05	SW-13		
SW-06	SW-14		
SW-07	SW-15		
SEPTEMBER/OCTOBER 1991		**MAY 1992**	
SW-01	SW-09	SW-02	SW-11
SW-02	SW-10	SW-04	SW-12
SW-03	SW-11	SW-05	SW-16
SW-04	SW-12	SW-06	SW-17
SW-05	SW-13	SW-07	SW-18
SW-06	SW-14	SW-09	
SW-07	SW-15		
SW-08			
JANUARY/FEBRUARY 1992			
SW-04	SW-09		
SW-05	SW-10		
SW-06	SW-11		
SW-07	SW-12		

TABLE 2-27. SEDIMENT LOCATIONS SAMPLED AND COLLECTION DATES

JUNE 1991	
SD-01	SD-08
SD-02	SD-09
SD-03	SD-10
SD-04	SD-12
SD-05	SD-13
SD-06	SD-14
SD-07	SD-15
SEPTEMBER/OCTOBER 1991	
SD-01	SD-09
SD-02	SD-10
SD-03	SD-11
SD-04	SD-12
SD-05	SD-13
SD-06	SD-14
SD-07	SD-15
SD-08	
MAY 1992	
SD-02	SD-11
SD-04	SD-12
SD-05	SD-16
SD-06	SD-17
SD-07	SD-18
SD-09	

TABLE 2-28. LANDFILL GAS SAMPLING LOCATIONS AND DEPTHS (1)

Sample ID	Area	Grid Location	Depth
SG-SS(08+000)-12	Sewage Sludge	8+00	12 feet
SG-BW(04+100)-6	Bulky Waste	4+100	6 feet
SG-BW(05+500)-12	Bulky Waste	5+500	12 feet
SG-SW(13+300)-12 SUMMA Canister Duplicate	Solid Waste	13+300	12 feet
SG-SW(11+500)-5	Solid Waste	11+500	5 feet
SG-SW(03+300)-6 Reduced-Sulfur Duplicate	Solid Waste	3+300	6 feet

1. Each sample location was analyzed for reduced sulfur and volatile organics using method TO-14.

TABLE 3-1. GRAIN-SIZE ANALYSIS RESULTS OF SOILS *

Boring Location	Disposal Area	Depth (feet)	Geologic Strata	Material (%) Gravel	Sand	Silt	Clay
Landfill Analytical Boring Samples **							
BH-01	Sewage Sludge	2-8	Fill/Sludge	6.8	61.4	29.4	2.3
BH-03	Sewage Sludge	16-20	Fill & Disturbed Soils	5.5	79.9	14.1	0.4
BH-05	Background	10-16	Outwash	6.5	51.1	39.4	3.1
BH-06	Bulky Waste	6-10	Outwash	8.8	59.8	25.8	5.5
BH-07	Solid Waste	4-14	Solid Waste	8.1	60.7	27.6	3.5
Landfill Cover Material Samples							
PT-01	Solid Waste	0-4	Cover Material	7.7	44.5	41.8	6.0
PT-02	Solid Waste	0-4	Cover Material	13.7	54.3	27.4	4.6
PT-03	Solid Waste	0-4	Cover Material	15.0	55.0	24.9	5.0
PT-04	Solid Waste	0-4	Cover Material	11.5	57.8	25.5	5.1
PT-05	Bulky Waste	0-4	Cover Material	9.4	59.9	27.9	3.3
		Cover Material Average:		11.5	54.3	29.5	4.8
Test Boring Soil Samples							
MW-02-01	Sewage Sludge	18-22	Outwash	3.5	81.9	14.5	0.1
MW-03-01	(1)	25-39.5	Outwash	2.9	90.5	6.7	0.0
MW-11-01	(1)	8-13	Outwash	23.7	68.8	5.8	1.7
MW-13-01	(1)	9-17	Outwash	7.7	87.4	4.9	0.0
		Outwash Material Average:		9.4	82.2	8.0	0.5
MW-03-01	(1)	16.2-20.5	Lacustrine	0.0	6.9	90.0	3.0
MW-10-01	(1)	6-14	Lacustrine	0.8	28.9	70.3	0.0
MW-12-01	(1)	26.9-32	Lacustrine	0.0	6.7	82.9	10.3
		Lacustrine Material Average:		0.3	14.2	81.1	4.4
MW-13-01	(1)	21-29.5	Albation Till	26.8	57.1	15.3	0.8
MW-07-01	(1)	26-32	Ablation Till	20.3	69.2	9.2	1.3
MW-09-01	(1)	16-26	Outwash/Till	21.3	57.5	19.4	1.8

* Based on laboratory analysis of soils

** Samples from BH-02 and BH-04 were not submitted for analysis

(1) Not located within a disposal area

TABLE 3-2. GRAIN-SIZE ANALYSIS RESULTS OF SEDIMENTS *

Location **	Depth (feet)	June 1991 Material (%)				September/October 1991 Material (%)			
		Gravel	Sand	Silt	Clay	Gravel	Sand	Silt	Clay
Saugatucket River									
SD-02	0-0.5	0.8	95.0	3.8	0.4	1	89.7	6.7	2.6
SD-03	0-0.5	1.5	87.8	8.8	1.9	0.7	87.3	7.5	4.5
SD-04	0-0.5	1.9	37.7	48.5	11.8	3	31.1	54.2	11.6
SD-05	0-0.5	2.9	50.4	42.5	4.1	4.2	49.2	41.7	4.9
SD-06	0-0.5	2.6	76.4	17.1	3.9	1.6	93.4	5.0	0
SD-11	0-0.5	--	--	--	--	1.2	83.1	15.7	0
SD-08	0-0.5	0.3	84.1	12.9	2.7	0.1	64.4	31.3	4.1
	AVERAGE:	1.7	71.9	22.3	4.1	1.7	71.2	23.2	4.0
Mitchell Brook									
SD-13	0-0.5	13.8	57.3	26.5	2.3	10.6	57	29.1	3.2
SD-14	0-0.5	8.7	65.4	22.2	3.6	12.9	75.1	12	0
SD-15	0-0.5	3.2	83.0	13.8	0.0	3.5	79.2	16.6	0.6
SD-09	0-0.5	4.6	74.6	18.9	1.9	7.3	67.6	23.8	1.3
SD-07	0-0.5	2.4	93.8	3.4	0.4	7.7	77.9	12.9	1.4
SD-12	0-0.5	1.0	97.0	1.6	0.4	0.2	97.3	2.2	0.3
	AVERAGE:	5.6	78.5	14.4	1.4	7.0	75.7	16.1	1.1
Unnamed Brook									
SD-10	0-0.5	3.0	67.7	18.8	10.4	0.8	64.0	27.4	7.8
Unnamed Tributary									
SD-01	0-0.5	6.6	56.9	33.5	2.9	1.8	51.2	39.5	7.5

-- Not analyzed

* Based on laboratory analysis of sediments

** Locations listed from upstream to downstream

TABLE 3-3. SURFACE WATER ELEVATIONS

	Surface Water Elevation (feet NGVD)				
Location *	06/18/91	06/28/91	09/30/91	01/27/92	04/06/92
Saugatucket River					
SG-01	46.98	46.91	47.20	47.77	47.50
SG-05	33.07	33.00	33.33	34.08	33.67
SG-07	28.90	28.78	29.50	30.14	29.78
SG-06	28.23	NM	29.20	29.33	29.24
Mitchell Brook					
SG-10	68.41	68.35	68.52	68.74	68.64
SG-09	56.95	56.85	57.18	57.52	57.36
SG-02	52.85	NM	**	**	53.01
SG-08	48.94	48.86	49.24	49.53	49.37
SG-03	40.49	40.38	40.56	40.84	40.75
SG-11	30.48	30.42	30.57	30.98	30.83
Unnamed Brook					
SG-12	43.15	42.52	42.68	42.87	42.76
SG-04	32.62	NM	32.67	34.82	32.72

NGVD - National Geodetic Vertical Datum (1929)

NM - Not Measured

* Stream locations listed from upstream to downstream

** No water, or not significant enough for measurement

TABLE 3-4. SURFACE WATER VELOCITIES

Station	Location *	Measured Velocities (ft/sec)							
		06/18/91	Device	09/30/91	Device	01/27/92	Device	04/06/92	Device
Saugatucket River:									
SG-01	Staff Gauge	0.26	MM	0.31	PM	0.85	DM	0.73	DM
SG-05	Approx. 100 ft Upstream	0.87	PM	1.05	PM	3.12	DM	3.05	DM
SG-07	Staff Gauge	0.18	MM	0.18	DM	0.63	DM	0.78	DM
SG-06	5-ft Culverts At Saug. Road	0.85	DM	0.55	DM	1.33	DM	1.26	DM
Mitchell Brook:									
SG-10	Staff Gauge	0.57	PM	0.61	MM	1.8	MM	1.91	DM
						2.6	DM		
SG-09	Staff Gauge	0.17	DM	—	—	0.17	DM	0.71	DM
SG-09	Approx. 100 ft Downstream	—	—	0.39	MM	1.3	MM	—	—
						1.51	DM		
SD/SW-09		—	—	0.49	DM	—	—	—	—
SG-02	Staff Gauge	—	—	No Flow		No Flow		0.45	DM
SG-08	Staff Gauge	0.07	DM	0.45	DM	0.60	DM	1.17	DM
				0.52	PM				
SG-03	Staff Gauge	0.01	DM	—	—	0.31	DM	0.37	DM
SG-03	Approx. 100 ft Downstream	—	—	0.28	MM	—	—	—	—
SG-11	Staff Gauge	0.10	DM	0.19	DM	1.0	DM	0.48	DM
Unnamed Brook:									
SG-12	Approx. 50 ft Upstream	—	—	—	—	0.41	MM	—	—
						0.58	DM		
SG-12	Staff Gauge	0.70	PM	0.25	MM	—	—	0.63	DM
SG-04	@ 30-inch Diameter Culvert	—	—	0.12	MM	0.37	MM	0.69	DM
		0.06	DM	0.47	DM	0.89	DM		

* Stream locations listed from upstream to downstream
— Not measured
MM - Marsh McBirney
DM - Drogue measurements
PM - Pygmy meter

TABLE 3-5. AQUIFER TESTING RESULTS (1)

Well Location	Well Radius (inches)	Casing Radius (inches)	Well Depth (feet bgs)	Screen Elevation Interval (feet NGVD)	Saturated Aquifer Thickness (feet)	Screened Strata	Hydraulic Conductivity (2) (feet/day)	Transmisivity (3) (feet^2/day)
MW-02-01	4.0	1.0	34.12	49.88-34.88	46.26	Outwash	36.77	NA
MW-02-02	2.5	1.0	68.63	9.55-(-0.42)	46.87	Outwash	15.23	NA
MW-03-01	4.0	1.0	11.55	34.87-24.87	44.42	Outwash	5.10	NA
MW-04-01	4.0	1.0	14.85	40.08-30.08	13.37	Outwash	1.76	NA
MW-04-02	4.0	1.0	32.05	24.87-14.87	33.37	Outwash	37.48	NA
MW-05-01	4.0	1.0	16.2	32.31-22.31	23.33	Outwash	5.03	NA
MW-06-01	5.0	1.0	18	39.54-24.54	16.62	Outwash	22.94	NA
MW-12-01	4.0	1.0	18	36.75-21.75	44.94	Outwash	2.02	NA
MW-13-01	4.0	1.0	17.44	57.14-42.14	22.96	Outwash	21.50	NA
						OUTWASH AVERAGE:	16.43	
MW-11-01	4.0	1.0	20.45	36.76-21.76	40.7	Outwash/Lacustrine	1.85	NA
MW-01-01	4.0	1.0	17.98	50.94-36.46	20.24	Outwash/Lacustrine/Till	8.38	NA
MW-03-02	2.5	1.0	44.33	1.28-(-8.12)	45.63	Outwash/Till	5.35	NA
MW-07-01	5.0	1.0	33	55.29-40.29	25.53	Outwash/Till	4.99	NA
MW-08-01	4.0	1.0	13.51	42.80-32.80	10.89	Outwash/Till	8.36	NA
MW-09-01	2.5	1.0	33	35.96-25.96	20.14	Outwash/Till	5.52	NA
MW-13-02	4.0	1.0	27.75	42.52-32.52	22.86	Outwash/Till	17.06	NA
MW-14-01 (BH-07)	4.0	1.0	32.8	42.49-32.49	11.1	Lacustrine/Till	6.13	NA
MW-05-02	2.5	1.0	26.56	22.52-12.52	23.58	Till	6.75	NA
MW-06-02	2.5	1.0	32	20.12-10.12	30.29	Till	20.13	NA
MW-10-01	2.5	1.0	35.43	14.99-4.99	30.56	Till	16.68	NA
MW-12-02	5.0	1.0	42.72	7.03-(-2.97)	44.67	Till	32.44	NA
						TILL AVERAGE:	19.00	
MW-11-02	2.5	1.0	42.41	7.31-(-2.69)	41.94	Till/boulders	53.88	NA
MW-01-02	3.0	3.0	79.87	18.89-(-24.98)*	NA	Bedrock	0.06	0.29
MW-03-03	3.0	3.0	143.4	-11.19-(-101.59)*	NA	Bedrock	2.00	396.98
MW-04-03	3.0	3.0	135.7	4.43-(-90.27)*	NA	Bedrock	1.24	0.24
MW-07-02	3.0	2.0	72.62	28.35-0.73	NA	Bedrock	3.75	92.22
MW-08-02	2.5	1.0	25.26	26.10-21.10	NA	Bedrock	9.49	3.72
MW-11-03	3.0	2.0	76.44	-6.07-(-36.07)	NA	Bedrock	0.11	0.06
						BEDROCK AVERAGE:	2.78	82.25

bgs Below Ground Surface
NGVD Bational Geodetic Vertical Datum (1929)
NA Not Applicable
* Open bedrock borehole, no screen

1. Based on in-situ hydraulic conductivity results in monitoring wells.
2. Calculated by Bouwer & Rice (1976) method.
3. Calculated by Cooper, Bradehoeft, and Papadopolos (1967) method.

TABLE 3-6. PERMEABILITY RESULTS FOR SOILS *

Boring Location	Disposal Area	Depth Of Sample (feet bgs)	Geologic Strata	Permeability (feet/day)
Landfill Analytical Boring Samples:**				
BH-01	Sewage Sludge	2-8	Fill/Sludge	0.16
BH-03	Sewage Sludge	16-20	Fill & Disturbed Soils	0.60
BH-05	Background	10-16	Outwash	0.04
BH-06	Bulky Waste	6-10	Outwash	0.04
BH-07	Solid Waste	4-14	Solid Waste	0.29
Landfill Cover Material Samples:				
PT-01	Solid Waste	0-2	Cover	0.26
PT-02	Solid Waste	0-2	Cover	0.28
PT-03	Solid Waste	0-2	Cover	0.10
PT-04	Solid Waste	0-2	Cover	0.02
PT-05	Bulky Waste	0-2	Cover	0.26
			Cover Material Average	0.18

bgs below ground surface
Cover Landfill Cover Material
* Based on laboratory analysis of soils.
** Samples from BH-02 and BH-04 were not submitted for analysis.

TABLE 3-7. STREAMBED HYDRAULIC CONDUCTIVITIES

Location *	Type	9/91-10/91 Estimated Streambed Seepage Volumetric Rates (feet^3/day)	9/91-10/91 Hydraulic Conductivity (feet/day)	1/92 Estimated Streambed Seepage Volumetric Rates (feet^3/day)	1/92 Hydraulic Conductivity (feet/day)	4/92 Estimated Streambed Seepage Volumetric Rates (feet^3/day)	4/92 Hydraulic Conductivity (feet/day)
Saugatucket River							
SG-01	Mini-Piezometer	-0.00	0.00	0.012	0.13	0.003	0.08
SG-01	Seepage Meter	0.02	0.59	0.003	0.02	0.003	< 0.03
SG-05	Seepage Meter	0.27	0.90	0.51	0.69	0.44	1.91
SG-07	Mini-Piezometer	0.20	12.67	0.09	1.13	0.009	1.43
SG-07	Seepage Meter	0.03	1.29	0.09	0.65	0.00	0.00
		Average:	3.09	Average:	0.52	Average:	0.68
Conductivity Average: 1.43							
Mitchell Brook							
SG-10	Mini-Piezometer	-0.01	0.85	-0.006	0.11	-0.009	0.54
SG-09	Mini-Piezometer	0.05	2.14	0.07	1.98	0.03	0.15
SG-08	Mini-Piezometer	0.01	0.85	0.03	1.13	0.03	6.97
SG-03	Mini-Piezometer	0.01	1.07	0.15	0.95	0.10	4.70
SG-11	Mini-Piezometer	0.14	0.48	0.22	1.48	0.02	1.00
		Average:	1.08	Average:	1.13	Average:	2.67
Conductivity Average: 1.62							
Unnamed Brook							
SG-12	Mini-Piezometer	-3.32	14.93	-1.92	20.23	-3.10	22.30
Conductivity Average: 19.15							

(1) Locations listed from upstream to downstream

(2) Estimates of streambed seepage volumes were determined by measuring the amount of water gained or lost from a tedlar bag connected to the mini piezometers and seepage meters. Positive numbers indicate gain of water from groundwater. Negative numbers indicate loss of water to groundwater.

(3) Average of hydraulic conductivities calculated for seepage rates and hydraulic gradients during 9/30 - 10/01/91 and 10/01 and 10/02/91.

TABLE 3-8. GROUNDWATER ELEVATIONS

Well Location	Screen Elevation Interval (feet NGVD)	Screened Strata	Groundwater Flow System	Water Level Elevation (feet NGVD)			
				06/18/91	09/30/91	01/27/92	04/06/92
MW-I	~43.03-33.03	Outwash/Till	Shallow OB	48.99	48.21	49.96	49.88
MW-II	~47.71-37.71	Outwash/Till	Shallow OB	47.70	46.32	47.91	48.08
MW-III	~46.72-36.72	Outwash/Till	Shallow OB	47.30	45.12	46.51	46.59
MW-IV	~49.15-39.15	Outwash/Till	Shallow OB	45.07	43.85	45.30	45.43
MW-V	~48.39-38.39	Outwash/Till	Shallow OB	45.54	43.94	45.66	45.84
OW-27	~66.23-56.23	Outwash/Till	Deep OB	57.73	57.93	59.31	59.17
OW-30	~51.22-41.22	Outwash	Deep OB	50.88	51.37	52.57	52.36
MW-01-01	50.94-36.46	Outwash/LA/Till	Shallow OB		50.44	55.10	54.36
MW-01-02	18.89-(-24.98)*	Bedrock	Bedrock		50.41	53.76	53.50
MW-02-01	49.88-34.88	Outwash	Shallow OB		46.81	48.38	48.57
MW-02-02	9.55-(-0.42)	Outwash	Deep OB		46.97	48.54	48.69
MW-03-01	34.87-24.87	Outwash	Shallow OB		36.75	37.30	37.23
MW-03-02	1.28-(-8.12)	Outwash/Till	Deep OB		37.54	38.46	38.22
MW-03-03	-11.19-(-101.59)*	Bedrock	Bedrock		41.03	42.68	42.53
MW-04-01	40.08-30.08	Outwash	Shallow OB		42.94	44.09	43.67
MW-04-02	24.87-14.87	Outwash	Deep OB		42.84	44.01	43.58
MW-04-03	4.43-(-90.27)*	Bedrock	Bedrock		39.38	43.73	41.39
MW-05-01	32.31-22.31	Outwash	Shallow OB		33.76	34.49	34.26
MW-05-02	22.52-12.52	Till	Deep OB		34.04	34.95	34.77
MW-06-01	39.54-24.54	Outwash	Shallow OB		38.81	39.97	39.33
MW-06-02	20.12-10.12	Till	Deep OB		39.38	39.44	39.11
MW-07-01	55.29-40.29	Outwash/Till	Deep OB		53.82	55.56	55.57
MW-07-02	28.35-0.73	Bedrock	Bedrock		53.22	54.67	54.57
MW-08-01	42.80-32.80	Outwash/Till	Deep OB		41.55	41.70	41.70
MW-08-02	26.10-21.10	Bedrock	Bedrock		41.72	41.94	41.76
MW-09-01	35.96-25.96	Outwash/Till	Deep OB		43.35	46.35	46.53
MW-10-01	14.99-4.99	Till	Deep OB		33.70	35.19	34.92
MW-11-01	36.76-21.76	Outwash/LA	Shallow OB		36.07	36.68	36.39
MW-11-02	7.31-(-2.69)	Till/Boulders	Deep OB		36.60	37.21	36.91
MW-11-03	-6.07-(-36.07)	Bedrock	Bedrock		36.72	37.29	36.97
MW-12-01	36.75-21.75	Outwash	Shallow OB		39.01	40.41	40.42
MW-12-02	7.03-(-2.97)	Till	Deep OB		41.14	41.39	41.35
MW-13-01	57.14-42.14	Outwash	Shallow OB		53.89	55.48	55.33
MW-13-02	42.52-32.52	Outwash/Till	Deep OB		54.31	55.44	55.30
MW-14-01	42.49-32.49	LA/Till	Deep OB		39.96	40.25	40.26
RES#3	~44.25-24.25	Bedrock	Bedrock		49.22	49.80	50.40

NGVD National Geodetic Vertical Datum (1929)

LA Lacustrine

OB Overburden

* Open boring, no screen

TABLE 3-9. VERTICAL GROUNDWATER HYDRAULIC GRADIENTS

Location	Wells	Groundwater Flow System	Vertical Distance Between Wells (feet)	9/91 Water Level Elevation Difference (feet)	9/91 Gradient (1,2) (feet/feet)	1/92 Water Level Elevation Difference (feet)	1/92 Gradient (1,2) (feet/feet)	4/92 Water Level Elevation Difference (feet)	4/92 Gradient (1,2) (feet/feet)
MW-01	MW-01-01/MW-01-02	Shallow OB/Bedrock	17.57	-0.03	-0.00	-1.34	-0.08	-0.86	-0.05
MW-02	MW-02-01/MW-02-02	Shallow OB/Deep OB	25.33	0.16	0.01	0.16	0.01	0.12	0
MW-03	MW-03-01/MW-03-02	Shallow OB/Deep OB	23.59	0.78	0.03	1.16	0.05	0.99	0.04
MW-03	MW-03-02/MW-03-03	Deep OB/Bedrock	3.07	3.50	1.14	4.22	1.37	4.31	1.4
MW-04	MW-04-01/MW-04-02	Shallow OB/Deep OB	5.21	-0.10	-0.02	-0.08	-0.02	-0.09	-0.02
MW-04	MW-04-02/MW-04-03	Deep OB/Bedrock	10.44	-3.46	-0.33	-0.28	-0.03	-2.19	-0.21
MW-06	MW-06-01/MW-06-02	Shallow OB/Deep OB	4.42	0.57	0.13	0.53	0.12	-0.22	-0.05
MW-07	MW-07-01/MW-07-02	Deep OB/Bedrock	11.94	-0.60	-0.05	-0.89	-0.07	-1	-0.08
MW-08	MW-08-01/MW-08-02	Deep OB/Bedrock	6.7	0.17	0.03	0.24	0.04	0.06	0.01
MW-11	MW-11-01/MW-11-02	Shallow OB/Deep OB	14.45	0.53	0.04	0.53	0.04	0.52	0.04
MW-11	MW-11-02/MW-11-03	Deep OB/Bedrock	3.38	0.12	0.04	0.08	0.02	0.06	0.02
MW-12	MW-12-01/MW-12-02	Shallow OB/Deep OB	14.72	2.13	0.14	0.98	0.07	0.93	0.06

OB Overburden

1. Gradient=(Water Level Elevation Difference)/(Vertical Distance)

2. - = Downward Gradient

Well clusters MW-13-01 - 02 and MW-05-01 - 02 were not included in this table since the well screens of the cluster overlap each other; resulting in a negative vertical distance between wells.

TABLE 3-10. STREAM FLOW VOLUMETRIC BUDGET

Stream and River Reaches	Stream-Flow Volumetric Change (feet^3/sec) 06/18/91	Device	09/30/91	Device	01/27/92	Device	04/06/92	Device
Saugatucket River								
Reach 1 - Northern - Upstream								
between SG-01 - SG-05	0.18	MM	1.57	PM	15.68	DM	13.6	DM
Reach 2 - Central Region								
between SG-05 - SG-07	0.12	MM	(1)		-9.7	DM	-10.3	DM
Reach 3 - Downstream								
between SG-07 - SG-06	(1)		-1.04	DM	-4.6 to -18.2 *	DM	-0.7	DM
Mitchell Brook								
Reach 1 - Eastward Flowing Upstream								
between SG-10 - SG-09	(1)		-0.37	MM	-4.0 to -6.0 **	DM	-1.1	DM
between SG-09 - SG-08	0.005	DM	(1)		4.9	DM	4.1	DM
Reach 2 - Southward Flowing Section								
between SG-08 - SG-03	-0.18	DM	0.52	DM	-3.8	DM	-2.8	DM
between SG-03 - SG-11	0.13	DM	-0.37	DM	2.9	DM	-2.0	DM
Unnamed Brook								
Reach 1								
between SG-12 - SG-04	(1)		-0.05	MM	0.3	DM	0.5	DM
					-0.3	MM		

PM Pygmy Meter

DM Drogue Measurements

MM Marsh-McBirney Meter

- Surface water losing to groundwater

1. Flow measurement was not calculated because different velocity measuring techniques were used between stations.

* A flow rate could not be determined on this date because the water depth was not measured. The maximum and minimum depths measured (1.1- and 2.2-ft.), during Rounds 1, 2 and 4 were used to calculate a range of volumetric flo[illegible]s.

** The cross sectional river length was not measured. The maximum and minimum cross sectional river lengths (4.5- and 3.7-ft.), measured during Rounds 1, 2 and 4 were used to calculate a range of probable flow rates given the cross sectional flow velocities that were measured on 01/27/92

TABLE 3-11. SURFACE WATER/GROUNDWATER HYDRAULIC GRADIENTS

Location (1)	Type	06/18/91 & 06/19/91 Surface Water Elevation (feet NGVD)	06/18/91 & 06/19/91 Gradient (feet/feet)	09/30/91 Surface Water Elevation (feet NGVD)	09/30/91 Gradient (feet/feet)	01/27/92 Surface Water Elevation (feet NGVD)	01/27/92 Gradient (feet/feet)	01/28/92 (4) Surface Water Elevation (feet NGVD)	01/28/92 (4) Gradient (feet/feet)	04/07/92 (4) Surface Water Elevation (feet NGVD)	04/07/92 (4) Gradient (feet/feet)
Saugatucket River											
SG-01	Mini-Piezometer	46.98	0.01	47.20	0.02	47.77	0.18	47.74	0.09	47.49	0.04
SG-01	Seepage Meter	---	---	47.20	(2)	47.78 (5)	0.09	47.74	0.06	47.49	0.01
SG-05	Seepage Meter	35.02	0.05	33.33	1.54	NM	NM	34.06	0.29-0.25 (6)	33.67	0.08
SG-07	Mini-Piezometer	30.69	(2)	29.50	(2)	NM	NM	30.09	0.08-0.18 (6)	29.78	0.01
SG-07	Seepage Meter	---	---	29.50	NM	NM	NM	30.09	0.03-0.07 (6)	29.78	0.02
Mitchell Brook											
SG-10	Mini-Piezometer	71.37	0.30	68.52	-0.03 (3)	68.68	(2)	68.68	(2)	68.62	-0.03 (3)
SG-09	Mini-Piezometer	59.55	0.17	57.18	(2)	57.52	0.06	57.51	0.05	57.36	0.31
SG-08	Mini-Piezometer	51.43	-0.71 (3)	49.24	0.14	49.23	0.1	49.51	(2)	49.37	0.01
SG-03	Mini-Piezometer	40.49	0	40.56	0.02	40.21	0.48	40.82	0.05	40.74	0.03
SG-11	Mini-Piezometer	32.60	0.31	30.57	(2)	NM	NM	30.94	0.45-0.03 (6)	30.82	0.03
Unnamed Brook											
SG-12	Mini-Piezometer	42.68	-0.85 (3)	42.68	-0.33 (3)	NM	NM	42.87	-0.15 (3)	42.77	-0.23 (3)

NGVD National Geodetic Vertical Datum (1929)

NM Not Measured

-- Not Applicable

(1) Locations listed from upstream to downstream

(2) Data recorded but inconsistant with volumetric streambed seepage rates and hydraulic conductivity values.

(3) Downward Gradient

(4) In general the gradients measured on the first day for the minipiezometer of each round were more accurate than on the following days because the risers had remained stabilized above water so that the water levels measured within them were static. The water levels measured in the minipiezometer after the first day of each round may still have been recovering to steady state conditions when they were measured.

(5) Surface water elevation is different from that used for minipiezometer because measurements were made earlier in the day, than those for the minipiezometer.

(6) Range of gradients given because two different heads were measured on the same day before and after a test.

TABLE 3-12. WILDLIFE SPECIES OBSERVED DURING THE MAY 1991 RECONNAISSANCE SURVEY

Common Name	Scientific Name
Birds	
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American robin	*Turdus migratorius*
Barn swallow	*Hirundo rustica*
Belted kingfisher	*Ceryle alcyon*
Black-capped chickadee	*Parus atricapillus*
Blue jay	*Cyanocitta cristata*
Blue-winged warbler	*Vermivora pinus*
Brown thrasher	*Toxostoma rufum*
Canada goose	*Branta canadensis*
Chestnut-sided warbler	*Dendroica pensylvanica*
Common grackle	*Quiscalus quiscula*
Common yellowthroat	*Geothlypis trichas*
Eastern kingbird	*Tyrannus tyrannus*
Empidonax flycatcher	*Empidonax spp.*

TABLE 3-12 (Continued). WILDLIFE SPECIES OBSERVED DURING THE MAY 1991 RECONNAISSANCE SURVEY

Common Name	Scientific Name
European starling	*Sturnus vulgaris*
Field sparrow	*Spizella pusilla*
Glossy ibis [1]	*Plegadis falcinellus*
Gray catbird	*Dumetella carolinensis*
Great crested flycatcher	*Myiarchus crinitus*
Great egret [1]	*Casmerodius albus*
Greater yellowlegs	*Tringa melanoleuca*
Gull spp.	*Larus spp.*
House sparrow	*Passer domesticus*
Killdeer	*Charadrius vociferus*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*
Northern mockingbird	*Mimus polyglottos*
Prairie warbler	*Dendroica discolor*

TABLE 3-12 (Continued). WILDLIFE SPECIES OBSERVED DURING THE MAY 1991 RECONNAISSANCE SURVEY

Common Name	Scientific Name
Purple martin	*Progne subis*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rufous-sided towhee	*Pipilo erythrophthalmus*
Song sparrow	*Melospiza melodia*
Tree swallow	*Tachycineta bicolor*
Tufted titmouse	*Parus bicolor*
Wood thrush	*Hylocichla mustelina*
Yellow warbler	*Dendroica petechia*
Mammals	
Eastern chipmunk	*Tamias striatus*
Eastern cottontail	*Sylvilagus floridanus*
Eastern gray squirrel	*Sciurus carolinensis*
Raccoon	*Procyon lotor*
Striped skunk	*Mephitis mephitis*
Virginia opossum	*Didelphis virginiana*
White-footed mouse	*Peromyscus leucopus*

TABLE 3-12 (Continued). WILDLIFE SPECIES OBSERVED DURING THE MAY 1991 RECONNAISSANCE SURVEY

Common Name	Scientific Name
White-tailed deer	*Odocoileus virginianus*
Reptiles and Amphibians	
American toad	*Bufo americanus*
Bullfrog	*Rana catesbeiana*
Eastern garter snake [2]	*Thamnophis sirtalis sirtalis*
Common snapping turtle[2]	*Chelydra serpentina serpentina*

[1] Species of State Interest
[2] Not observed during May 1991 wildlife survey; reported by geophysical personnel

TABLE 3-13. LIFE HISTORIES OF REPRESENTATIVE BIRDS PRESENT ON-SITE

Species	Habitat	Food	Comments	Reference
American Crow *Corvus brachyrhynchos*	Interior or edges of deciduous, coniferous, or mixed woodlands	Carrion, fruit, garbage, grain	Common, adaptable to human environment	DeGraaf and Rudis 1983; Ehrlich et al. 1988
American Goldfinch *Carduelis tristis*	Fields, pastures, forest edges	Seeds, grasses, forbs, fruit, insects, buds	Late nester	DeGraaf and Rudis 1983; Ehrlich et al. 1988
American Robin *Turdus migratorius*	Open woodlands, parklands, forests	Earthworms, insects, fruits	Common, adaptable to human environment	DeGraaf and Rudis 1983; Ehrlich et al. 1988
Black-capped Chickadee *Parus atricapillus*	Mixed (preferred), deciduous, coniferous woodlots, parks	Insect, seeds, fruits, spiders	Common in suburbs, will use nest boxes, feeders	DeGraaf and Rudis 1983; Ehrlich et al. 1988
Blue Jay *Cyanocitta cristata*	Mixed forest with brushy understory	Seeds, fruits, nuts, occasionally nestlings, eggs	Common, adapts to urban conditions	DeGraaf and Rudis 1983; Ehrlich et al. 1988
Common Grackle *Quiscalus quiscula*	Open woodlots, suburbs	Insects, fruits, nuts, grains, seeds, eggs, nestlings	Generalist feeder	DeGraaf and Rudis 1983; Ehrlich et al. 1988
Glossy Ibis *Plegadis falcinellus*	Shallow pools bordered by shrubs and emergent vegetation	Crustraceans, small snakes, grubs, grasshoppers, leeches	Nest on ground in tall, dense vegetation, in low bushes, or tops of low trees growing in water; colonial nester	DeGraaf and Rudis 1983
Gray Catbird *Dumetella carolinensis*	Dense thickets in woodlots, along streams or ponds	Fruits, insects, spiders	Adaptable, will use suburban areas	DeGraaf and Rudis 1983; Ehrlich et al. 1988

TABLE 3-13 (Continued). LIFE HISTORIES OF REPRESENTATIVE BIRDS PRESENT ON-SITE

Species	Habitat	Food	Comments	Reference
Killdeer *Charadrius vociferus*	Meadows, edges of pasture ponds, dry uplands, close to human habitation	Insects, centipedes, spiders, worms, snails, crayfish, weed seeds	Solitary feeders	DeGraaf and Rudis 1983
Mallard *Anas platyrhynchos*	Ponds, marshes, lakes, streams	Seeds, marsh plants, waste grain, insects	Game bird, very common, adaptable to human environment	Bellrose 1980; DeGraaf and Rudis 1983
Northern Flicker *Colaptes auratus*	Open deciduous, coniferous, or mixed woods, woodland edges, suburbs, farm woodlots, fields, meadows	Ants and other insects, wild fruits	Common in New England	DeGraaf and Rudis 1983
Red-tailed Hawk *Buteo jamaicensis*	Deciduous and mixed woodlands interspersed with meadows, brushy pastures, open bogs, and swampy areas	Small mammals, amphibians, reptiles, nestling birds, insects, and carrion	Generally select the largest and tallest trees for nesting	DeGraaf and Rudis 1983
Red-winged Blackbird *Agelaius phoeniceus*	Emergent marshes, swamps, fields	Insects, seeds, grain	Often roosts in large flocks	DeGraaf and Rudis 1983; Ehrlich et al. 1988
Tree Swallow *Tachycineta bicolor*	Woodlots near water, wooded swamps	Mostly aerial insects, some seeds, berries	Requires cavities to nest, will use nest boxes	DeGraaf and Rudis 1983; Ehrlich et al. 1988
Yellow Warbler *Dendroica petechia*	Saplings, dense shrubs in woods, roadsides, along streams or ponds	Mostly insects, some fruit	Habitat generalist	DeGraaf and Rudis 1983; Ehrlich et al. 1988

TABLE 3-14. CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Red-throated loon	*Gavia stellata*	23	5	37	5
Common loon	*Gavia immer*	242	64	57	6
Pied-billed grebe	*Podilymbus podiceps*	8	4	2	3
Horned grebe	*Podiceps auritus*	126	70	40	13
Red-necked grebe	*Podiceps grisegena*	7	2	3	0
Northern gannet	*Sula bassanus*	20	213	6	0
Great cormorant	*Phalacrocorax carbo*	956	199	409	64
Double-crested cormorant	*Phalacrocorax auritus*	23	23	48	31
American bittern	*Botaurus lentiginosus*	1	1	0	2
Great blue heron	*Ardea herodias*	44	46	45	14
Black-crowned night heron	*Nycticorax nycticorax*	1	0	2	1
Mute swan	*Cygnus olor*	190	204	268	127
Canada goose	*Branta canadensis*	2,908	3,096	2,718	552
Greater white-fronted goose	*Anser albifrons*	0	1	0	0
Snow goose	*Chen caerulescens*	1	0	1	0
Brant	*Branta bernicla*	4	7	73	0
Green-winged teal	*Anas crecca*	27	40	31	43
American black duck	*Anas rubripes*	357	1,345	1,343	1,096
Mallard	*Anas platyrhynchos*	257	913	420	489

TABLE 3-14 (Continued). CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Northern pintail	*Anas acuta*	33	80	91	72
Northern shoveler	*Anas clypeata*	3	0	3	4
Gadwall	*Anas strepera*	150	146	87	76
American wigeon	*Anas americana*	92	31	52	26
Wood duck	*Aix sponsa*	0	0	0	2
Redhead	*Aythya americana*	11	0	0	0
Canvasback	*Aythya valisineria*	52	132	15	5
Ring-necked duck	*Aythya collaris*	3	15	8	22
Lesser scaup	*Aythya affinis*	74	21	0	0
Greater scaup	*Aythya marila*	160	331	235	12
Common eider	*Somateria mollissima*	6	4	2	0
King eider	*Somateria spectabilis*	4	0	0	1
Harlequin duck	*Histrionicus histrionicus*	3	0	0	0
Oldsquaw	*Clangula hyemalis*	11	18	42	0
Black scoter	*Melanitta nigra*	8	64	17	2
Surf scoter	*Melanitta perspicillata*	25	83	98	5
White-winged scoter	*Melanitta fusca*	106	202	86	5
Common goldeneye	*Bucephala clangula*	469	646	450	51
Bufflehead	*Bucephala albeola*	233	324	332	97
Common merganser	*Mergus merganser*	59	107	109	10
Red-brested merganser	*Mergus serrator*	3,168	939	1,170	255

TABLE 3-14 (Continued). CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Hooded merganser	*Lophodytes cucullatus*	34	42	43	16
Ruddy duck	*Oxyura jamaicensis*	25	0	0	22
Bald eagle	*Haliaeetus leucocephalus*	0	0	1	0
Osprey	*Pandion haliaetus*	1	0	0	1
Northern harrier	*Circus cyaneus*	7	14	14	4
Sharp-shinned hawk	*Accipiter striatus*	5	8	8	5
Cooper's hawk	*Accipiter cooperii*	2	1	0	0
Northern goshawk	*Accipiter gentilis*	0	3	1	0
Red-shouldered hawk	*Buteo lineatus*	1	0	2	3
Red-tailed hawk	*Buteo jamaicensis*	3	9	16	5
Rough-legged hawk	*Buteo lagopus*	0	0	3	0
American kestrel	*Falco sparverius*	13	9	2	4
Merlin	*Falco columbarius*	0	0	0	1
Ring-necked pheasant	*Phasianus colchicus*	0	1	1	0
Ruffed grouse	*Bonasa umbellus*	0	1	1	3
Northern bobwhite	*Colinus virginianus*	0	4	14	23
Virginia rail	*Rallus limicola*	2	1	0	1
American coot	*Fulica americana*	24	0	0	4
Black-bellied plover	*Pluvialis squatarola*	4	3	3	3
Killdeer	*Charadrius vociferus*	2	1	0	1
Greater yellowlegs	*Tringa melanoleuca*	0	0	0	2

TABLE 3-14 (Continued). CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Ruddy turnstone	*Arenaria interpres*	0	2	0	0
Sanderling	*Calidris alba*	24	55	22	15
Purple sandpiper	*Calidris maritima*	35	78	3	11
Dunlin	*Calidris alpina*	225	282	87	1
American woodcock	*Scolopax minor*	1	3	2	1
Common snipe	*Gallinago gallinago*	0	2	1	6
Laughing gull	*Larus atricilla*	3	0	0	0
Little gull	*Larus minutus*	0	0	0	1
Common black-headed gull	*Larus ridibundus*	1	1	0	0
Bonaparte's gull	*Larus philadelphia*	350	274	79	58
Ring-billed gull	*Larus delawarensis*	950	704	243	312
Herring gull	*Larus argentatus*	3,086	4,225	2,540	2,713
Thayer's gull	*Larus thayeri*	1	0	0	0
Iceland gull	*Larus glaucoides*	3	1	0	0
Glaucous gull	*Larus hyperboreus*	2	1	0	0
Lesser black-backed gull	*Larus fuscus*	0	1	0	1
Great black-backed gull	*Larus marinus*	834	1,805	647	915
Black-legged kittiwake	*Rissa tridactyla*	42	132	2	1
Gull spp.	*Larus* spp.	0	2,500	0	0
Razorbill	*Alca torda*	0	7	0	1
Dovekie	*Alle alle*	2	0	0	0

TABLE 3-14 (Continued). CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Mourning dove	*Zenaida macroura*	515	350	224	739
Rock dove	*Columba livia*	134	318	113	799
Eastern screech-owl	*Otus asio*	2	2	0	1
Great horned owl	*Bubo virginianus*	6	4	3	2
Long-eared owl	*Asio otus*	0	0	1	0
Short-eared owl	*Asio flammeus*	0	0	4	2
Snowy owl	*Nyctea scandiaca*	1	0	0	0
Barred owl	*Strix varia*	2	2	0	0
Belted kingfisher	*Ceryle alcyon*	16	14	8	7
Red-bellied woodpecker	*Melanerpes carolinus*	1	0	2	8
Yellow-bellied sapsucker	*Sphyrapicus varius*	1	0	1	1
Northern flicker	*Colaptes auratus*	31	38	41	14
Downy woodpecker	*Picoides pubescens*	43	42	65	38
Hairy woodpecker	*Picoides villosus*	5	4	11	7
Eastern phoebe	*Sayornis phoebe*	1	1	1	0
Horned lark	*Eremophila alpestris*	94	16	210	37
American crow	*Corvus brachyrhynchos*	236	270	217	138
Blue jay	*Cyanocitta cristata*	144	70	343	424
Black-capped chickadee	*Parus atricapillus*	562	631	604	874
Tufted titmouse	*Parus bicolor*	107	79	118	161
White-breasted nuthatch	*Sitta carolinensis*	37	49	49	72

TABLE 3-14 (Continued). CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Red-breasted nuthatch	*Sitta canadensis*	8	4	10	9
Brown creeper	*Certhia americana*	15	18	6	5
Winter wren	*Troglodytes troglodytes*	0	1	0	3
Carolina wren	*Thryothorus ludovicianus*	30	26	41	84
Marsh wren	*Cistothorus palustris*	2	0	0	4
Golden-crowned kinglet	*Regulus satrapa*	67	39	18	77
Ruby-crowned kinglet	*Regulus calendula*	1	1	0	4
Brown thrasher	*Toxostoma rufum*	0	2	2	3
Gray catbird	*Dumetella carolinensis*	3	6	33	13
Northern mockingbird	*Mimus polyglottos*	100	82	117	87
American robin	*Turdus migratorius*	250	778	457	310
Eastern bluebird	*Sialia sialis*	4	19	35	33
Hermit thrush	*Catharus guttatus*	3	9	28	5
American pipit	*Anthus rubescens*	0	11	3	5
Cedar waxwing	*Bombycilla cedrorum*	59	27	159	35
Northern shrike	*Lanius excubitor*	1	0	0	0
Yellow-rumped warbler	*Dendroica coronata*	410	122	157	219
Pine warbler	*Dendroica pinus*	0	1	2	0
Palm warbler	*Dendroica palmarum*	2	5	0	3
Common yellowthroat	*Geothlypis trichas*	1	1	0	1
Yellow-breasted chat	*Icteria virens*	0	1	0	0

TABLE 3-14 (Continued). CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Northern waterthrush	*Seiurus novaboracensis*	0	0	1	0
Red-winged blackbird	*Agelaius phoeniceus*	2	213	4	5
Rusty blackbird	*Euphagus carolinus*	0	12	2	16
Eastern meadowlark	*Sturnella magna*	79	23	4	6
Common grackle	*Quiscalus quiscula*	0	6	2	0
Brown-headed cowbird	*Molothrus ater*	110	20	5	78
European starling	*Sturnus vulgaris*	3,877	4,551	1,395	2,210
House sparrow	*Passer domesticus*	362	312	328	370
Dark-eyed junco	*Junco hyemalis*	182	361	299	459
Snow bunting	*Plectrophenax nivalis*	20	2	6	6
Lapland longspur	*Calcarius lapponicus*	0	0	1	0
Northern cardinal	*Cardinalis cardinalis*	116	96	133	184
Purple finch	*Carpodacus purpureus*	10	0	9	10
House finch	*Carpodacus mexicanus*	682	823	373	373
Pine siskin	*Carduelis pinus*	32	0	6	34
American goldfinch	*Carduelis tristis*	84	44	131	107
Evening grosbeak	*Coccothraustes vespertina*	34	0	49	32
Rufous-sided towhee	*Pipilo erythrophthalmus*	19	9	25	21
American tree sparrow	*Spizella arborea*	124	101	112	99
Field sparrow	*Spizella pusilla*	82	76	32	98
Chipping sparrow	*Spizella passerina*	5	4	6	1

TABLE 3-14 (Continued). CHRISTMAS BIRD COUNT DATA 1987-1991, SOUTH KINGSTOWN, RHODE ISLAND

Common Name	Scientific Name	1987-1988	1988-1989	1989-1990	1990-1991
Savannah sparrow	*Passerculus sandwichensis*	40	4	22	5
Fox sparrow	*Passerella iliaca*	1	2	12	5
Song sparrow	*Melospiza melodia*	199	139	191	335
Swamp sparrow	*Melospiza georgiana*	11	9	25	75
White-throated sparrow	*Zonotrichia albicollis*	407	350	691	677
White-crowned sparrow	*Zonotrichia leucophrys*	2	0	0	1
Total Species		124	119	114	118
Total Individuals		24,921	29,746	18,982	16,656

TABLE 3-15. LIFE HISTORY PROFILES OF MAMMALS ON-SITE

Species	Habitat	Food	Home Range	Comments	Reference
Eastern Cottontail *Sylvilagus floridanus*	Farmlands, pastures, fallow fields, open woodlands, thickets, swamps, marshes	Grasses, forbs, bark, twigs, buds	1.4 ac	Will use uninhabitated burrows	DeGraaf and Rudis 1983
Eastern Chipmunk *Tamias striatus*	Woods with abundant undergrowth	Seeds, fruits, nuts, eggs	0.5-1.0 ac	Uses hollow logs and underground tunnels	DeGraaf and Rudis 1983
Eastern Gray Squirrel *Sciurus carolinensis*	Deciduous woods	Nuts, buds, seeds, grains	2-7 ac	Arboreal, may feed on ground; common in suburbs	Burt and Grossenheider 1976; DeGraaf and Rudis 1983
Muskrat *Ondatra zibethicus*	Lakes, ponds, streams, marshes	Aquatic emergent vegetation	490 ft diameter	Valuable furbearer	Burt and Grossenheider 1976; Perry 1982
Raccoon *Procyon lotor*	Streams, lakes, wetlands, wooded areas near wetlands	Omnivorous; fruits, nuts, small rodents, insects, aquatic invertebrates, garbage	0.6-0.8 mi	Furbearer, adaptable to human environment	Kaufman 1982; DeGraaf and Rudis 1983
Striped Skunk *Mephitis mephitis*	Mixed woods, brushland, open fields, close to water	Rodents, eggs, insects, berries, carrion, garbage	500-1,000 ac	Furbearer, adaptable to human environment	Godin 1982; DeGraaf and Rudis 1983
Virginia Opossum *Didelphis virginiana*	Wooded areas, common in wet woods near rivers and swamps	Insects, worms, fruits, nuts, mammals, carrion, garbage	0.33-58 ac	Nests in hollow logs or abandoned burrows; common near human habitation	Whitaker 1980; DeGraaf and Rudis 1983
White-footed Mouse *Peromyscus leucopus*	Woods, clearings, buildings	Seeds, acorns, nuts, fruits, green plants	0.06-0.54 ac	Common, stores food	DeGraaf and Rudis 1983

TABLE 3-15 (Continued). LIFE HISTORY PROFILES OF MAMMALS ON-SITE

Species	Habitat	Food	Home Range	Comments	Reference
White-tailed Deer *Odocoileus virginianus*	Forest edges, swamp borders, areas interspersed with fields and woodlands	Woody deciduous plants, twigs, bark, herbs, roots, grasses	40-300 ac	Common; requires dense cover for winter shelter	Whitaker 1980; DeGraaf and Rudis 1983

TABLE 3-16. LIFE HISTORY PROFILES OF REPTILES AND AMPHIBIANS ON-SITE

Species	Habitat	Food	Comments	References
American Toad *Bufo americanus*	Almost any habitat, common where there are insects and moisture	Insects, spiders, slugs, earthworms	Requires shallow water for breeding	Behler and King 1979; DeGraaf and Rudis 1983
Bull Frog *Rana catesbeiana*	Shorelines of water bodies with emergent vegetation	Small mammals and birds, fish, frogs, salamanders, insects, spiders, crustaceans	Common; spend little time on land; hibernates under water in mud; possibly sensitive to pollutants	DeGraaf and Rudis 1983
Common Snapping Turtle *Chelydra s. serpentina*	Lakes, bogs, marshes, streams	Fish, crustaceans, birds, mammals, aquatic plants, carrion	Common; almost entirely aquatic; hibernates in mud or debris in lake bottoms, banks	DeGraaf and Rudis 1983

TABLE 3-17. HABITAT ACREAGE SUMMARY

Cover Type [1]	Area (acres)
Palustrine Open Water	3.6
Palustrine Emergent Wetland	0.5
Palustrine Forested Wetland	19.3
Total Wetland [2]	23.4
Deciduous Forest	86.2
Scrub (Mixture of shrubs, herbaceous plants, and small trees)	7.8
Successional Shrubland	2.7
Successional Old Field	57.7
Mowed Lawn	5.8
Bare Ground	5.6
Paved/Gravel Surfaces	5.9
Structures	0.4
Total Upland	172.1
Total	195.5

[1] Wetland cover types follow Cowardin et al. (1979). Upland cover types were adapted from Reschke (1987). Acreage figures apply only to the area shown on Figure 3-24.

[2] All wetland cover types listed qualify as Army Corps of Engineers' wetlands subject to regulation under Section 404 of the Clean Water Act.

TABLE 3-18. SUMMARY OF THE WET II MODEL EVALUATION RESULTS

Wetland Function or Value	Social Significance [1]	Effectiveness [1]	Opportunity [1]
Groundwater Recharge	M	U	*
Groundwater Discharge	M	L	*
Floodflow Alteration	L	M	M
Sediment Stabilization	L	H	*
Sediment/Toxicant Retention	H	L	H
Nutrient Removal/Transformation	M	L	H
Production Export	*	M	*
Wildlife Diversity/Abundance	H	*	*
- Breeding	*	H	*
- Migration	*	H	*
- Wintering	*	H	*
Aquatic Diversity/Abundance	L	L	*
Uniqueness/Heritage	L	*	*
Recreation	L	*	*

[1] See text for a definition of these terms. Rankings are defined as follows: H = High; M = Medium; L = Low; U = Uncertain; * = Conditions where functions and values are not evaluated by the model.

TABLE 3-19. SUMMARY OF SEDIMENT CHARACTERISTICS*

Locations	Percent Gravel	Percent Sand	Percent Silt	Iron (mg/kg)
Saugatucket River				
SE-02	15	80	5	885
SE-04	13	82	5	4,240
SE-05	33	65	2	25,000
SE-06	1.4	96	3	12,500
SE-11	0.7	93	6	3,680
Mitchell Brook				
SE-09	8	89	3	3,860
SE-07	8	90	2	12,400
SE-12	7.5	91	1.5	9,630

* Sampling locations are presented from upstream to downstream within each water body (SE-02 and SE-09 are considered upstream locations). A detailed description of the nature and extent of contamination in the sediments is found in section 4.

TABLE 3-20 TAXONOMIC LIST OF ORGANISMS COLLECTED FROM THE ROSE HILL REGIONAL LANDFILL SITE, MAY 1992

Class / Order / Family / *Genus Species*	Saugatucket River	Mitchell Brook
Insecta		
Ephemeroptera		
Ephemerellidae		
Ephemerella	X	X
Eurylophella	X	
Heptageniidae		
Stenonema	X	
Leptophlebiidae	X	X
Habrophlebia vibrans	X	
Siphlonuridae		X
Ameletus		X
Siphlonurus	X	
Odonata		
Calopterygidae		
Calopteryx	X	
Gomphidae		
Stylogomphus	X	
Plecoptera		
Chloroperlidae		
Haploperla	X	
Leuctridae		
Leuctra	X	X
Nemouridae		
Amphinemura	X	X

TABLE 3-20 TAXONOMIC LIST OF ORGANISMS COLLECTED FROM THE ROSE HILL REGIONAL LANDFILL SITE, MAY 1992

Class / Order / Family	*Genus Species*	Saugatucket River	Mitchell Brook
Perlidae			
	Agnetina	X	
	Eccoptura xanthenes		X
Perlodidae			
	Isoperla	X	
Trichoptera			
Hydropsychidae			
	Cheumatopsyche	X	
	Hydropsyche	X	
Hydroptilidae			
	Ochrotrichia	X	
	Hydroptila	X	
Lepidostomatidae			
	Lepidostoma	X	X
Leptoceridae			
	Mystacides	X	
	Oecetis	X	
Limnephilidae			
	Goera	X	
	Limnephilus	X	
	Pycnopsyche	X	X
Molannidae			
	Molanna	X	
Odontoceridae			
	Psilotreta	X	X

TABLE 3-20 TAXONOMIC LIST OF ORGANISMS COLLECTED FROM THE ROSE HILL REGIONAL LANDFILL SITE, MAY 1992

Class / Order / Family	*Genus Species*	Saugatucket River	Mitchell Brook
Polycentropodidae			
	Cyrnellus	X	
	Neureclipsis	X	
	Phylocentropus	X	
	Polycentropus	X	
Psychomyidae			
	Lype diversa	X	
Coleoptera			
Dytiscidae			X
	Agabus	X	
	Deronectes	X	
	Hydrovatus	X	
	Oreodytes		X
Elmidae			
	Ancyronyx variegata	X	
	Macronychus glabratus	X	
	Optioservus	X	X
	Promoresia	X	
Hydrophilidae			
	Tropisternus		X
Megaloptera			
Corydalidae			
	Nigronia	X	
Sialidae			
	Sialis	X	X

TABLE 3-20 TAXONOMIC LIST OF ORGANISMS COLLECTED FROM THE ROSE HILL REGIONAL LANDFILL SITE, MAY 1992

Class Order Family *Genus Species*	Saugatucket River	Mitchell Brook
Diptera		
Ceratopogonidae		
Culicoides	X	
Probezzia	X	
Chironomidae		
Chironominae		
Chironomus	X	X
Cladotanytarsus	X	
Cryptochironomus	X	X
Microtendipes	X	
Pagastiella	X	
Paralauterborniella	X	
Paratendipes	X	X
Phaenospectra	X	X
Polypedilum	X	X
Polypedilum fallax	X	X
Rheotanytarsus	X	X
Tanytarsus	X	X
Tribelos	X	X
Zavrelia	X	
Diamesinae		
Potthastia longimana	X	X
Orthocladinae		
Corynoneura	X	X
Cricotopus	X	
Cricotopus bicinctus	X	

TABLE 3-20 TAXONOMIC LIST OF ORGANISMS COLLECTED FROM THE ROSE HILL REGIONAL LANDFILL SITE, MAY 1992

Class / Order / Family	*Genus Species*	Saugatucket River	Mitchell Brook
	Dipiocladius		X
	Krenosmittia		X
	Orthocladius	X	X
	Nanocladius	X	
	Parametriocnemus	X	X
	Psectrocladius	X	
	Psectrocladius psilopterus	X	
	Rheocricotopus	X	X
	Thienemanniella	X	X
	Tvetenia bavarica	X	X
	Unniella multivirga	X	X
Tanypodinae		X	
	Ablabesmyia	X	X
	Apsectrotanypus	X	
	Conchapelopia	X	X
	Hudsonimyia	X	
	Larsia	X	
	Macropelopia	X	
	Natarsia	X	X
	Procladius	X	
	Zavrelimyia	X	X
Empididae			
	Hemerodromia	X	
Simulidae			
	Simulium	X	X

TABLE 3-20 TAXONOMIC LIST OF ORGANISMS COLLECTED FROM THE ROSE HILL REGIONAL LANDFILL SITE, MAY 1992

Class / Order / Family / *Genus Species*	Saugatucket River	Mitchell Brook
Tipulidae	X	
Antocha	X	
Dicranota	X	
Hexatoma	X	
Molophilus	X	
Pseudolimnophilus	X	
Crustacea		
Amphipoda		
Crangonyctidae	X	
Gammaridae		
Gammarus fasciatus	X	
Isopoda		
Asellidae		
Caecidotea communis	X	X
Gastropoda		
Mesogastropoda		
Planorbidae		
Planorbella		X
Ancylidae		
Ferrissia	X	
Valvatidae		
Valvata	X	
Viviparidae	X	

TABLE 3-20 TAXONOMIC LIST OF ORGANISMS COLLECTED FROM THE ROSE HILL REGIONAL LANDFILL SITE, MAY 1992

Class / Order / Family *Genus Species*	Saugatucket River	Mitchell Brook
Bivalvia		
Veneroida		
Sphaeriidae		
Sphaerium	X	X
Oligochaeta		
Haplotaxida		
Haplotaxidae		X
Lumbricina	X	X
Tubificida		
Enchytraeidae	X	
Tubificidae	X	X
Limnodrilus	X	X
Hirudinea		
Rhynchobdellida		
Glossiphoniidae		
Helobdella stagnalis	X	

TABLE 3-21. LIFE HISTORY CHARACTERISTICS OF SELECTED BENTHIC TAXA

Taxon	Habitat	Feeding	Reference	Pollution Tolerance[1]	
				Metals	Organics
Crangonyctidae		Most amphipods are scavengers	Thorpe and Covich 1991	-	F
Tanytarsus	Lentic - vascular hydrophytes (floating zone) and profundal; lotic - erosional (some instar 1 planktonic); climbers, clingers (net spinners	Collectors (filterers and gatherers, a few scrapers)	Merrit and Cummins 1978	-	I/F
Leuctra	Lotic - erosional and depositional	Shredders - detritivores	Merrit and Cummins 1978	-	I
Conchapelopia	Lotic - erosional; lentic - littoral; sprawlers	Engulfers (predators); piercers - predators (Chironomidae, Trichoptera, Ephemeroptera)	Merrit and Cummins 1978	-	-
Cryptochironomus	Lentic - littoral and profundal; lotic - and depositional; sprawlers, burrowers	Engulfers (predators; Protozoa, microcrustacea, Chironomidae); piercers - predators (Oligochaeta); collectors - gathers	Merrit and Cummins 1978	-	I/F
Ephemerella	Lotic - erosional and depositional (vascular hydrophytes and sediments) Lentic - vascular hydrophytes Clingers, sprawlers, swimmers	Collectors - gatherers (detritus, diatoms); scrapers, some shredders - herbivores, filamentous algae; 1 species reported to be engulfers	Merrit and Cummins 1978	-	I
Paratendipes	Lotic - depositional; lentic - littoral; burrowers (tube builders)	Collectors - gatherers	Merrit and Cummins 1978	-	I
Polypedilum fallax	Lentic - vascular hydrophytes (floating zone); climbers, clingers	Shredders - herbivores (miners), collectors - gatherers, engulfers (predators)	Merrit and Cummins 1978	I	F

TABLE 3-21 (Continued). LIFE HISTORY CHARACTERISTICS OF SELECTED BENTHIC TAXA

Taxon	Habitat	Feeding	Reference	Pollution Tolerance[1]	
				Metals	Organics
Culicoides	Lentic littoral (margins); tree holes and temporary pools, brackish marshes, lotic margins; burrowers, occasionally planktonic	Engulfers (predators) collectors - gatherers	Merrit and Cummins 1978	-	-
Chironomus	Lentic - littoral and profundal; lotic - depositional; burrowers (tube builders)	Collectors - gatherers (a few filterers) shredders - herbivores (miners)	Merrit and Cummins 1978	-	F/T
Thienemanniella	Lotic - erosional and depositional; lentic - littoral; sprawlers	Collectors - gatherers?	Merrit and Cummins 1978	-	I
Diplocladius	Lotic - erosional; sprawlers	Collectors - gathers	Merrit and Cummins 1978	-	-
Orthocladius	Lentic - littoral (erosional) and profundal; lotic - erosional; sprawlers, burrowers	collectors - gatherers (detritus, diatoms, filamentous algae)	Merrit and Cummins 1978	-	I/F

1 From USEPA (1990c) : T = Toluene; F = Facultaine; I = Intolerant; - = No Data

TABLE 3-22. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-02, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Crangonyctidae	18	85	46	49.7	30.84
Caecidotea communis	14	19	42	25.0	46.37
Tanytarsus	3	31	31	21.7	59.83
Procladius	5	14	5	8.0	64.80
Larsia	2	17	2	7.0	69.14
Culicoides	0	2	17	6.3	73.08
Conchapelopia	4	11	3	6.0	76.81
Ablabesmyia	0	5	6	3.7	79.09
Natarsia	0	4	4	2.7	80.75
Gammarus fasciatus	2	4	2	2.7	82.40
Eurylophella	0	3	5	2.7	84.06
Deronectes	0	2	6	2.7	85.71
Apsectrotanypus	0	3	4	2.3	87.16
Pseudolimnophila	0	2	5	2.3	88.61
Zavrelia	0	3	3	2.0	89.86
Paralauterborniella	0	5	0	1.7	90.89
Unniella multivirga	0	4	1	1.7	91.93
Macropelopia	1	0	3	1.3	92.75
Sphaerium	1	1	2	1.3	93.58
Zavrelimyia	1	0	3	1.3	94.41
		95%			
Psectrocladius psilopterus	0	3	0	1.0	95.03
Orthocladius	1	0	2	1.0	95.65
Pagastiella	1	0	1	0.7	96.06
Cryptochironomus	1	0	1	0.7	96.48
Sialis	0	1	1	0.7	96.89
Limnephilus	0	0	2	0.7	97.31
Tanypodinae	0	2	0	0.7	97.72
Cladotanytarsus	1	0	0	0.3	97.93
Polypedilum	1	0	0	0.3	98.14
Phaenospectra	0	1	0	0.3	98.34
Molanna	1	0	0	0.3	98.55

TABLE 3-22 (Continued). ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-02, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Optioservus	1	0	0	0.3	98.76
Pycnopsyche	0	1	0	0.3	98.96
Cyrnellus	0	1	0	0.3	99.17
Lepidostoma	0	1	0	0.3	99.38
Molophilus	0	0	1	0.3	99.58
Agabus	0	0	1	0.3	99.79
Paratendipes	0	0	1	0.3	100.00

TABLE 3-23. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-04, MAY 1992.

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Conchapelopia	7	9	3	6.3	13.67
Cryptochrinomus	4	9	5	6.0	26.62
Crangonyctidae	5	6	1	4.0	35.25
Molanna	3	3	4	3.3	42.45
Culicoides	5	3	2	3.3	49.64
Sphaerium	2	5	3	3.3	56.83
Cladotanytarsus	3	3	1	2.3	61.87
Tanytarsus	3	2	1	2.0	66.19
Pycnopsyche	2	2	2	2.0	70.50
Procladius	3	0	1	1.3	73.38
Natarsia	2	1	0	1.0	75.54
Pagastiella	0	2	1	1.0	77.70
Mystacides	2	0	1	1.0	79.86
Valvata	1	2	0	1.0	82.01
Caecidotea communis	0	2	1	1.0	84.17
Parametriocnemus	0	1	1	0.7	85.61
Sialis	1	0	1	0.7	87.05
Tubificidae	0	1	1	0.7	88.49
Zavrelia	1	0	0	0.3	89.21
Tanypodinae	0	1	0	0.3	89.93
Paratendipes	0	0	1	0.3	90.65
Gammarus fasciatus	0	1	0	0.3	91.37
Eurylophella	1	0	0	0.3	92.09
Stenomema	0	1	0	0.3	92.81
Ephemerella	0	1	0	0.3	93.52
Goera	0	1	0	0.3	94.24
Habrophlebia vibrans	0	1	0	0.3	94.96
		95%			
Stylogomphus	0	1	0	0.3	95.68
Tipulidae	0	1	0	0.3	96.40
Dicranota	0	1	0	0.3	97.12
Optioservus	0	1	0	0.3	97.84
Lumbricina	0	0	1	0.3	98.56
Limnodrilus	0	0	1	0.3	99.28
Enchytraeidae	0	1	0	0.3	100.00

TABLE 3-24. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-05, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Conchapelopia	29	30	25	28.0	21.76
Caecidotea communis	3	44	24	23.7	40.16
Paratendipes	1	29	8	12.7	50.00
Tanytarsus	6	20	7	11.0	58.55
Parametriocnemus	17	0	4	7.0	63.99
Ephemerella	17	0	2	6.3	68.91
Natarsia	1	6	7	4.7	72.54
Hydroptila	14	0	0	4.7	76.17
Polypedilum	6	2	2	3.3	78.76
Cryptochironomus	0	2	8	3.3	81.35
Pycnopsyche	3	1	4	2.7	83.42
Cladotanytarsus	3	4	0	2.3	85.23
Crangonyctidae	0	4	2	2.0	86.79
Tribelos	0	5	1	2.0	88.34
Optioservus	5	0	0	1.7	89.64
Potthastia longimana	4	0	0	1.3	90.67
Zavrelia	2	2	0	1.3	91.71
Phylocentropus	2	0	2	1.3	92.75
Eurylophella	1	0	2	1.0	93.52
Polypedilum fallax	1	0	1	0.7	94.04
Pagastiella	0	1	1	0.7	94.56
		95%			
Limnephilus	0	1	1	0.7	95.08
Limnodrilus	0	1	1	0.7	95.60
Thienemanniella	0	1	0	0.3	95.85
Corynoneura	0	1	0	0.3	96.11
Procladius	0	1	0	0.3	96.37
Rheocricotopus	0	0	1	0.3	96.89
Collembola	1	0	0	0.3	97.15
Hemerodromia	1	0	0	0.3	97.41
Promoresia	1	0	0	0.3	97.67
Antocha	1	0	0	0.3	97.93

TABLE 3-24 (Continued). ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-05, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Culicoides	1	0	0	0.3	98.19
Probezzia	0	1	0	0.3	98.45
Leuctra	0	1	0	0.3	98.70
Mystacides	0	1	0	0.3	98.96
Sialis	0	0	1	0.3	99.22
Nigronia	0	0	1	0.3	99.48
Helobdella stagnalis	0	0	1	0.3	99.74
Tipulidae	0	0	1	0.3	100.00

TABLE 3-25. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-06, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Sphaerium	27	10	29	22.0	36.67
Cryptochironomus	10	3	5	6.0	46.67
Musculium	14	1	1	5.3	55.56
Polypedilum	1	6	8	5.0	63.89
Tanytarsus	8	0	7	5.0	72.22
Natarsia	5	1	3	3.0	77.22
Conchapelopia	1	0	7	2.7	81.67
Zavrelia	4	0	2	2.0	85.00
Caecidotea communis	4	0	0	1.3	87.22
Tipulidae	1	1	1	1.0	88.89
Culicoides	0	2	1	1.0	90.56
Cladotanytarsus	2	0	0	0.7	91.67
Sialis	1	0	1	0.7	92.78
Hexatoma	0	0	2	0.7	93.89
Tubificida	0	0	2	0.7	95.00
		95%			
Cricotopus	1	0	0	0.3	95.56
Ablabesmyia	1	0	0	0.3	96.11
Procladius	0	1	0	0.3	96.67
Nanocladius	0	1	0	0.3	97.22
Pagastiella	0	0	1	0.3	97.78
Rheotanytarsus	0	0	1	0.3	98.33
Optioservus	1	0	0	0.3	98.89
Amphipoda	0	0	1	0.3	99.44
Enchytraeidae	0	0	1	0.3	100.00

TABLE 3-26. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-11, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Caecidotea communis	7	29	1	12.3	16.30
Sphaerium	19	8	7	11.3	31.28
Paratendipes	22	5	6	11.0	45.81
Natarsia	10	3	12	8.3	56.83
Tanytarsus	9	12	1	7.3	66.52
Crangonyctidae	4	6	10	6.7	75.33
Cladotanytarsus	3	1	6	3.3	79.74
Ablabesmyia	1	4	3	2.7	83.26
Sialis	2	0	3	1.7	85.46
Conchapelopia	1	0	3	1.3	87.22
Cryptochironomus	0	0	4	1.3	88.99
Polypedilum	1	0	2	1.0	90.31
Tubificidae	0	3	0	1.0	91.63
Tribelos	1	0	1	0.7	92.51
Macropelopia	0	2	0	0.7	93.39
Hydrovatus	0	2	0	0.7	94.27
		95%			
Tricladida	0	2	0	0.7	95.15
Zavrelimyia	1	0	0	0.3	95.59
Nigronia	1	0	0	0.3	96.04
Tipulidae	1	0	0	0.3	96.48
Phylocentropus	1	0	0	0.3	96.92
Phaenospectra	0	1	0	0.3	97.36
Pycnopsyche	0	1	0	0.3	97.80
Polycentropus	0	1	0	0.3	98.24
Probezzia	0	1	0	0.3	98.68
Pseudolimnophila	0	1	0	0.3	99.12
Ferrissia	0	1	0	0.3	99.56
Parametriocnemus	0	0	1	0.3	100.00

TABLE 3-27. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-09, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Paratendipes	10	1	4	5.0	22.06
Tanytarsus	1	4	3	2.7	33.82
Tubificidae	3	5	0	2.7	45.59
Lumbricina	1	1	4	2.0	54.41
Sphaerium	1	3	2	2.0	63.24
Oreodytes	3	1	0	1.3	69.12
Tribelos	0	2	1	1.0	73.53
Chironomus	0	1	1	0.7	76.47
Culicoides	1	0	1	0.7	79.41
Limnodrilus	0	2	0	0.7	82.35
Polypedilum	0	2	0	0.7	85.29
Siphlonuridae	0	0	2	0.7	88.24
Dytiscidae	0	0	1	0.3	89.71
Ameletus	0	1	0	0.3	91.18
Optioservus	0	1	0	0.3	92.64
Simulium	1	0	0	0.3	94.12
.....	.....	95%	.....	.....	.....
Unniella multivirga	0	0	1	0.3	95.59
Krenosmittia	0	1	0	0.3	97.06
Phaenospectra	1	0	0	0.3	98.53
Ablabesmyia	0	1	0	0.3	100.00

TABLE 3-28. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-07, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Sphaerium	8	8	3	6.3	40.04
Diplocladius	0	7	0	2.3	55.32
Culicoides	1	1	2	1.3	63.83
Oligochaeta	1	1	2	1.3	72.34
Natarsia	1	2	0	1.0	78.72
Parametriocnemus	1	0	1	0.7	82.98
Unniella multivirga	0	2	0	0.7	87.23
Polypedilum	1	0	0	0.3	89.36
Zavrelimyia	0	1	0	0.3	91.49
Orthocladius	0	1	0	0.3	93.62
		95%			
Planorbella	1	0	0	0.3	95.74
Leuctra	0	1	0	0.3	97.87
Psilotreta	1	0	0	0.3	100.00

TABLE 3-29. ROSE HILL REGIONAL LANDFILL BENTHIC GRAB TAXA AND DENSITIES PER 36 SQUARE INCHES, LOCATION SE-12, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Conchapelopia	1	0	1	0.7	33.33
Thienemanniella	0	1	0	0.3	50.00
Diplocladius	0	1	0	0.3	66.67
Cryptochironomus	0	1	0	0.3	83.33
		95%			
Haplotaxidae	0	0	1	0.3	100.00

TABLE 3-30. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-02, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Leuctra	43	76	57	58.7	35.85
Conchapelopia	43	36	42	40.3	60.49
Tanytarsus	13	9	13	11.7	67.72
Unniella multivirga	20	6	4	10.0	73.73
Caecidotea communis	12	4	6	7.3	78.21
Polypedilum pedestre	10	4	4	6.0	81.87
Amphinemura	7	4	5	5.3	85.13
Crangonyctidae	8	4	4	5.3	88.39
Microtendipes	0	8	2	3.3	90.43
Corynoneura	7	0	2	3.0	92.26
Stenonema	4	0	2	2.0	93.48
Macronychus glabratus	3	0	3	2.0	94.70
		95%			
Neurelipsis	2	2	0	1.3	95.52
Cyrnellus	1	0	3	1.3	96.33
Thienemanniella	3	0	0	1.0	96.95
Psectrocladius	3	0	0	1.0	97.56
Eurylophella	2	1	0	1.0	98.17
Pycnopsyche	0	2	0	0.7	98.57
Lype diversa	1	0	0	0.3	98.78
Culicoides	1	0	0	0.3	98.98
Ancyronyx variegata	0	1	0	0.3	99.19
Agnetina	0	1	0	0.3	99.39
Viviparidae	0	1	0	0.3	99.59
Psilotreta	0	0	1	0.3	99.80
Lepidostoma	0	0	1	0.3	100.00

TABLE 3-31. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-04, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Conchapelopia	33	72	58	54.3	35.43
Ephemerella	45	16	8	23.0	50.43
Leuctra	24	16	26	22.0	64.78
Simulium	23	1	1	8.3	70.22
Stenonema	5	10	6	7.0	74.78
Thienemanniella	10	0	10	6.7	79.13
Habrophlebia vibrans	11	1	6	6.0	83.04
Polypedilum	8	3	5	5.3	86.52
Tanytarsus	2	5	5	4.0	89.13
Microtendipes	4	3	0	2.3	90.65
Amphinemura	4	0	1	1.7	91.74
Caecidotea communis	2	2	1	1.7	92.83
Polypedilum fallax	4	0	0	1.3	93.70
Eurylophella	2	1	1	1.3	94.57
.....	.....	95%	.....	.....	.....
Ochrotrichia	0	2	2	1.3	95.43
Hudsonimyia	0	0	3	1.0	96.09
Haploperla	2	1	0	1.0	96.74
Isoperla	0	1	1	0.7	97.17
Crangonyctidae	1	0	1	0.7	97.61
Pycnopsyche	0	1	1	0.7	98.04
Corynoneura	1	0	0	0.3	98.26
Hydropsyche	1	0	0	0.3	98.48
Cyrnellus	1	0	0	0.3	98.70
Culicoides	0	1	0	0.3	98.91
Viviparidae	0	1	0	0.3	99.13
Oecetis	0	1	0	0.3	99.35
Cheumatopsyche	0	0	1	0.3	99.57
Lepidostoma	0	0	1	0.3	99.78
Neureclipsis	0	0	1	0.3	100.00
Stylogomphus	0	1	0	0.3	95.68

TABLE 3-32. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-05, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Conchapelopia	34	40	35	36.3	37.07
Polypedilum fallax	11	22	13	15.3	52.72
Tanytarsus	17	8	10	11.7	64.63
Leuctra	7	10	17	11.3	76.19
Parametriocnemus	6	14	3	7.7	84.01
Polypedilum	4	0	8	4.0	88.10
Caecidotea communis	2	2	3	2.3	90.48
Microtendipes	4	0	2	2.0	92.52
Unniella multivirga	0	0	5	1.7	94.22
		95%			
Larsia	0	0	3	1.0	95.24
Ephemerella	0	1	2	1.0	96.26
Phaenospectra	0	0	2	0.7	96.94
Rheotanytarsus	0	0	2	0.7	97.62
Pycnopsyche	1	0	0	0.3	97.96
Stenonema	1	0	0	0.3	98.30
Neureclipsis	1	0	0	0.3	98.64
Siphlonurus	1	0	0	0.3	98.98
Leptophlebiidae	1	0	0	0.3	99.32
Crangonyctidae	0	0	1	0.3	99.66
Culicoides	0	0	1	0.3	100.00

TABLE 3-33. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-06, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Polypedilum fallax	19	26	6	17.0	30.18
Conchapelopia	9	10	7	8.7	45.56
Leuctra	7	4	8	6.3	56.80
Tanytarsus	5	5	4	4.7	65.09
Orthocladius	3	4	0	2.3	69.23
Parametriocnemus	2	2	1	1.7	72.19
Cricotopus bicinctus	2	3	0	1.7	75.15
Unniella multivirga	3	1	0	1.3	77.51
Caecidotea communis	2	2	0	1.3	79.88
Ochrotricha	1	3	0	1.3	82.25
Rheocricotopus	0	0	3	1.0	84.02
Ephemerella	2	1	0	1.0	85.80
Crangonyctidae	1	0	2	1.0	87.57
Neureclipsis	2	0	1	1.0	89.35
Polypedilum	2	0	0	0.7	90.53
Rheotanytarsus	1	1	0	0.7	91.72
Thienemanniella	0	2	0	0.7	92.90
Zavrelia	1	0	0	0.3	93.49
Tribelos	1	0	0	0.3	94.08
Tvetenia bavarica	0	1	0	0.3	94.67
.....	.....	95%	.....	.....	.....
Chironomus	0	1	0	0.3	95.27
Corynoneura	0	1	0	0.3	95.86
Paratendipes	0	1	0	0.3	96.45
Microtendipes	0	0	1	0.3	97.04
Simulium	1	0	0	0.3	97.63
Amphinemura	0	1	0	0.3	98.22
Calopteryx	0	1	0	0.3	98.82
Dicranota	0	1	0	0.3	99.41
Dytiscidae	0	0	1	0.3	100.00

TABLE 3-34. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-11, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Conchapelopia	13	9	9	10.3	20.26
Polpedilum fallax	8	12	6	8.7	37.25
Leuctra	4	10	5	6.3	49.67
Tanytarsus	2	8	0	3.3	56.21
Polypedilum	6	3	0	3.0	62.09
Caecidotea communis	3	3	2	2.7	67.32
Orthocladius	5	1	1	2.3	71.90
Rheocricotopus	1	3	2	2.0	75.82
Parametriocnemus	3	1	2	2.0	79.74
Crangonyctidae	1	3	0	1.3	82.35
Ochrotrichia	0	0	4	1.3	84.97
Rheotanytarsus	1	2	0	1.0	86.93
Microtendipes	0	1	2	1.0	88.89
Tanypodinae	0	0	3	1.0	90.85
Unniella multivirga	1	1	0	0.7	92.16
Nanocladius	0	1	1	0.7	93.46
Neureclipsis	0	0	2	0.7	94.77
		95%			
Tribelos	0	1	0	0.3	95.42
Phaenospectra	0	0	1	0.3	96.08
Zavrelimyia	0	0	1	0.3	96.73
Thienemanniella	0	0	1	0.3	97.39
Zavrelia	0	0	1	0.3	98.04
Culicoides	1	0	0	0.3	98.69
Lype diversa	0	0	1	0.3	99.35
Nigronia	0	0	1	0.3	100.00

TABLE 3-35. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-09, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Unniella multivirga	5	10	4	6.3	26.03
Amphinemura	3	2	7	4.0	42.47
Polypedium fallax	3	1	5	3.0	54.79
Conynoneura	1	1	5	2.3	64.38
Thienemanniella	2	2	1	1.7	71.23
Tanytarsus	1	1	3	1.7	78.08
Conchapelopia	0	4	0	1.3	83.56
Tvetenia bavarica	1	0	1	0.7	86.30
Rheocricotopus	0	0	2	0.7	89.04
Leuctra	0	1	1	0.7	91.78
Potthastia longimana	0	0	1	0.3	93.15
Rheotanytarsus	0	0	1	0.3	94.52
		95%			
Eccoptura xanthenes	1	0	0	0.3	95.89
Lepidostoma	0	1	0	0.3	97.26
Sialis	0	0	1	0.3	98.63
Pycnopsyche	0	0	1	0.3	100.00

TABLE 3-36. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-07, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Polypedilum fallax	3	5	3	3.7	22.92
Chironomus	0	5	0	1.7	33.33
Oligochaeta	1	3	0	1.3	41.67
Conchapelopia	2	2	0	1.3	50.00
Corynoneura	2	0	1	1.0	56.25
Tribelos	2	1	0	1.0	62.50
Orthocladius	0	1	2	1.0	68.75
Polypedilum	0	2	0	0.7	72.92
Caecidotea communis	2	0	0	0.7	77.08
Leuctra	1	1	0	0.7	81.25
Potthastia longimana	1	0	0	0.3	83.33
Thienemanniella	0	1	0	0.3	85.42
Psectrocladius	0	1	0	0.3	87.50
Tanytarsus	0	0	1	0.3	89.58
Amphinemura	1	0	0	0.3	91.67
Ephemerella	1	0	0	0.3	93.75
		95%			
Leptophlebiidae	1	0	0	0.3	95.83
Dytiscidae	1	0	0	0.3	97.92
Enchytraeidae	0	0	1	0.3	100.00

TABLE 3-37. ROSE HILL REGIONAL LANDFILL ARTIFICIAL SUBSTRATE AND DENSITIES PER 36 SQUARE INCHES, LOCATION AS-12, MAY 1992

	Rep 1	Rep 2	Rep 3	Average	Cum. %
Polypedilum fallax	2	4	3	3.0	25.00
Orthocladius	1	0	3	1.3	36.11
Chironomus	2	0	1	1.0	44.44
Unniella multivirga	2	0	1	1.0	52.78
Conchapelopia	0	2	1	1.0	61.11
Polypedilum	1	0	1	0.7	66.67
Phaenospectra	1	0	1	0.7	72.22
Rheocricotopus	1	0	1	0.7	77.78
Dytiscidae	1	0	1	0.7	83.33
Tanytarsus	1	0	0	0.3	86.11
Paratendipes	1	0	0	0.3	88.89
Rheotanytarsus	1	0	0	0.3	91.67
Parametriocnemus	0	0	1	0.3	94.44
		95%			
Tropisternus	1	0	0	0.3	97.22
Caecidotea communis	0	1	0	0.3	100.00

TABLE 3-38. RESULTS OF ANOVA AND LSD MULTIPLE COMPARISON TEST ON BENTHIC ORGANISM DENSITIES (132 SQUARE INCHES) IN THE SAUGATUCKET RIVER (UNDERLINED LOCATIONS ARE NOT SIGNIFICANTLY DIFFERENT AT P > 0.05 WITH REGARD TO DENSITIES)

Grab Samples

Total Species Density

Location:	SE-02	SE-05	SE-11	SE-06	SE-04
Mean Density:	161	129	77	60	46

***Conchapelopia* Density**

Location:	SE-05	SE-02	SE-04	SE-06	SE-11
Mean Density:	28	6	6	3	1

Artificial Substrates

Total Species Density

Location:	AS-02	AS-04	AS-05	AS-06	AS-11
Mean Density:	164	153	98	56	51

TABLE 3-38 (Continued). RESULTS OF ANOVA AND LSD MULTIPLE COMPARISON TEST ON BENTHIC ORGANISM DENSITIES (132 SQUARE INCHES) IN THE SAUGATUCKET RIVER (UNDERLINED LOCATIONS ARE NOT SIGNIFICANTLY DIFFERENT AT P > 0.05 WITH REGARD TO DENSITIES)

***Conchapelopia* Density**

Location:	AS-04	AS-02	AS-05	AS-11	AS-6
Mean Density:	54	40	36	10	9

***Leuctra* Density**

Location:	AS-02	AS-04	AS-05	AS-06	AS-11
Mean Density:	59	22	11	6	6

***Tanytasus* Density**

Location:	AS-02	AS-05	AS-04	AS-06	AS-11
Mean Density:	12	12	4	5	3

TABLE 3-39. DISTRIBUTION OF EPHEMOPTERA, PLECOPTERA, AND TRICHOPTERA IN THE SAUGATUCKET RIVER

Location	Ephemoptera		Plecoptera		Trichoptera		Total	
	Mean Density	Mean Percent Occurrence	Mean Density	Mean Percent Occurrence	Mean Density	Mean Percent Occurrence	Mean Density	Mean Percent Occurrence
Grab Samples:								
SE-02	2.7	1.67	0	0	1.9	1.18	4.6	2.85
SE-04	1.2	2.59	0	0	6.6	14.25	7.8	16.84
SE-05	7.3	5.7	0.3	0.23	9.7	7.57	17.3	13.50
SE-06	0	0	0	0	0	0	0	0
SE-11	0	0	0	0	0.9	1.19	0.9	1.19
Artificial Substrates:								
AS-02	3	1.83	64.5	39.2	4.2	2.56	71.70	43.59
AS-04	37.3	24.3	24.5	16.5	3.5	2.28	65.30	43.08
AS-05	1.9	1.93	11.3	11.53	0.6	0.61	13.8	14.07
AS-06	1	1.77	6.6	11.72	2.3	4.08	9.9	17.57
AS-11	0	0	6.3	12.35	2.3	4.50	8.6	16.85

TABLE 3-40. SUMMARY OF ECOLOGICAL COMMUNITY INDICES

Location	Mean Density/ 36 sq. in.	Number of Taxa	Shannon-Wiener Diversity	Simpson's Dominance	Evenness
Saugatucket River					
SE-02	161	38	2.32	0.16	0.75
SE-04	46.3	34	2.76	0.08	0.85
SE-05	128.7	40	2.37	0.14	0.76
SE-06	60	24	2.00	0.20	0.78
SE-11	75.7	28	2.26	0.15	0.82
AS-02	163.7	25	1.97	0.24	0.66
AS-04	153.3	29	2.04	0.22	0.66
AS-05	98	20	1.88	0.21	0.78
AS-06	56.3	29	2.25	0.16	0.83
AS-11	51	25	2.38	0.12	0.87
Mitchell Brook					
SE-09	22.7	20	0.16	0.88	0.86
SE-07	15.7	13	1.57	1.27	0.85
SE-12	2	5	0.60	0.61	--
AS-09	24.3	16	1.98	0.18	0.87
AS-07	15	19	1.99	0.17	0.93
AS-12	12	15	1.85	0.22	0.93

TABLE 3-41. DISTRIBUTION OF EPHEMOPTERA, PLECOPTERA AND TRICHOPTERA IN MITCHELL BROOK

Location	Ephemoptera		Plecoptera		Trichoptera		Total	
	Mean Density	Mean Percent Occurrence	Mean Density	Mean Percent Occurrence	Mean Density	Mean Percent Occurrence	Mean Density	Mean Percent Occurrence
Grab Samples:								
SE-09	1.0	4.4	0	0	0	0	1	4.4
SE-07	0	0	0.3	1.91	0.3	1.91	0.6	3.82
SE-12	0	0	0	0	0	0	0	0
Artificial Substrates:								
AS-09	0	0	5	20.5	0.6	2.46	5.6	22.96
AS-07	0.3	1.87	1.0	6.25	0	0	1.3	8.12
AS-12	0	0	0	0	0	0	0	0

TABLE 3-42. RESULTS OF ANOVA AND LSD MULTIPLE COMPARISON TESTS ON BENTHIC ORGANISM DENSITIES (132 SQUARE INCHES) IN MITCHELL BROOK (UNDERLINED LOCATIONS ARE NOT SIGNIFICANTLY DIFFERENT AT P > 0.05 WITH REGARD TO DENSITIES)

Grab Samples

	Total Species Density		
Location:	SE-09	SE-07	SE-12
Mean Density:	23	16	2

Artificial Substrates

	Total Species Density		
Location:	SE-09	SE-07	SE-12
Mean Density:	24	15	12

	Polypedilum Fallax Density		
Location:	SE-07	SE-09	SE-12
Mean Density:	4	3	3

	Conchapelopia Density		
Location:	SE-09	SE-07	SE-12
Mean Density:	2	1	1

TABLE 4-1. SEWAGE SLUDGE CONCENTRATION STATISTICS FROM THE 1988 NATIONAL SURVEY AND THE 1980 40 CITY SURVEY

Analyte	NSSS (1)		40 City Survey	
	Mean	Standard Deviation	Mean	Standard Deviation
METALS	mg/kg	mg/kg	mg/kg	mg/kg
Arsenic	9.9	18.8	6.7	6.59
Berylium	0.37	0.34	1.63	2.1
Cadmium	6.94	11.86	69.0	252
Chromium	119	339	429	441
Copper	741	961	892	524
Lead	134	198	369	332
Mercury	5.22	15.5	2.8	2.6
Molybdenum	9.24	16.6	17.7	16.7
Nickel	42.7	94.8	135	169
Selenium	5.16	7.34	7.3	29.1
Zinc	1,200	1,550	1,590	1,760
ORGANICS **	µg/kg	µg/kg	µg/kg	µg/kg
Benzene	*	*	1,782	4,273
Benzo(a)pyrene	*	*	138	472
Bis(2-ethylhexyl)-phthalate	74,721	598,376	155,585	157,443
Trichloroethene	*	*	8,139	30,685

SOURCE: Federal Register, 1990.

NOTES: (1) - NSSS--National Sewage Sludge Survey

* - Indicates that there were not enough detected results to determine a mean or a standard deviation.

** - Only those analytes that were detcted greater then 20% of the time are listed.

TABLE 4-2. ORGANIC SOLVENTS TYPICALLY FOUND IN HOUSEHOLD CLEANING PRODUCTS

SOLVENTS	PRODUCTS
1,2-Dichlorobenzene	Drain degreaser
1,4-Dichlorobenzene	Drain degreaser
	Toliet bowl deodorizer
1,1,1-Trichloroethane	Septic tank drain field cleaner
	Drain opener
	Oven cleaner (aerosol)
	Cleaning fluid
	Furniture polish
Trichloroethene	Cleaning fluid
Tetrachloroethene	Laundry degreaser
	Home and auto parts cleaner
Aliphatic/Aromatic	Septic tank drain field cleaner
	Laundry degreaser
	Cleaning fluid
	Engine degreaser
	Car wash
Petroleum distillates	Septic tank drain field cleaner
	Drain opener
	Oil and grease dissolver
	Garage degreaser
	Cleaning fluid
	Engine degreaser
	Spray cleaner
	Floor cleaner
	Furniture polish
	Spot remover
Methylene chloride	Oven cleaner
	Graffiti remover
	Brush cleaner
Harmful organics	Floor stripper and cleaner
Chlorinated solvents	Laundry degreaser

TABLE 4-3. CONCENTRATIONS OF ORGANICS AND INORGANICS DETECTED IN LEACHATE FROM MUNICIPAL WASTE LANDFILLS

Organics	USEPA, 1987 Concentration Range (μg/L)	USEPA, 1988 Concentration Range (μg/L)
Acetone	140 - 11,000	8,000 - 4,600,000
Benzene	2 - 6,080	NDA
Bromoethane	10 - 170	NDA
Carbon tetrachloride	2 - 398	NDA
Chlorobenzene	2 - 237	NDA
Chloroethane	5 - 860	NDA
Bis(2-chloroethoxy)methane	2 - 25	NDA
Chloroform	2 - 1,300	NDA
Chloromethane	10 - 170	400,000
Delta BHC	0 - 5	NDA
Dibromoethane	5 - 25	NDA
1,4-Dichloroebenzene	2 - 37	NDA
Dichlorodifluoromethane	10 - 450	NDA
1,1-Dichloroethane	2 - 6,300	4,000
1,2-Dichloroethane	0 - 11,000	NDA
cis-1,2-Dichloroethene	4 - 190	NDA
trans-1,2-Dichloroethene	4 - 2,760	6,000 - 677,000
Dichloromethane	2 - 3,300	6,000 - 690,000
1,2-Dichloropropane	2 - 100	NDA
Diethylphthalate	2 - 330	32,000
Dimethylphthalate	4 - 55	NDA
Di-n-butylphthalate	4 - 150	NDA
Endrin	0 - 1	NDA
Ethylbenzene	5 - 4,900	NDA
Bis(2-ethylhexyl) phthalate	6 - 150	NDA
Isophorene	10 - 16,000	25,000
Methylethyl ketone	110 - 28,000	1,300,000 - 12,000,000
Methyl isobutyl ketone	10 - 660	NDA
Naphthalene	4 - 68	NDA
Nitrobenzene	2 - 120	NDA
4-Nitrophenol	17 - 40	NDA
Pentachlorophenol	3 - 470	NDA
Phenol	10 - 28,800	378,000 - 2,100,000
2-Propanol	94 - 10,000	NDA
1,1,2,2-Tetrachloroethane	7 - 210	NDA
Tetrachloroethene	2 - 620	NDA
Toluene	2 - 3,200	83,000 - 11,000,000
Toxaphene	0 - 5	NDA
1,1,1-Trichloroethane	0 - 2,400	NDA
1,1,2-Trichloroethane	2 - 500	NDA
Trichloroethene	1 - 1,120	NDA

TABLE 4-3 (Continued). CONCENTRATIONS OF ORGANICS AND INORGANICS DETECTED IN LEACHATE FROM MUNICIPAL WASTE LANDFILLS

Organics	USEPA, 1987 Concentration Range (μg/L)	USEPA, 1988 Concentration Range (μg/L)
Trichlorofluoromethane	4 - 100	NDA
Vinyl chloride	0 - 110	NDA
m-Xylene	21 - 79	NDA
p-Xylene and *o*-Xylene	12 - 50	NDA
4',4'-DDT	NDA	42 - 220
2 Hexanone	NDA	39,000 - 690,000
Inorganics	**USEPA, 1988 Concentration Range (mg/L)**	**Lee and Jones, 1989 Concentration Range (mg/L)**
Aluminum	2.2 - 3.4	NDA
Arsenic	0.003 - 0.04	NDA
Barium	0.08 - 1.7	NDA
Cadmium	0.003 - 0.02	0.03 - 17
Calcium	657 - 1,060	60 - 7,200
Chromium	0.006 - 0.37	0.02 - 18
Copper	0.02 - 0.07	0.005 - 9.9
Iron	2.6 - 695	4.0 - 2,820
Lead	0.007 - 0.15	0.001 - 2.0
Manganese	1.0 - 50	NDA
Magnesium	275 - 424	17 - 15,600
Nickel	0.05 - 1.6	0.02 - 79
Potassium	363 - 471.8	NDA
Selenium	0.002 - 0.002	NDA
Silver	0.026 - 0.037	NDA
Sodium	69 - 2,574	0 - 7,700
Vanadium	0.016 - 0.024	NDA
Zinc	0.06 - 6.4	0.06 - 370
Ammonia	0.39 - 810	0 - 1,966
BOD	13 - 5,890	4 - 57,700
TOC	20 - 14,500	0 - 28,500
pH (no units)	6.17 - 8.39	3.7 - 8.8
Specific Conductivity (μmhos/cm)	1,750 - 28,125	1,400 - 17,100

NOTES: NDA - No data available.

TABLE 4-4. LOCATION GROUPINGS USED IN NATURE AND EXTENT, ROSE HILL REGIONAL LANDFILL SITE

SURFACE SOIL				
Background	Sewage Sludge Area	Bulky Waste Area	Solid Waste Area	Non-Disposal Area
SS-01	SS-11	SS-09	SS-03	SS-06 (south of transfer station road
SS-02	SS-12	SS-10	SS-04	SS-07 (residential)
SS-14	SS-15	SS-24	SS-05	SS-08 (residential)
			SS-13	SS-18 (adjacent to Mitchell Brook)
			SS-16	SS-19 (near Mitchell Brook)
			SS-17	SS-20 (near Mitchell Brook)
				SS-21 (near Mitchell Brook)
				SS-22 (near Saugatucket River)
				SS-23 (near Saugatucket River)

SUBSURFACE SOIL			
Background	Sewage Sludge Area	Bulky Waste Area	Solid Waste Area
BH-05	BH-01	BH-06	BH-O7 [MW-14-01]
	BH-02		
	BH-03		
	BH-04		

GROUNDWATER - MONITORING WELLS			
Background	Shallow Overburden	Deep Overburden	Bedrock
MW-01-01	MW-I	OW-25	MW-03-03
(shallow overburden)	MW-II	OW-27	MW-04-03
MW-01-02	MW-III	OW-30	MW-07-02
(bedrock)	MW-IV	MW-02-02	MW-08-02
	MW-V	MW-03-02	MW-11-03
	MW-02-01	MW-04-02	
	MW-03-01	MW-05-02	
	MW-04-01	MW-06-02	
	MW-05-01	MW-07-01	
	MW-06-01	MW-08-01	
	MW-11-01	MW-09-01	
	MW-12-01	MW-10-01	
	MW-13-01	MW-11-02	
		MW-12-02	
		MW-13-02	
		MW-14-01	

TABLE 4-4 (Continued). LOCATION GROUPINGS USED IN NATURE AND EXTENT, ROSE HILL REGIONAL LANDFILL SITE

RESIDENTIAL WELLS			
RES #1 - RES #10			
LEACHATE			
	Saugatucket River	Mitchell Brook	
	LE-02	LE-01	
	LE-03		
	LE-04		
	LE-05		
	LE-06		
SURFACE WATER			
Saugatucket River	Mitchell Brook	unnamed brook	unnamed tributary
SW-02	SW-07	SW-10	SW-01
SW-03	SW-09		
SW-04	SW-12		
SW-05	SW-13		
SW-06	SW-14		
SW-08	SW-15		
SW-11	SW-16		
SW-17			
SW-18			
SEDIMENT			
Saugatucket River	Mitchell Brook	unnamed brook	unnamed tributary
SD-02	SD-07	SD-10	SD-01
SD-03	SD-09		
SD-04	SD-12		
SD-05	SD-13		
SD-06	SD-14		
SD-08	SD-15		
SD-11	SD-16		
SD-17			
SD-18			

TABLE 4-5. BACKGROUND METAL CONCENTRATIONS IN SURFICIAL SOILS IN THE EASTERN U.S., AND RHODE ISLAND

	EASTERN UNITED STATES (1)		RHODE ISLAND (2)
	ARITHMETIC AVERAGE (mg/kg)	RANGE (mg/kg)	(mg/kg)
Aluminum	5.7	700 to > 10,000	>100,000
Iron	25,000	100 to > 100,000	30,000
Calcium	6,300	100 to 280,000	11,000
Magnesium	4,600	50 to > 50,000	7,000
Potassium	15,000	50 to 37,000	15,000
Sodium	7,800	< 500 to 50,000	15,000
Barium	420	10 to 1,500	500
Beryllium	0.85	< 1 to 7	ND
Antimony	0.76	< 1 to 8.8	—
Arsenic	7.4	0.1 to 73	3.5
Cadmium	—	—	—
Chromium	52	1 to 1,000	50
Cobalt	9.2	< 0.3 to 70	10
Copper	22	< 1 to 700	15
Lead	17	< 10 to 300	15
Manganese	640	< 2 to 7,000	500
Mercury	0.12	0.01 to 3.4	0.24
Nickel	18	< 5 to 700	15
Selenium	0.45	< 0.1 to 3.9	0.9
Silver	—	—	—
Thallium	8.6	2.2 to 23	—
Vanadium	66	< 7 to 300	70
Zinc	52	< 5 to 2,900	300,000

NOTES:

— - No data available

1. Shacklette and Boerngen, 1984
2. Boerngen and Shacklette, 1981; data present for one sample

TABLE 4-6. SUMMARY OF CHEMICALS DETECTED IN SURFACE SOIL, SEPTEMBER/OCTOBER 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	RANGE OF DETECTION LIMITS MAXIMUM	BACKGROUND RANGE OF CONCENTRATIONS (3) MINIMUM	BACKGROUND RANGE OF CONCENTRATIONS (3) MAXIMUM	SEWAGE SLUDGE FREQUENCY OF DETECTION (2)	SEWAGE SLUDGE ARITHMETIC AVERAGE	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (3) MINIMUM	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (3) MAXIMUM	SEWAGE SLUDGE MAXIMUM LOCATION	BULKY WASTE FREQUENCY OF DETECTION (2)	BULKY WASTE ARITHMETIC AVERAGE	BULKY WASTE RANGE OF CONCENTRATIONS (3) MINIMUM	BULKY WASTE RANGE OF CONCENTRATIONS (3) MAXIMUM	BULKY WASTE MAXIMUM LOCATION	SOLID WASTE FREQUENCY OF DETECTION (2)	SOLID WASTE ARITHMETIC AVERAGE	SOLID WASTE RANGE OF CONCENTRATIONS (3) MINIMUM	SOLID WASTE RANGE OF CONCENTRATIONS (3) MAXIMUM	SOLID WASTE MAXIMUM LOCATION	NON-DISPOSAL AREA FREQUENCY OF DETECTION (2)	NON-DISPOSAL AREA ARITHMETIC AVERAGE	NON-DISPOSAL AREA RANGE OF CONCENTRATIONS (3) MINIMUM	NON-DISPOSAL AREA RANGE OF CONCENTRATIONS (3) MAXIMUM	NON-DISPOSAL AREA MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	AREA OF OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/kg)																										
Benzene	11	17	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	6.0	6 J	6 J	SS-13	0 / 3	--	--	--	--	SS-03	Solid Waste
Toluene	11	17	--	--	0 / 2	--	--	--	--	1 / 2	4.5 *	3 J		SS-09	3 / 4	65	58	110 J	SS-13	0 / 3	--	--	--	--	SS-13	Solid Waste
Ethylbenzene	11	17	--	--	0 / 2	--	--	--	--	1 / 2	4.0 *	2 J		SS-09	3 / 4	14	11 J	21 J	SS-13	0 / 3	--	--	--	--	SS-13	Solid Waste
Total Xylenes	11	17	--	--	0 / 2	--	--	--	--	1 / 2	8.0	10 J		SS-09	3 / 4	39	20	84 J	SS-13	0 / 3	--	--	--	--	SS-13	Solid Waste
Acetone	11	17	7 J		2 / 2	18	14	23	SS-11	2 / 2	12,000	37 J	23,700 J	SS-09	2 / 4	45,000	75	160,000 J	SS-04	3 / 3	21	15 J	32 J	SS-06	SS-04	Solid Waste
2-Butanone	11	17	--	--	1 / 2	5.0 *	4 J		SS-12	1 / 2	360	717 J		SS-09	3 / 4	230	24 J	830 J	SS-04	1 / 3	9.0	15 J		SS-07	SS-04	Solid Waste
4-Methyl-2-pentanone	11	17	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	5.9 *	3 J		SS-04	0 / 3	--	--	--	--	SS-04	Solid Waste
2-Hexanone	11	17	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	6.6 *	6 J		SS-04	0 / 3	--	--	--	--	SS-04	Solid Waste
Tetrachloroethene	11	17	--	--	1 / 2	3.8 *	2 J		SS-11	2 / 2	8.0	3 J	13 J	SS-09	3 / 4	4.1	2 J	5 J	SS-04	1 / 3	5.5 *	4 J		SS-08	SS-09	Bulky Waste
Trichloroethene	11	17	--	--	0 / 2	--	--	--	--	1 / 2	4.0 *	2 J		SS-09	0 / 4	--	--	--	--	0 / 3	--	--	--	--	SS-09	Bulky Waste
1,1,1-Trichloroethane	11	17	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	7.1	8 J		SS-03	0 / 3	--	--	--	--	SS-03	Solid Waste
1,1-Dichloroethene	11	17	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	5.6 *	4 J		SS-13	0 / 3	--	--	--	--	SS-13	Solid Waste
1,2-Dichloroethene(total)	11	17	--	--	0 / 2	--	--	--	--	1 / 2	7.0	8 J		SS-09	2 / 4	850	970 J	2,400 J	SS-13	1 / 3	14	31 J		SS-07	SS-13	Solid Waste
1,1-Dichloroethane	11	17	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	11	25		SS-03	1 / 3	4.7 *	2 J		SS-07	SS-03	Solid Waste
Chloroform	11	17	--	--	0 / 2	--	--	--	--	1 / 2	4.0 *	2 J		SS-09	2 / 4	5.0 *	2 J	3 J	SS-03	1 / 3	5.2 *	2 J		SS-06	SS-03	Solid Waste
Vinyl Chloride	11	17	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	66	4 J	250	SS-13	0 / 3	--	--	--	--	SS-13	Solid Waste
SEMIVOLATILE ORGANICS (µg/kg)																										
Phenanthrene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	160 *	55 J	110 J	SS-05	1 / 3	150 *	65 J		SS-07	SS-05	Solid Waste
Fluoranthene	350	550	25 J		0 / 2	--	--	--	--	0 / 2	--	--	--	--	3 / 4	120	33 J	160 J	SS-05	1 / 3	150 *	73 J		SS-07	SS-05	Solid Waste
Pyrene	350	550	29 J		1 / 2	100 *	26 J		SS-11	0 / 2	--	--	--	--	3 / 4	120	38 J	170 J	SS-05	2 / 3	100	23 J	115 J	SS-07	SS-05	Solid Waste
Benzo(a)anthracene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	150 *	37 J	78 J	SS-05	1 / 3	140 *	46 J		SS-07	SS-05	Solid Waste
Chrysene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	150 *	33 J	95 J	SS-05	1 / 3	140 *	53 J		SS-07	SS-05	Solid Waste
Benzo(b)fluoranthene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	150 *	39 J	76 J	SS-05	1 / 3	140 *	55 J		SS-07	SS-05	Solid Waste
Benzo(k)fluoranthene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	140 *	28 J	64 J	SS-05	1 / 3	140 *	47 J		SS-07	SS-05	Solid Waste
Benzo(a)pyrene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	150 *	31 J	68 J	SS-05	1 / 3	140 *	36 J		SS-07	SS-05	Solid Waste
Benzo(g,h,i)perylene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	140 *	23 J	57 J	SS-05	1 / 3	140 *	32 J		SS-07	SS-05	Solid Waste
Indeno(1,2,3-cd)pyrene	350	550	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	2 / 4	140 *	23 J	52 J	SS-05	1 / 3	140 *	34 J		SS-07	SS-05	Solid Waste
4-Chloroaniline	350	550	--	--	1 / 2	340	490		SS-11	0 / 2	--	--	--	--	0 / 4	--	--	--	--	0 / 3	--	--	--	--	SS-11	Sewage Sludge
Diethylphthalate	350	550	31 J		1 / 2	114 *	29 J		SS-12	0 / 2	--	--	--	--	1 / 4	160 *	29 J		SS-13	0 / 3	--	--	--	--	SS-13	Solid Waste (4)
Butylbenzylphthalate	350	550	41 J		0 / 2	--	--	--	--	1 / 2	160 *	120 J		SS-10	1 / 4	180 *	41 J		SS-03	0 / 3	--	--	--	--	SS-10	Bulky Waste
PESTICIDES (µg/kg)																										
4,4'-DDE	3.5	20	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	3.4	7.6		SS-13	1 / 3	4.2	8.8		SS-07	SS-07	Non-Disposal
4,4'-DDD	3.5	20	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	2.8	5.2 J		SS-13	0 / 3	--	--	--	--	SS-13	Solid Waste
4,4'-DDT	3.4	20	1.2 J		0 / 2	--	--	--	--	0 / 2	--	--	--	--	1 / 4	2.8	4.7 J		SS-04	1 / 3	3.0	5.2 J		SS-07	SS-07	Non-Disposal
Aldrin	1.8	10	0.6 J		0 / 2	--	--	--	--	0 / 2	--	--	--	--	0 / 4	--	--	--	--	0 / 3	--	--	--	--	SS-01	Background
Dieldrin	3.5	20	--	--	1 / 2	3.2	4.5 J		SS-11	0 / 2	--	--	--	--	0 / 4	--	--	--	--	0 / 3	--	--	--	--	SS-11	Sewage Sludge
alpha-Chlordane	1.8	10	--	--	1 / 2	2.3	3.7 J		SS-11	0 / 2	--	--	--	--	0 / 4	--	--	--	--	0 / 3	--	--	--	--	SS-11	Sewage Sludge
PCBs																										
None Detected																										
METALS (mg/kg)																										
Aluminum	2.7	3.8	12,200	16,600	2 / 2	4,900	3,450	6,360	SS-11	2 / 2	8,800	8,630	8,940	SS-09	4 / 4	9,400	7,650	11,000	SS-03	3 / 3	8,700	1,740	13,000	SS-07	SS-07	Non-Disposal (4)
Iron	1.2	1.7	12,300	18,100	2 / 2	8,800	7,190	10,400	SS-11	2 / 2	11,000	10,600	11,650	SS-09	4 / 4	11,000	9,970	12,100	SS-03	3 / 3	11,000	4,090	14,700	SS-07	SS-07	Non-Disposal (4)
Calcium	4.1	5.8	645	712	2 / 2	470	263	680	SS-11	2 / 2	640	588	685	SS-10	4 / 4	670	534	781	SS-05	3 / 3	620	196	952	SS-08	SS-08	Non-Disposal
Magnesium	5.3	7.6	1,110	1,220	2 / 2	940	773	1,100	SS-11	2 / 2	1,100	946	1,270	SS-10	4 / 4	1,700	1,310	1,990	SS-13	3 / 3	1,000	381	1,710	SS-08	SS-13	Solid Waste
Potassium	90.1	128.9	673	909	2 / 2	750	653	847	SS-11	2 / 2	670	566	766	SS-10	3 / 4	680	612	944	SS-13	3 / 3	560	308	717	SS-08	SS-13	Solid Waste
Antimony	5.1	7.3	--	--	1 / 2	41	78.8 J		SS-11	0 / 2	--	--	--	--	0 / 4	--	--	--	--	0 / 3	--	--	--	--	SS-11	Sewage Sludge
Arsenic	0.2	0.3	2.1 J	2.8	2 / 2	0.69	0.52 J	0.86 J	SS-11	2 / 2	1.2	1.05	1.3 J	SS-10	4 / 4	1.3	0.81	1.6 J	SS-13	2 / 3	2.2	3.1 J	3.4 J	SS-07	SS-07	Non-Disposal
Barium	0.2	0.3	15.4	37.8	2 / 2	34	8.5	58.9	SS-11	2 / 2	16	16.4	16.5	SS-10	4 / 4	18	17.0	20.3	SS-13	3 / 3	13	5.2	16.9	SS-08	SS-11	Sewage Sludge
Cadmium	0.6	0.9	--	--	0 / 2	--	--	--	--	0 / 2	--	--	--	--	0 / 4	--	--	--	--	1 / 3	0.44	0.62 J		SS-07	SS-07	Non-Disposal
Chromium	1.6	2.3	11.2	17.5	2 / 2	7.6	5.3 J	9.8	SS-11	2 / 2	8.7	7.7	9.8	SS-10	4 / 4	11	9.7	12.8	SS-13	3 / 3	10	3.2	13.9	SS-07	SS-07	Non-Disposal (4)
Cobalt	1.2	1.7	3.0	3.6	2 / 2	3.3	3.0	3.6	SS-11	2 / 2	4.0	3.3	4.8	SS-10	4 / 4	4.6	4.0	5.7	SS-13	2 / 3	3.6	3.8	6.2	SS-08	SS-08	Non-Disposal
Copper	0.8	1.2	3.5	5.3	1 / 2	51	99.3		SS-11	0 / 2	--	--	--	--	4 / 4	69	5.4	253	SS-03	1 / 3	9.4 *	6.3		SS-07	SS-03	Solid Waste
Lead	0.2	0.3	14.3 J	30.1	2 / 2	7.2	2.6 J	11.8 J	SS-11	2 / 2	5.6	5.6 J	5.6 J	SS-10	4 / 4	9.3	7.3 J	11.5 J	SS-13	3 / 3	14	3.1	27.4 J	SS-07	SS-07	Non-Disposal (4)
Manganese	0.4	0.6	104	267	2 / 2	120	96.4	135	SS-12	2 / 2	130	108	154	SS-09	4 / 4	110	92.1	131	SS-04	3 / 3	120	86.6	167	SS-08	SS-08	Non-Disposal (4)
Mercury	0.1	0.13	--	--	1 / 2	0.16	0.28		SS-11	0 / 2	--	--	--	--	0 / 4	--	--	--	--	0 / 3	--	--	--	--	SS-11	Sewage Sludge
Nickel	3.3	4.7	4.1	5.5	2 / 2	4.6	3.9	5.4	SS-11	2 / 2	5.0	3.3 J	6.6	SS-10	4 / 4	8.0	5.2	10.3	SS-03	1 / 3	4.8	10.6		SS-08	SS-08	Non-Disposal
Silver	0.6	0.9	--	--	1 / 2	0.95	1.6		SS-11	0 / 2	--	--	--	--	2 / 4	0.58	0.73	0.87	SS-13	0 / 3	--	--	--	--	SS-11	Sewage Sludge
Thallium	0.2	0.3	--	--	1 / 2	0.18	0.25 J		SS-12	0 / 2	--	--	--	--	1 / 4	0.18	0.3		SS-03	0 / 3	--	--	--	--	SS-03	Solid Waste
Vanadium	0.6	0.9	21.0	25.7	1 / 2	7.7	12.0		SS-11	2 / 2	14	13.2	15.0	SS-10	4 / 4	18	13.7	22.9	SS-13	3 / 3	17	3.2	27.2	SS-07	SS-07	Non-Disposal
Zinc	1.2	1.7	22.3	30.1	2 / 2	38	19.9	56.5	SS-11	2 / 2	29	22.7	36.0	SS-09	4 / 4	36	24.4	40.5	SS-03	3 / 3	30	20.8	37.4	SS-08	SS-11	Sewage Sludge

TABLE 4-6 (Continued). SUMMARY OF CHEMICALS DETECTED IN SURFACE SOIL, SEPTEMBER/OCTOBER 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	RANGE OF DETECTION LIMITS MAXIMUM	BACKGROUND RANGE OF CONCENTRATIONS (3) MINIMUM	BACKGROUND RANGE OF CONCENTRATIONS (3) MAXIMUM	SEWAGE SLUDGE FREQUENCY OF DETECTION (2)	SEWAGE SLUDGE ARITHMETIC AVERAGE	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (3) MINIMUM	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (3) MAXIMUM	SEWAGE SLUDGE MAXIMUM LOCATION	BULKY WASTE FREQUENCY OF DETECTION (2)	BULKY WASTE ARITHMETIC AVERAGE	BULKY WASTE RANGE OF CONCENTRATIONS (3) MINIMUM	BULKY WASTE RANGE OF CONCENTRATIONS (3) MAXIMUM	BULKY WASTE MAXIMUM LOCATION	SOLID WASTE FREQUENCY OF DETECTION (2)	SOLID WASTE ARITHMETIC AVERAGE	SOLID WASTE RANGE OF CONCENTRATIONS (3) MINIMUM	SOLID WASTE RANGE OF CONCENTRATIONS (3) MAXIMUM	SOLID WASTE MAXIMUM LOCATION	NON-DISPOSAL AREA FREQUENCY OF DETECTION (2)	NON-DISPOSAL AREA ARITHMETIC AVERAGE	NON-DISPOSAL AREA RANGE OF CONCENTRATIONS (3) MINIMUM	NON-DISPOSAL AREA RANGE OF CONCENTRATIONS (3) MAXIMUM	NON-DISPOSAL AREA MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	AREA OF OVERALL MAX. LOC.
SOIL QUALITY PARAMETERS																										
Cyanide - Not Detected																										
TOTAL COMBUSTIBLE ORGANICS (%)																										
Organic Content	NA		6.8	7.5	2 / 2	1.8	0.9	2.8	SS-11	2 / 2	2.4	1.9	2.9	SS-10	4 / 4	5.2	2.3	9.4	SS-13	3 / 3	6.5	3.2	12.6	SS-07	SS-07	Non-Disposal
Solids Content	NA		71.7	78.5	2 / 2	88	84.2	91.2	SS-12	2 / 2	86	84.6	88.0	SS-09	4 / 4	77	63.8	85.3	SS-05	3 / 3	77	71.4	80.9	SS-06	SS-12	Sewage Sludge
Moisture Content	NA		21.5	28.3	2 / 2	12	8.8	15.7	SS-11	2 / 2	14	12.0	15.4	SS-10	4 / 4	23	14.7	36.1	SS-13	3 / 3	23	19.1	28.6	SS-07	SS-13	Solid Waste

NOTES:

1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits.
   Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included.
   A single concentration is presented when only one positive detection occurred.
4. The actual highest concentration for this chemical was detected in a background sample.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-7. SUMMARY OF CHEMICALS DETECTED IN SURFACE SOIL, APRIL 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	RANGE OF DETECTION LIMITS MAXIMUM	BACKGROUND CONCEN-TRATIONS	SEWAGE SLUDGE FREQUENCY OF DETECTION (2)	SEWAGE SLUDGE CONCEN-TRATIONS	SEWAGE SLUDGE LOCATION	BULKY WASTE FREQUENCY OF DETECTION (2)	BULKY WASTE CONCEN-TRATIONS	BULKY WASTE LOCATION	SOLID WASTE FREQUENCY OF DETECTION (2)	SOLID WASTE ARITHMETIC AVERAGE	SOLID WASTE RANGE OF CONCENTRATIONS (3) MINIMUM	SOLID WASTE RANGE OF CONCENTRATIONS (3) MAXIMUM	SOLID WASTE MAXIMUM LOCATION	NON-DISPOSAL AREA FREQUENCY OF DETECTION (2)	NON-DISPOSAL AREA ARITHMETIC AVERAGE	NON-DISPOSAL AREA RANGE OF CONCENTRATIONS (3) MINIMUM	NON-DISPOSAL AREA RANGE OF CONCENTRATIONS (3) MAXIMUM	NON-DISPOSAL AREA MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	AREA OF OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/kg)																					
Toluene	11	32	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	2 / 6	6.6	2 J	9 J	SS-23	SS-23	Non-Disposal
Ethylbenzene	11	32	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	8.9	9 J		SS-22	SS-22	Non-Disposal
Total Xylenes	11	32	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	9.3	11.5 J		SS-22	SS-22	Non-Disposal
Acetone	11	32	480	0 / 1	--	--	0 / 1	--	--	1 / 2	2,000	4,000		SS-16	1 / 6	34	98.5 J		SS-22	SS-16	Solid Waste
2-Butanone	11	32	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	11	19.5 J		SS-22	SS-22	Non-Disposal
SEMIVOLATILE ORGANICS (µg/kg)																					
Naphthalene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	250 *	34.5 J		SS-22	SS-22	Non-Disposal
Phenanthrene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	110 *	31 J		SS-17	1 / 6	200 *	59 J		SS-23	SS-23	Non-Disposal
Fluoranthene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	120 *	60 J		SS-17	1 / 6	200 *	64 J		SS-23	SS-23	Non-Disposal
Pyrene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	110 *	40 J		SS-17	1 / 6	210 *	120 J		SS-23	SS-23	Non-Disposal
Benzo(a)anthracene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	100 *	22 J		SS-17	0 / 6	--	--	--	--	SS-17	Solid Waste
Chrysene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	100 *	21 J		SS-17	1 / 6	200 *	55 J		SS-23	SS-23	Non-Disposal
Benzo(b)fluoranthene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	110 *	26 J		SS-17	1 / 6	200 *	57 J		SS-23	SS-23	Non-Disposal
Benzo(k)fluoranthene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	100 *	24 J		SS-17	0 / 6	--	--	--	--	SS-17	Solid Waste
Benzo(a)pyrene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	100 *	23 J		SS-17	0 / 6	--	--	--	--	SS-17	Solid Waste
Benzo(g,h,i)perylene	350	1,100	--	0 / 1	--	--	0 / 1	--	--	1 / 2	100 *	19 J		SS-17	0 / 6	--	--	--	--	SS-17	Solid Waste
Diethylphthalate	350	1,100	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	2 / 6	220 *	27 J	45.5 J	SS-22	SS-22	Non-Disposal
PESTICIDES (µg/kg)																					
4,4'-DDE	3.5	11	0.99 J	0 / 1	--	--	0 / 1	--	--	1 / 2	1.1 *	0.33 J		SS-17	3 / 6	3.3	0.38 J	11 J	SS-23	SS-23	Non-Disposal
4,4'-DDD	3.5	11	--	0 / 1	--	--	0 / 1	--	--	1 / 2	1.0 *	0.24 J		SS-16	0 / 6	--	--	--	--	SS-16	Solid Waste
4,4'-DDT	3.5	11	1.0 J	0 / 1	--	--	0 / 1	--	--	1 / 2	1.4 *	0.90 J		SS-17	3 / 6	2.1	0.38 J	3.4 J	SS-23	SS-23	Non-Disposal
Endrin Ketone	3.5	11	0.46 J	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	2.8 *	2.3 J		SS-18	SS-18	Non-Disposal
PCBs																					
None Detected																					
METALS (mg/kg)																					
Aluminum	4.50	13.90	10,700	1 / 1	6,740	SS-15	1 / 1	6,500	SS-24	2 / 2	5,100	4,590	5,650	SS-16	6 / 6	6,400	2,520	14,400	SS-18	SS-18	Non-Disposal
Iron	4.70	14.50	12,700	1 / 1	9,240	SS-15	1 / 1	9,240	SS-24	2 / 2	9,400	6,840	12,000	SS-16	6 / 6	40,000	6,020	149,000	SS-23	SS-23	Non-Disposal
Calcium	7.00	21.40	213	1 / 1	470	SS-15	1 / 1	442	SS-24	2 / 2	390	309	476	SS-17	6 / 6	600	146	1,870	SS-23	SS-23	Non-Disposal
Magnesium	4.50	13.90	1,360	1 / 1	1,300	SS-15	1 / 1	1,150	SS-24	2 / 2	1,000	1,030	1,060	SS-16	6 / 6	490	185	732	SS-18	SS-15	Sewage Sludge (4)
Potassium	16.90	51.70	443	1 / 1	518	SS-15	1 / 1	504	SS-24	2 / 2	700	630	766	SS-17	6 / 6	250	106	472	SS-21	SS-17	Solid Waste
Arsenic	0.42	1.30	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	1.5	3.5		SS-18	SS-18	Non-Disposal
Barium	0.21	0.63	11	1 / 1	15.8	SS-15	1 / 1	14.4	SS-24	2 / 2	16	15.5	16.9	SS-16	6 / 6	31	9.2	86.2 J	SS-23	SS-23	Non-Disposal
Beryllium	0.21	0.63	0.39	1 / 1	0.4	SS-15	1 / 1	0.52	SS-24	2 / 2	0.78	0.46	1.1	SS-16	6 / 6	0.57	0.37	0.88	SS-22	SS-16	Solid Waste
Chromium	0.62	1.90	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	4.5	12.1 J		SS-18	SS-18	Non-Disposal
Cobalt	0.62	1.90	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	2 / 6	4.2	7.1	12.8	SS-23	SS-23	Non-Disposal
Copper	0.44	0.66	4.3	1 / 1	9.9	SS-15	1 / 1	5.6	SS-24	2 / 2	6.6	5.5	7.6	SS-16	2 / 4	2.8	2.8 J	5.4	SS-19	SS-15	Sewage Sludge
Lead	0.21	6.40	11.1	1 / 1	4.4	SS-15	1 / 1	4.3	SS-24	2 / 2	4.0	3.9	4.1	SS-16	6 / 6	33	4.4	124	SS-23	SS-23	Non-Disposal
Manganese	0.21	0.63	82	1 / 1	97.3	SS-15	1 / 1	105	SS-24	2 / 2	130	114	138	SS-16	6 / 6	1,100	12.9	6,120	SS-23	SS-23	Non-Disposal
Mercury	0.09	0.32	0.17	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	2 / 6	0.14	0.2	0.41	SS-23	SS-23	Non-Disposal
Nickel	0.62	0.99	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 5	2.4	6.2 J		SS-22	SS-22	Non-Disposal
Selenium	0.83	5.90	--	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	1 / 6	1.6	5.9 J		SS-18	SS-18	Non-Disposal
Thallium	0.21	0.64	0.28 J	0 / 1	--	--	0 / 1	--	--	0 / 2	--	--	--	--	0 / 6	--	--	--	--	SS-14	Background
Vanadium	0.41	1.30	16.5	1 / 1	12.1	SS-15	1 / 1	10.2	SS-24	2 / 2	8.6	6.9	10.2	SS-16	6 / 6	11	5.7	21.3	SS-18	SS-18	Non-Disposal
Zinc	2.40	3.60	21 J	1 / 1	22.1 J	SS-15	1 / 1	19.3 J	SS-24	2 / 2	23	19.8 J	25.7 J	SS-16	4 / 4	15	10.3 J	18.5 J	SS-20	SS-16	Solid Waste
SOIL QUALITY PARAMETERS																					
Cyanide - Not Detected																					

NOTES:

1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.
4. The actual highest concentration for this chemical was detected in a background sample.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

-- Analyte was not detected in samples.

TABLE 4-8. SUMMARY OF CHEMICALS DETECTED IN SUBSURFACE SOIL, AUGUST 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	BACKGROUND RANGE OF CONCENTRATIONS (4) MINIMUM	BACKGROUND RANGE OF CONCENTRATIONS (4) MAXIMUM	SEWAGE SLUDGE FREQUENCY OF DETECTION (3)	SEWAGE SLUDGE ARITHMETIC AVERAGE	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (4) MINIMUM	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (4) MAXIMUM	SEWAGE SLUDGE MAXIMUM LOCATION	BULKY WASTE FREQUENCY OF DETECTION (3)	BULKY WASTE ARITHMETIC AVERAGE	BULKY WASTE RANGE OF CONCENTRATIONS (4) MINIMUM	BULKY WASTE RANGE OF CONCENTRATIONS (4) MAXIMUM	BULKY WASTE MAXIMUM LOCATION	SOLID WASTE FREQUENCY OF DETECTION (3)	SOLID WASTE ARITHMETIC AVERAGE	SOLID WASTE RANGE OF CONCENTRATIONS (4) MINIMUM	SOLID WASTE RANGE OF CONCENTRATIONS (4) MAXIMUM	SOLID WASTE MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	AREA OF OVERALL MAX. LOC.
VOLATILE ORGANICS (µg/kg)																					
Toluene	10	3,100	--	--	1 / 8	48	320		BH-03 (18 - 20 ft)	0 / 2	--	--	--	--	0 / 2	--	--	--	--	BH-03 (18 - 20 ft)	Sewage Sludge
Acetone	10	3,100	--	--	3 / 8	170	84 J	740 J	BH-01 (4 - 6 ft)	2 / 2	200	48 J	350 J	BH-06 (2 - 4 ft)	0 / 2	--	--	--	--	BH-01 (4 - 6 ft)	Sewage Sludge
2-Butanone	10	3,100	--	--	3 / 8	85	73 J	340 J	BH-01 (4 - 6 ft)	0 / 2	--	--	--	--	0 / 2	--	--	--	--	BH-01 (4 - 6 ft)	Sewage Sludge
SEMIVOLATILE ORGANICS (µg/kg)																					
Naphthalene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	2 / 2	1,200	200 J	2,200 J	BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
2-Methylnaphthalene	340	3,600	--	--	2 / 8	150 *	27 J	140 J	BH-01 (2 - 8 ft)	0 / 2	--	--	--	--	2 / 2	2,000	700	3,300 J	BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
Phenanthrene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	2 / 2	540	150 J	920 J	BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
Fluoranthene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	970 *	140 J		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
Pyrene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	980 *	160 J		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
Benzo(a)anthracene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	930 *	63 J		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
Chrysene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	940 *	84 J		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
1,2-Dichlorobenzene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	1,000 *	240 J		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
1,4-Dichlorobenzene	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	950 *	97 J		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
Phenol	340	3,600	--	--	1 / 8	180	240 J		BH-01 (2 - 8 ft)	0 / 2	--	--	--	--	0 / 2	--	--	--	--	BH-01 (2 - 8 ft)	Sewage Sludge
2-Methylphenol	340	3,600	--	--	1 / 8	270	700		BH-03 (16 - 20 ft)	0 / 2	--	--	--	--	1 / 2	2,100	4,000		BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
4-Methylphenol	340	3,600	--	--	2 / 8	1,100	2,200	5,600	BH-01 (2 - 8 ft)	0 / 2	--	--	--	--	1 / 2	1,000 *	260 J		BH-07 (4 - 8 ft)	BH-01 (2 - 8 ft)	Sewage Sludge
Diethylphthalate	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	2 / 2	460	140 J	790 J	BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
Di-n-butylphthalate	340	3,600	62 J		4 / 8	160 *	40 J	120 J	BH-02 (16 - 18 ft)	0 / 2	--	--	--	--	2 / 2	1,300	320 J	2,300 J	BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
bis(2-Ethylhexyl)phthalate	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	1,900	2,000		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
Di-n-octylphthalate	340	3,600	19 J		2 / 8	170 *	26 J	86 J	BH-03 (16 - 20 ft)	0 / 2	--	--	--	--	1 / 2	1,900	3,600 J		BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
Butylbenzylphthalate	340	3,600	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	2 / 2	9,000	96 J	18,000	BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
PESTICIDES (µg/kg)																					
4,4'-DDE	3.4	4.0	--	--	0 / 8	--	--	--	--	1 / 2	3.2	4.6		BH-06 (2 - 4 ft)	2 / 2	22	12.0	31.0	BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
4,4'-DDD	3.4	4.0	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	14	26.0		BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
Dieldrin	3.4	4.0	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	7.9	14.0		BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
alpha-Chlordane	1.7	2.1	--	--	1 / 8	1.6	6.2		BH-01 (2 - 8 ft)	0 / 2	--	--	--	--	1 / 2	9.0	17.0		BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
gamma-Chlordane	1.7	2.1	--	--	1 / 8	1.7	7.5		BH-01 (2 - 8 ft)	0 / 2	--	--	--	--	1 / 2	8.0	15.0		BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
PCBs (µg/kg)																					
Aroclor-1242	34	40	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	160	310.0		BH-07 (14 - 18 ft)	BH-07 (14 - 18 ft)	Solid Waste
Aroclor-1254	34	40	--	--	0 / 8	--	--	--	--	0 / 2	--	--	--	--	1 / 2	140	270.0		BH-07 (4 - 8 ft)	BH-07 (4 - 8 ft)	Solid Waste
METALS (mg/kg)																					
Aluminum	5.42	6.34	3,955	11,800	7 / 8	4,400	3,705	6,000	BH-04 (4 - 6 ft)	2 / 2	7,000	5,100	8,810	BH-06 (2 - 4 ft)	2 / 2	4,400	3,620	5,250	BH-07 (4 - 8 ft)	BH-06 (2 - 4 ft)	Bulky Waste (5)
Iron	3.62	4.22	6,415	12,800	8 / 8	6,700	3,400	8,635	BH-02 (16 - 18 ft)	2 / 2	8,100	6,620	9,530	BH-06 (2 - 4 ft)	2 / 2	6,200	4,800	7,540	BH-07 (4 - 8 ft)	BH-06 (2 - 4 ft)	Bulky Waste (5)
Magnesium	6.63	7.74	966	1,350	8 / 8	1,100	419	1,700	BH-01 (8 - 10 ft)	2 / 2	1,000	846	1,150	BH-06 (6 - 10 ft)	2 / 2	910	738	1,090	BH-07 (4 - 8 ft)	BH-01 (8 - 10 ft)	Sewage Sludge
Potassium	50.4	58.90	415	888	8 / 8	760	367	1,450	BH-01 (8 - 10 ft)	2 / 2	680	401	963	BH-06 (6 - 10 ft)	2 / 2	700	618	780	BH-07 (4 - 8 ft)	BH-01 (8 - 10 ft)	Sewage Sludge
Antimony	3.42	3.99	--	--	4 / 8	5.8	5.4 J	16.8 J	BH-01 (2 - 8 ft)	1 / 2	4.0	6.0 J		BH-06 (6 - 10 ft)	1 / 2	4.0	6.0 J		BH-07 (4 - 8 ft)	BH-01 (2 - 8 ft)	Sewage Sludge
Barium	0.40	0.47	19.1		5 / 8	19	10.1 J	54.3	BH-01 (2 - 8 ft)	2 / 2	17	14.6	19.8	BH-06 (6 - 10 ft)	2 / 2	19	16.0	22.9	BH-07 (4 - 8 ft)	BH-01 (2 - 8 ft)	Sewage Sludge
Beryllium	0.20	0.23	0.47	0.59	8 / 8	0.52	0.35	0.71	BH-04 (8 - 10 ft)	2 / 2	0.58	0.55	0.61	BH-06 (2 - 4 ft)	2 / 2	0.54	0.39	0.7	BH-07 (4 - 8 ft)	BH-04 (8 - 10 ft)	Sewage Sludge
Chromium	1.41	1.64	3.8	9.2	8 / 8	4.8	1.6	8.9	BH-01 (8 - 10 ft)	2 / 2	4.6	3.0	6.3	BH-06 (2 - 4 ft)	2 / 2	5.5	5.5	5.5	BH-07 (4 - 8 ft)	BH-01 (8 - 10 ft)	Sewage Sludge (5)
Cobalt	0.80	0.94	3.1	5.4	8 / 8	3.5	1.0	6.3	BH-04 (4 - 6 ft)	2 / 2	3.5	3.5	3.5	BH-06 (2 - 4 ft)	2 / 2	2.6	1.8	3.3	BH-07 (4 - 8 ft)	BH-04 (4 - 6 ft)	Sewage Sludge
Copper	2.21	2.58	3.4	3.5	7 / 8	16	4.2	79.2	BH-01 (2 - 8 ft)	2 / 2	3.7	3.3	4.1	BH-06 (2 - 4 ft)	2 / 2	13	7.4	18.9	BH-07 (4 - 8 ft)	BH-01 (2 - 8 ft)	Sewage Sludge
Lead	0.39	0.47	2.6	12.6	7 / 8	4.0	2.3	8.8	BH-01 (2 - 8 ft)	2 / 2	33	4.5	61.4	BH-06 (2 - 4 ft)	2 / 2	20	19.4	20.2	BH-07 (4 - 8 ft)	BH-06 (2 - 4 ft)	Bulky Waste
Manganese	1.81	2.11	125	148	5 / 8	110	106	213	BH-02 (16 - 18 ft)	1 / 2	82	116		BH-06 (2 - 4 ft)	0 / 2	--	--	--	--	BH-02 (16 - 18 ft)	Sewage Sludge
Mercury	0.09	0.11	0.15 J		3 / 8	0.12	0.13 J	0.47 J	BH-01 (2 - 8 ft)	2 / 2	0.22	0.20 J	0.24 J	BH-06 (6 - 10 ft)	2 / 2	0.28	0.18 J	0.39 J	BH-07 (4 - 8 ft)	BH-01 (2 - 8 ft)	Sewage Sludge
Vanadium	0.60	0.70	6.2	19.3	7 / 8	7.4	5.7	11.4	BH-01 (8 - 10 ft)	2 / 2	9.0	6.7	11.3	BH-06 (2 - 4 ft)	2 / 2	7.4	5.5	9.3	BH-07 (4 - 8 ft)	BH-01 (8 - 10 ft)	Sewage Sludge (5)
Zinc	1.61	1.88	12.1 J	20.0	7 / 8	41	16.5	188	BH-01 (2 - 8 ft)	2 / 2	57	18.9	95.9	BH-06 (2 - 4 ft)	2 / 2	57	45.5	68.2	BH-07 (14 - 18 ft)	BH-01 (2 - 8 ft)	Sewage Sludge
SOIL QUALITY PARAMETERS																					
Cyanide - Not Detected																					
TOTAL COMBUSTIBLE ORGANICS (%)																					
Organic Content	NA		0.7		2 / 2	1.8	0.5	3.0	BH-01 (2 - 8 ft)	1 / 1	NA	1.0		BH-06 (6 - 10 ft)	1 / 1	NA	3.8		BH-07 (4 - 14 ft)	BH-07 (4 - 14 ft)	Solid Waste
Solids Content	NA		89		2 / 2	85	75.8	94.7	BH-03 (16 - 20)	1 / 1	NA	91.3		BH-06 (6 - 10 ft)	1 / 1	NA	87.1		BH-07 (4 - 14 ft)	BH-03 (16 - 20 ft)	Sewage Sludge
Moisture Content	NA		11.1		2 / 2	15	5.3	24.3	BH-01 (2 - 8 ft)	1 / 1	NA	8.7		BH-06 (6 - 10 ft)	1 / 1	NA	13.0		BH-07 (4 - 14 ft)	BH-01 (2 - 8 ft)	Sewage Sludge

TABLE 4-8 (Continued). SUMMARY OF CHEMICALS DETECTED IN SUBSURFACE SOIL, AUGUST 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	BACKGROUND RANGE OF CONCENTRATIONS (4) MINIMUM	BACKGROUND RANGE OF CONCENTRATIONS (4) MAXIMUM	SEWAGE SLUDGE FREQUENCY OF DETECTION (3)	SEWAGE SLUDGE ARITHMETIC AVERAGE	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (4) MINIMUM	SEWAGE SLUDGE RANGE OF CONCENTRATIONS (4) MAXIMUM	SEWAGE SLUDGE MAXIMUM LOCATION	BULKY WASTE FREQUENCY OF DETECTION (3)	BULKY WASTE ARITHMETIC AVERAGE	BULKY WASTE RANGE OF CONCENTRATIONS (4) MINIMUM	BULKY WASTE RANGE OF CONCENTRATIONS (4) MAXIMUM	BULKY WASTE MAXIMUM LOCATION	SOLID WASTE FREQUENCY OF DETECTION (3)	SOLID WASTE ARITHMETIC AVERAGE	SOLID WASTE RANGE OF CONCENTRATIONS (4) MINIMUM	SOLID WASTE RANGE OF CONCENTRATIONS (4) MAXIMUM	SOLID WASTE MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	AREA OF OVERALL MAX. LOC.
GRAIN SIZE (%)																					
Clay	NA		3.1		2 / 2	1.4	0.4	2.3	BH-01 (2 - 8 ft)	1 / 1	NA	5.5		BH-06 (6 - 10 ft)	1 / 1	NA	3.5		BH-07 (4 - 14 ft)	BH-06 (6 - 10 ft)	Bulky Waste
Gravel	NA		6.5		2 / 2	6.2	5.5	6.8	BH-01 (2 - 8 ft)	1 / 1	NA	8.8		BH-06 (6 - 10 ft)	1 / 1	NA	8.1		BH-07 (4 - 14 ft)	BH-06 (6 - 10 ft)	Bulky Waste
Sand	NA		51.1		2 / 2	71	61.4	79.9	BH-03 (16 - 20)	1 / 1	NA	59.8		BH-06 (6 - 10 ft)	1 / 1	NA	60.7		BH-07 (4 - 14 ft)	BH-03 (16 - 20 ft)	Sewage Sludge
Silt	NA		39.4		2 / 2	22	14.1	29.4	BH-01 (2 - 8 ft)	1 / 1	NA	25.8		BH-06 (6 - 10 ft)	1 / 1	NA	27.6		BH-07 (4 - 14 ft)	BH-01 (2 - 8 ft)	Sewage Sludge (5)
PERMEABILITY (ft/dy)																					
Hydraulic Conductivity	NA		0.0414		2 / 2	0.38	0.162	0.595	BH-03 (16 - 20)	1 / 1	NA	0.0408		BH-06 (6 - 10 ft)	1 / 1	NA	0.286		BH-07 (4 - 14 ft)	BH-03 (16 - 20 ft)	Sewage Sludge

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.
5. The actual highest concentration for this chemical was detected in a background sample.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

-- Analyte was not detected in samples.

TABLE 4-9. SUMMARY OF CHEMICALS DETECTED IN LEACHATE, JUNE 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (3)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (4) MINIMUM	MAXIMUM	MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (3)	CONCENTRATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)											
Toluene		5	3 / 5	22	27 J	50	LE-03	0 / 1	—	LE-03	Saugatucket
Chlorobenzene		5	3 / 5	2.2 *	2 J	2 J	LE-03	0 / 1	—	LE-03	Saugatucket
Trichloroethene		5	0 / 4	—	—	—	—	1 / 1	4 J	LE-01	Mitchell Brook
1,2-Dichloroethene(total)		5	0 / 4	—	—	—	—	1 / 1	44	LE-01	Mitchell Brook
1,1-Dichloroethane		5	3 / 5	2.2 *	2 J	2 J	LE-03	0 / 1	—	LE-03	Saugatucket
Chloroethane		10	3 / 5	5.8	5 J	8 J	LE-03	0 / 1	—	LE-03	Saugatucket
Vinyl Chloride		10	0 / 4	—	—	—	—	1 / 1	1 J	LE-01	Mitchell Brook
Carbon Disulfide		5	1 / 4	2.6	3 J		LE-02	1 / 1	12	LE-01	Mitchell Brook
SEMIVOLATILE ORGANICS (µg/L)											
bis(2-Ethylhexyl)phthalate		10	1 / 5	50	230 J		LE-06	0 / 1	—	LE-06	Saugatucket
PESTICIDES/PCBs											
None Detected											
METALS - UNFILTERED (µg/L)											
Aluminum	10	27	4 / 5	2,100	184 J	9,220 J	LE-02	1 / 1	60,500 J	LE-01	Mitchell Brook
Iron	7	18	5 / 5	370,000	15,200 J	1,370,000 J	LE-02	1 / 1	133,000 J	LE-02	Saugatucket
Calcium	7	28	5 / 5	27,000	10,000	59,000	LE-02	1 / 1	14,900	LE-02	Saugatucket
Magnesium	13	33	5 / 5	7,500	2,420	16,100	LE-02	1 / 1	5,610	LE-02	Saugatucket
Sodium	22	30	5 / 5	23,000	5,560	55,400	LE-02	1 / 1	9,300 J	LE-02	Saugatucket
Potassium	42	251	5 / 5	16,000	2,000	44,800	LE-02	1 / 1	3,620	LE-02	Saugatucket
Arsenic	2	4	0 / 4	—	—	—	—	1 / 1	3.7	LE-01	Mitchell Brook
Barium	1	2	5 / 5	550	22.2	2,120	LE-02	1 / 1	328 J	LE-02	Saugatucket
Beryllium		1	1 / 5	2.3	8.7		LE-02	1 / 1	11.2	LE-01	Mitchell Brook
Chromium	2	7	0 / 5	—	—	—	—	1 / 1	23.9	LE-01	Mitchell Brook
Cobalt	2	4	4 / 5	63	5.6	295	LE-02	0 / 1	—	LE-02	Saugatucket
Copper	3	11	0 / 5	—	—	—	—	1 / 1	37.8 J	LE-01	Mitchell Brook
Lead	1	2	1 / 5	37	174 J		LE-02	1 / 1	150	LE-02	Saugatucket
Manganese	1	9	5 / 5	8,300	2,490 J	14,700 J	LE-02	1 / 1	814	LE-02	Saugatucket
Nickel	4	6	2 / 5	5.3	4 J	13.6	LE-02	1 / 1	15.8	LE-01	Mitchell Brook
Vanadium	2	3	2 / 5	18	22.2	65.2	LE-02	1 / 1	49.8	LE-02	Saugatucket
Zinc	3	8	2 / 4	260 *	34.3	133 J	LE-02	1 / 1	209 J	LE-01	Mitchell Brook
METALS - FILTERED (µg/L)											
Iron	7	18	5 / 5	29,000	743	64,100 J	LE-03	1 / 1	1,260 J	LE-03	Saugatucket
Calcium	7	28	5 / 5	16,000	4,500	41,500	LE-05	1 / 1	4,400	LE-05	Saugatucket
Magnesium	13	33	5 / 5	4,800	1,420	11,500	LE-05	1 / 1	1,360	LE-05	Saugatucket
Sodium	22	30	5 / 5	16,000	7,095	42,600	LE-05	1 / 1	11,600	LE-05	Saugatucket
Potassium	42	251	5 / 5	7,200	1,000	26,700	LE-05	1 / 1	1,440	LE-05	Saugatucket
Barium	1	2	4 / 5	57	22.5	143	LE-05	1 / 1	21.5	LE-05	Saugatucket
Cobalt	2	4	1 / 5	2.5	3.5 J		LE-04	0 / 1	—	LE-04	Saugatucket
Manganese	1	9	5 / 5	5,100	246	9,700 J	LE-03	1 / 1	184 J	LE-03	Saugatucket
WATER QUALITY PARAMETERS											
Cyanide (mg/L)		2	2 / 5	19	36.1	41.7	LE-06	0 / 1	—	LE-06	Saugatucket
Total Organic Carbon (mg/L)		1.0	3 / 5	18	18 J	48 J	LE-02	1 / 1	8.4 J	LE-02	Saugatucket
Biochemical Oxygen Demand (mg/L)		2.4	2 / 5	15	7.5	51	LE-02	0 / 1	—	LE-02	Saugatucket
Hardness (mg/L)		NA	5 / 5	99	35	214	LE-02	1 / 1	60	LE-02	Saugatucket
pH		NA	5 / 5	6.5	6.2	7.1	LE-02	1 / 1	5.4	LE-02	Saugatucket
Specific Conductance (µmhos/cm)		NA	5 / 5	750	250	1,800	LE-05	1 / 1	100	LE-05	Saugatucket

NOTES:
1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.
NA = Not Applicable
J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.
— Analyte was not detected in samples.

TABLE 4-10. SUMMARY OF CHEMICALS DETECTED IN LEACHATE, APRIL 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (2)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (3) MINIMUM	MAXIMUM
VOLATILE ORGANICS - (μg/L)						
Ethylbenzene		10	3 / 3	1.7	1 J	2 J
Total Xylenes		10	2 / 3	3.3 *	2 J	3 J
1,2-Dichloroethene(total)		10	1 / 3	3.7 *	1 J	
Chloroethane		10	1 / 3	4.0 *	2 J	
WATER SOLUBLE ORGANICS						
None Detected						
SEMIVOLATILE ORGANICS (μg/L)						
Naphthalene		10	3 / 3	0.77	0.7 J	0.9 J
Diethylphthalate		10	3 / 3	6.3	4 J	11
PESTICIDES/PCBs						
None Detected						
METALS - UNFILTERED (μg/L)						
Aluminum	21	22	2 / 3	310	238.75 J	623
Iron	23	25	3 / 3	140,000	49,800	283,000
Calcium	28	34	3 / 3	20,000	16,700	23,000
Magnesium	22	55	3 / 3	6,600	5,710	7,220
Sodium	34	67	3 / 3	23,000	20,800	24,700 J
Potassium	82	194	3 / 3	14,000	12,000	15,200
Barium	1	5	3 / 3	180	97.4 J	293 J
Chromium	3	5	1 / 3	2.6	4.85 J	
Lead		1	1 / 3	5.0	10.5 J	
Manganese		1	3 / 3	1,900	1,490	2,410
Mercury		0.2	1 / 3	0.13	0.2	
Zinc	8	11	1 / 2	6.8	8.1 J	
METALS - FILTERED (μg/L)						
Iron	23	25	3 / 3	20,000	13,800	27,500
Calcium	28	34	3 / 3	20,000	17,100	21,800
Magnesium	22	55	3 / 3	6,800	5,730	7,530
Sodium	34	67	3 / 3	25,000	22,900	27,700
Potassium	82	194	3 / 3	15,000	12,200	16,100
Barium	1	5	3 / 3	81	80.3	82.5
Manganese		1	3 / 3	1,500	1,410	1,570
WATER QUALITY PARAMETERS						
Cyanide	Not Detected					
Ammonia (mg/L)	0.0300		3 / 3	13	5.06	21.75
Total Organic Carbon (mg/L)		0.5	3 / 3	41	30.9	49.9
Biochemical Oxygen Demand (mg/L)		1.0	3 / 3	3.2	1.5	4.1 J
Hardness (mg/L)		NA	3 / 3	78	65	87
pH		NA	1 / 1	NA	6.5	
Specific Conductance (μmhos/cm)		NA	1 / 1	NA	412	

NOTES:

1. Analytical data is presented in Appendix D. Data is summarized for one sample, LE-05, collected on three consecutive days.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-11. SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER, JUNE 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	SHALLOW OVERBURDEN FREQUENCY OF DETECTION (3)	SHALLOW OVERBURDEN ARITHMETIC AVERAGE	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	SHALLOW OVERBURDEN MAXIMUM LOCATION	DEEP OVERBURDEN FREQUENCY OF DETECTION (3)	DEEP OVERBURDEN ARITHMETIC AVERAGE	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	DEEP OVERBURDEN MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	FLOW ZONE OF OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)														
Benzene		5	0 / 5	--	--	--	--	3 / 3	18	7	28	OW-25	OW-25	Deep Overburden
Toluene		5	1 / 5	15	64		MW-II	2 / 3	91	120	150	OW-30	OW-30	Deep Overburden
Ethylbenzene		5	0 / 5	--	--	--	--	3 / 3	38	17	72	OW-25	OW-25	Deep Overburden
Total Xylenes		5	0 / 5	--	--	--	--	3 / 3	100	39	210	OW-25	OW-25	Deep Overburden
Chlorobenzene		5	0 / 5	--	--	--	--	2 / 3	5.8	2 J	13	OW-25	OW-25	Deep Overburden
2-Butanone		10	0 / 3	--	--	--	--	1 / 3	50	140		OW-30	OW-30	Deep Overburden
4-Methyl-2-pentanone		10	0 / 5	--	--	--	--	1 / 3	14	31		OW-30	OW-30	Deep Overburden
1,1,1-Trichloroethane		5	0 / 5	--	--	--	--	1 / 3	13	34		OW-30	OW-30	Deep Overburden
1,1-Dichloroethene		5	1 / 5	2.4 *	2 J		MW-V	0 / 3	--	--	--	--	MW-V	Shallow Overburden
1,2-Dichloroethene(total)		5	0 / 5	--	--	--	--	3 / 3	250	3 J	730	OW-30	OW-30	Deep Overburden
1,1-Dichloroethane		5	0 / 5	--	--	--	--	2 / 3	74	1 J	220 J	OW-30	OW-30	Deep Overburden
1,2-Dichloropropane		5	0 / 5	--	--	--	--	2 / 3	2.5	2 J	3 J	OW-25	OW-25	Deep Overburden
Chloroethane		10	0 / 5	--	--	--	--	2 / 3	32	4 J	86	OW-30	OW-30	Deep Overburden
Vinyl Chloride		10	0 / 5	--	--	--	--	3 / 3	230	3 J	690 J	OW-30	OW-30	Deep Overburden
Carbon Disulfide		5	4 / 5	22	2 J	50	MW-II	3 / 3	47	3 J	87	OW-25	OW-25	Deep Overburden
SEMIVOLATILE ORGANICS (µg/L)														
Naphthalene		10	0 / 5	--	--	--	--	1 / 3	6.7	10		OW-25	OW-25	Deep Overburden
2-Methylnaphthalene		10	1 / 5	4.4 *	2 J		MW-V	0 / 3	--	--	--	--	MW-V	Shallow Overburden
1,4-Dichlorobenzene		10	0 / 5	--	--	--	--	1 / 3	12	25		OW-25	OW-25	Deep Overburden
Benzoic Acid		50	0 / 5	--	--	--	--	1 / 3	21 *	12 J		OW-30	OW-30	Deep Overburden
4-Methylphenol		10	1 / 5	5.4	7 J		MW-V	1 / 3	20	51 J		OW-30	OW-30	Deep Overburden
N-Nitroso-di-n-propylamine		10	0 / 5	--	--	--	--	1 / 3	6.7	10 J		OW-30	OW-30	Deep Overburden
PESTICIDES/PCBs														
None Detected														
METALS - UNFILTERED (µg/L)														
Aluminum	10	27	5 / 5	5,400	627 J	20,650 J	MW-III	3 / 3	15,000	917 J	22,700 J	OW-25	OW-25	Deep Overburden
Iron	7	18	5 / 5	33,000	794 J	73,600 J	MW-II	3 / 3	130,000	114,000 J	157,000 J	OW-27	OW-27	Deep Overburden
Calcium	7	28	5 / 5	4,900	1,020	8,460	MW-II	3 / 3	100,000	56,800	168,000	OW-25	OW-25	Deep Overburden
Magnesium	13	33	5 / 5	2,900	887	6,620	MW-III	3 / 3	25,000	5,990	62,000	OW-25	OW-25	Deep Overburden
Sodium	22	30	5 / 5	5,300	3,040	6,790	MW-IV	3 / 3	170,000	8,910 J	501,000	OW-25	OW-25	Deep Overburden
Potassium	42	251	5 / 5	2,500	499	4,970	MW-III	3 / 3	64,000	9,770	170,000	OW-25	OW-25	Deep Overburden
Arsenic	2	4	1 / 4	1.9	2.7		MW-II	2 / 2	6.7	4.8 J	8.6 J	OW-25	OW-25	Deep Overburden
Barium	1	2	4 / 5	35	19.5	105.7	MW-III	3 / 3	170	52.6 J	238	OW-27	OW-27	Deep Overburden
Beryllium	1		1 / 5	1.1	2.6		MW-III	0 / 3	--	--	--	--	MW-III	Shallow Overburden
Cadmium	1	3	1 / 5	5.0	19.4		MW-IV	1 / 3	14	40.0 J		OW-27	OW-27	Deep Overburden
Chromium	2	7	1 / 5	6.7	23.0		MW-III	2 / 3	37	44.8 J	62.5 J	OW-25	OW-25	Deep Overburden
Cobalt	2	4	2 / 5	9.0	16.1 J	21.0	MW-IV	2 / 3	22	29.4	33.1	OW-27	OW-27	Deep Overburden
Copper	3	11	2 / 5	26	45.5	75.5	MW-III	1 / 3	46	107		OW-25	OW-25	Deep Overburden
Lead	1	2	1 / 5	17	71.9 J		MW-III	2 / 3	120	173 J	181 J	OW-25	OW-25	Deep Overburden
Manganese	1	9	5 / 5	2,000	44.0	4,340 J	MW-IV	3 / 3	1,900	1,020 J	2,970 J	OW-30	MW-IV	Shallow Overburden
Nickel	4	6	4 / 5	12	5.4	23.5	MW-III	2 / 3	50	67.9	79.0	OW-27	OW-27	Deep Overburden
Vanadium	2	3	1 / 5	7.4	27.9		MW-III	2 / 3	29	36.7	45.2	OW-25	OW-25	Deep Overburden
Zinc	3	8	3 / 5	83	32.5	210 J	MW-IV	2 / 2	3300	645 J	5,980 J	OW-27	OW-27	Deep Overburden
METALS - FILTERED (µg/L)														
Iron	7	18	2 / 5	19,000	32,000	64,300 J	MW-II	3 / 3	76,000	20,800	115,000	OW-30	OW-30	Deep Overburden
Calcium	7	28	4 / 5	4,400	3,420	8,210	MW-II	3 / 3	90,000	59,800	137,000	OW-25	OW-25	Deep Overburden
Magnesium	13	33	5 / 5	1,800	716	3,940	MW-II	3 / 3	23,000	3,070	59,800	OW-25	OW-25	Deep Overburden
Sodium	22	30	5 / 5	5,900	3,410	8,280	MW-IV	3 / 3	190,000	10,200	540,000	OW-25	OW-25	Deep Overburden
Potassium	42	251	5 / 5	1,300	260	3,370	MW-II	3 / 3	63,000	5,780	171,000	OW-25	OW-25	Deep Overburden
Antimony	11	17	0 / 5	--	--	--	--	1 / 3	10	19.4		OW-25	OW-25	Deep Overburden
Barium	1	2	3 / 5	10	10.6	21.5	MW-II	3 / 3	68	47.5 J	87.9	OW-25	OW-25	Deep Overburden
Cobalt	2	4	1 / 5	3.5	5.0		MW-II	0 / 3	--	--	--	--	MW-II	Shallow Overburden
Manganese	1	9	3 / 5	1,700	524	4,160	MW-IV	3 / 3	1,200	191	2,850 J	OW-30	MW-IV	Shallow Overburden
Mercury		0.2	0 / 5	--	--	--	--	1 / 3	0.28	0.63		OW-25	OW-25	Deep Overburden
Nickel	4	6	1 / 5	3.6	7.8		MW-IV	1 / 3	4.4	9.2		OW-25	OW-25	Deep Overburden
Zinc	3	8	3 / 5	31	39.1	57.5	MW-IV	2 / 2	32	19.2	43.9	OW-25	MW-IV	Shallow Overburden
WATER QUALITY PARAMETERS														
Sulfide (mg/L)		0.05	5 / 5	1.5	0.64	2.70	MW-I	3 / 3	2.2	1.70	3.30	OW-27	OW-27	Deep Overburden
Cyanide		Not Detected												
Total Organic Carbon (mg/L)		1.0	0 / 5	--	--	--	--	2 / 2	44	24 J	65 J	OW-30	OW-30	Deep Overburden
Biochemical Oxygen Demand (mg/L)		2.4	1 / 5	3.4	8.0		MW-II	1 / 2	62	120		OW-30	OW-30	Deep Overburden
Hardness (mg/L)		NA	5 / 5	24	6	48	MW-III	3 / 3	360	167	675	OW-25	OW-25	Deep Overburden
pH		NA	5 / 5	6.7	6.1	7.1	MW-V	3 / 3	6.7	6.6	6.8	OW-30	MW-V	Shallow Overburden
Specific Conductance (µmhos/cm)		NA	5 / 5	130	21	260	MW-II	3 / 3	2,400	750	5,600	OW-25	OW-25	Deep Overburden

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

-- Analyte was not detected in samples.

TABLE 4-12. SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER, SEPTEMBER/OCTOBER 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	BACKGROUND CONCENTRATIONS SHALLOW OVERBURDEN	BACKGROUND CONCENTRATIONS BEDROCK	SHALLOW OVERBURDEN FREQUENCY OF DETECTION (3)	SHALLOW OVERBURDEN ARITHMETIC AVERAGE	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	SHALLOW OVERBURDEN MAXIMUM LOCATION	DEEP OVERBURDEN FREQUENCY OF DETECTION (3)	DEEP OVERBURDEN ARITHMETIC AVERAGE	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	DEEP OVERBURDEN MAXIMUM LOCATION	BEDROCK FREQUENCY OF DETECTION (3)	BEDROCK ARITHMETIC AVERAGE	BEDROCK RANGE OF CONCENTRATIONS (4) MINIMUM	BEDROCK RANGE OF CONCENTRATIONS (4) MAXIMUM	BEDROCK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	FLOW ZONE OF OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)																				
Benzene	10	50	--	--	1 / 13	5.6	13		MW-11-01	7 / 15	8.8	2 J	31	MW-14-01	0 / 5	--	--	--	--	MW-14-01 Deep Overburden
Toluene	10	50	--	--	2 / 13	4.5 *	1 J	2 J	MW-13-01	7 / 15	20	1 J	170	MW-14-01	3 / 5	4.6	1 J	10	MW-04-03	MW-14-01 Deep Overburden
Ethylbenzene	10	50	--	--	2 / 13	5.7	3 J	16	MW-11-01	9 / 15	9.9	2 J	23	MW-07-01	1 / 5	4.2 *	1 J		MW-04-03	MW-07-01 Deep Overburden
Total Xylenes	10	50	--	--	2 / 13	4.9	4 J	5 J	MW-11-01	9 / 15	15	4 J	49	MW-07-01	2 / 5	4.0	1 J	4 J	MW-04-03	MW-07-01 Deep Overburden
Chlorobenzene	10	50	--	--	0 / 13	--	--	--	--	2 / 15	6.3 *	5 J	5 J	MW-11-02	0 / 5	--	--	--	--	MW-11-02 Deep Overburden
Acetone	10	10	--	--	0 / 13	--	--	--	--	1 / 15	12	71 J		MW-12-02	2 / 5	36	16 J	120	MW-04-03	MW-04-03 Bedrock
2-Butanone	10	50	--	--	0 / 13	--	--	--	--	1 / 15	6.6	9 J		MW-13-02	1 / 5	30	130		MW-04-03	MW-04-03 Bedrock
4-Methyl-2-pentanone	10	50	--	--	0 / 13	--	--	--	--	1 / 15	6.3 *	5 J		MW-13-02	1 / 5	4.6 *	3 J		MW-04-03	MW-13-02 Deep Overburden
Tetrachloroethene	10	50	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	1 / 5	4.2 *	1 J		MW-04-03	MW-04-03 Bedrock
Trichloroethene	10	50	3 J	--	0 / 13	--	--	--	--	2 / 15	6.1 *	2 J	5 J	OW-27	1 / 5	4.6 *	3 J		MW-04-03	OW-27 Deep Overburden
1,1,1-Trichloroethane	10	50	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	1 / 5	4.6 *	3 J		MW-07-02	MW-07-02 Bedrock
1,1-Dichloroethene	10	50	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	1 / 5	4.4 *	2 J		MW-07-02	MW-07-02 Bedrock
1,2-Dichloroethene(total)	10	50	--	--	2 / 13	4.7 *	3 J	3 J	MW-11-01	6 / 15	9.7	1 J	41	MW-14-01	2 / 5	21	10	79	MW-07-02	MW-07-02 Bedrock
1,1-Dichloroethane	10	50	--	--	2 / 13	4.5 *	1 J	3 J	MW-11-01	8 / 15	6.9	2 J	16	MW-07-01	2 / 5	9.2	7 J	24	MW-07-02	MW-07-02 Bedrock
1,2-Dichloroethane	10	50	--	--	0 / 13	--	--	--	--	1 / 15	6.1 *	1 J		MW-06-02	0 / 5	--	--	--	--	MW-06-02 Deep Overburden
1,2-Dichloropropane	10	50	--	--	0 / 13	--	--	--	--	1 / 15	6.1 *	2 J		MW-14-01	0 / 5	--	--	--	--	MW-14-01 Deep Overburden
Chloroethane	10	50	--	--	1 / 13	6.7	27		MW-11-01	7 / 15	22	2 J	72	MW-06-02	1 / 5	5.6	8 J		MW-04-03	MW-06-02 Deep Overburden
Vinyl Chloride	10	50	--	--	1 / 13	5.0	5 J		MW-11-01	2 / 15	7.5	8 J	19	OW-27	0 / 5	--	--	--	--	OW-27 Deep Overburden
Carbon Disulfide	10	50	--	--	0 / 13	--	--	--	--	2 / 15	6.4	4 J	7 J	OW-27	1 / 5	4.6 *	3 J		MW-07-02	OW-27 Deep Overburden
WATER SOLUBLE ORGANICS (µg/L)																				
Acrylamide	200	2,000	--	--	0 / 12	--	--	--	--	1 / 15	110	229 J		MW-04-02	0 / 5	--	--	--	--	MW-04-02 Deep Overburden
N,N-DMF	50	500	--	--	2 / 13	39	50 J	183	MW-03-01	3 / 15	79	92 J	596	MW-14-01	2 / 5	400	537 J	1,390 J	MW-07-02	MW-07-02 Bedrock
SEMIVOLATILE ORGANICS (µg/L)																				
Naphthalene	10	20	--	--	1 / 13	5.2 *	3 J		MW-11-01	6 / 15	4.4	1 J	8 J	MW-14-01	0 / 5	--	--	--	--	MW-14-01 Deep Overburden
2-Methylnaphthalene	10	20	--	--	0 / 13	--	--	--	--	2 / 15	4.5 *	1 J	2 J	OW-27	0 / 5	--	--	--	--	OW-27 Deep Overburden
1,2-Dichlorobenzene	10	20	--	--	1 / 13	5.2 *	2 J		MW-11-01	3 / 15	4.4 *	2 J		MW-11-02	0 / 5	--	--	--	--	MW-11-01 Shallow Overburden
1,4-Dichlorobenzene	10	20	--	--	1 / 13	5.2 *	3 J		MW-11-01	4 / 15	4.5	2 J	5 J	MW-07-01	0 / 5	--	--	--	--	MW-07-01 Deep Overburden
Phenol	10	20	--	--	0 / 13	--	--	--	--	1 / 15	4.7 *	1.0 J		OW-30	1 / 5	5	5 J		MW-04-03	MW-04-03 Bedrock
2-Methylphenol	10	20	--	--	0 / 13	--	--	--	--	2 / 15	4.8	0.9 J	6 J	MW-14-01	0 / 5	--	--	--	--	MW-14-01 Deep Overburden
4-Methylphenol	10	20	--	--	0 / 13	--	--	--	--	3 / 15	5.5	2 J	17	MW-13-02	1 / 5	4.2 *	1 J		MW-04-03	MW-13-02 Deep Overburden
2,4-Dimethylphenol	10	20	--	--	0 / 13	--	--	--	--	2 / 15	4.6 *	0.9 J	3 J	MW-11-02	0 / 5	--	--	--	--	MW-11-02 Deep Overburden
4-Chloro-3-methylphenol	10	20	--	--	0 / 13	--	--	--	--	3 / 15	4.5 *	1 J	3 J	OW-27	0 / 5	--	--	--	--	OW-27 Deep Overburden
Pentachlorophenol	25	50	--	--	1 / 13	12.7 *	3 J		MW-13-01	0 / 15	--	--	--	--	0 / 5	--	--	--	--	MW-13-01 Shallow Overburden
Diethylphthalate	10	20	--	--	0 / 13	--	--	--	--	5 / 15	7.0	9 J	17	MW-07-01	1 / 5	4.1 *	0.7 J		MW-11-03	MW-07-01 Deep Overburden
Di-n-butylphthalate	10	20	--	--	1 / 13	5.0 *	0.5 J		MW-I	1 / 15	4.7 *	0.6 J		OW-27	0 / 5	--	--	--	--	OW-27 Deep Overburden
bis(2-Ethylhexyl)phthalate	10	20	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	1 / 5	12	36		MW-04-03	MW-04-03 Bedrock
PESTICIDES (µg/L)																				
gamma-BHC(Lindane)	0.050	0.053	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	2 / 5	0.02 *	0.0057 J	0.011 J	MW-07-02	MW-07-02 Bedrock
Aldrin	0.050	0.053	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	1 / 5	0.02 *	0.003 J		MW-07-02	MW-07-02 Bedrock
Dieldrin	0.10	0.11	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	1 / 5	0.04 *	0.0035 J		MW-04-03	MW-04-03 Bedrock
alpha-Chlordane	0.050	0.050	--	--	1 / 13	0.02 *	0.0030 J		MW-02-01	1 / 15	0.02 *	0.0028 J		MW-09-01	0 / 5	--	--	--	--	MW-02-01 Shallow Overburden
PCBs (µg/L)																				
Aroclor-1260	1.0	1.1	--	--	1 / 13	0.48 *	0.24 J		MW-05-01	1 / 15	0.49 *	0.16 J	J	MW-08-01	1 / 5	0.44 *	0.13 J		MW-08-02	MW-05-01 Shallow Overburden
METALS - UNFILTERED (µg/L)																				
Aluminum	13	31	19,700 J	201 J	13 / 13	16,000	1,010	55,600	MW-02-01	14 / 15	20,000	1,443 J	96,400 J	MW-07-01	2 / 5	640	1,410	1,570	MW-11-03	MW-07-01 Deep Overburden
Iron	6	12	31,500	--	13 / 13	41,000	3,640	118,000	MW-02-01	15 / 15	65,000	1,920 J	238,000	MW-07-01	4 / 5	2,800	1,270	5,080 J	MW-03-03	MW-07-01 Deep Overburden
Calcium	15	20	15,600	17,200	13 / 13	15,000	3,300	63,100	MW-11-01	15 / 15	34,000	5,230	91,900	MW-11-02	5 / 5	41,000	8,460 J	88,300	MW-07-02	MW-11-02 Deep Overburden
Magnesium	26	46	3,770	1,670	13 / 13	5,800	1,480	19,300	MW-11-01	15 / 15	13,000	1,560	52,000	MW-14-01	5 / 5	2,600	1,140 J	4,290	MW-04-03	MW-14-01 Deep Overburden
Sodium	13	57	15,400	8,190	9 / 13	15,000	4,570	75,100	MW-11-01	14 / 15	36,000	7,660	124,000	MW-14-01	5 / 5	31,000	10,500	59,500	MW-11-03	MW-14-01 Deep Overburden
Potassium	133	442	8,310	1,570	8 / 13	8,200	4,440	22,800	MW-11-01	13 / 15	24,000	2,870	139,000	MW-14-01	2 / 5	22,000	5,360	102,000	MW-07-02	MW-14-01 Deep Overburden
Antimony	25	47	--	--	1 / 13	20	74.2		MW-02-01	1 / 15	23	104.9		MW-12-02	0 / 5	--	--	--	--	MW-12-02 Deep Overburden
Arsenic	1	2	1.1	--	5 / 13	1.8	1.7	5.5	MW-II	7 / 15	2.5	1.1	9.7	MW-14-01	1 / 5	0.91	1 J		MW-03-03	MW-14-01 Deep Overburden

TABLE 4-12 (Continued). SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER, SEPTEMBER/OCTOBER 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	BACKGROUND CONCENTRATIONS SHALLOW OVERBURDEN	BACKGROUND CONCENTRATIONS BEDROCK	SHALLOW OVERBURDEN FREQUENCY OF DETECTION (3)	SHALLOW OVERBURDEN ARITHMETIC AVERAGE	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	SHALLOW OVERBURDEN MAXIMUM LOCATION	DEEP OVERBURDEN FREQUENCY OF DETECTION (3)	DEEP OVERBURDEN ARITHMETIC AVERAGE	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	DEEP OVERBURDEN MAXIMUM LOCATION	BEDROCK FREQUENCY OF DETECTION (3)	BEDROCK ARITHMETIC AVERAGE	BEDROCK RANGE OF CONCENTRATIONS (4) MINIMUM	BEDROCK RANGE OF CONCENTRATIONS (4) MAXIMUM	BEDROCK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	FLOW ZONE OF OVERALL MAX. LOC.
Barium	1	2	113	--	13 / 13	140	19.3	290	MW-11-01	13 / 15	180	26.6	454	MW-07-01	4 / 5	59	9.1	133	MW-08-02	MW-07-01	Deep Overburden
Beryllium	1		--	--	0 / 13	--	--	--	--	2 / 15	2.3	10.5 J	10.9	MW-07-01	0 / 5	--	--	--	--	MW-07-01	
Cadmium	3		--	--	0 / 13	--	--	--	--	1 / 15	4.1	39.9		OW-27	0 / 5	--	--	--	--	OW-27	Deep Overburden
Chromium	6	8	--	--	2 / 13	13.4	22.2	54.5 J	MW-02-01	5 / 15	24	17.5	141 J	MW-07-01	2 / 5	24	8.1 J	103 J	MW-07-02	MW-07-01	Deep Overburden
Cobalt	6	8	27.7	--	7 / 13	17.7	10.2	45.0	MW-I	6 / 15	18	14.0	53.8	MW-07-01	0 / 5	--	--	--	--	MW-07-01	Deep Overburden
Copper	4	5	--	--	7 / 13	42.7	12.4	104	MW-05-01	9 / 15	61	18.5	310	MW-07-01	0 / 5	--	--	--	--	MW-07-01	Deep Overburden
Lead	1	2	23.6	--	5 / 13	22.7	25.7	82.4	MW-02-01	7 / 15	42	10.9	307	MW-12-02	0 / 5	--	--	--	--	MW-12-02	Deep Overburden
Manganese	2		4,080	54.5 J	13 / 13	3,000	201	9,790	MW-04-01	15 / 15	2,500	489	9,995	MW-12-02	4 / 5	480	43.3 J	1,350	MW-08-02	MW-12-02	Deep Overburden
Mercury	0.2		--	--	1 / 13	0.11	0.22		MW-IV	1 / 15	0.11	0.28		OW-27	0 / 5	--	--	--	--	OW-27	Deep Overburden
Nickel	9	16	23.3		6 / 13	24	19.0	71.3	MW-12-01	6 / 15	33	26.8	125	MW-07-01	0 / 5	--	--	--	--	MW-07-01	Deep Overburden
Vanadium	3	5	15.9		8 / 13	22	6.5	101.0	MW-02-01	10 / 15	27	3 J	127	MW-07-01	1 / 5	3.6	9.8		MW-07-02	MW-07-01	Deep Overburden
Zinc	6	7	--	--	5 / 13	100	133 J	362 J	MW-02-01	6 / 15	630	103	7,360	OW-27	1 / 5	26	88.5 J		MW-03-03	OW-27	Deep Overburden
METALS - FILTERED (μg/L)																					
Aluminum	13	17	--	165 J	0 / 13	--	--	--	--	1 / 15	32	132 J		MW-03-02	0 / 5	--	--	--	--	MW-03-02	Deep Overburden (5)
Iron	6	7	3,150 J		10 / 13	17,000	89.0 J	56,900 J	MW-11-01	11 / 15	38,000	262 J	111,000 J	MW-07-01	0 / 5	--	--	--	--	MW-07-01	Deep Overburden
Calcium	8	20	11,000	17,300	12 / 13	12,000	3,110	61,700	MW-11-01	15 / 15	32,000	4,520	88,200	MW-11-02	5 / 5	40,000	8,355 J	88,400	MW-07-02	MW-07-02	Bedrock
Magnesium	14	26	1,890	1,750	13 / 13	3,200	660	18,400	MW-11-01	15 / 15	9,500	1,460	48,900	MW-14-01	5 / 5	2,200	404	4,240	MW-04-03	MW-14-01	Deep Overburden
Sodium	13	28	15,400	8,280	6 / 13	13,000	7,900	73,600	MW-11-01	13 / 15	36,000	7,940	146,000	MW-14-01	5 / 5	30,000	10,400	56,300	MW-07-02	MW-14-01	Deep Overburden
Potassium	73	442	3,930	1,740	3 / 13	4,500	11,700	21,400	MW-11-01	9 / 15	19,000	2,280	139,000	MW-14-01	2 / 5	22,000	5,260	104,000	MW-07-02	MW-14-01	Deep Overburden
Antimony	14	25	--	--	1 / 13	12	34.1		MW-04-01	2 / 15	11	12.0 J	20.4 J	OW-30	0 / 5	--	--	--	--	MW-04-01	Shallow Overburden
Arsenic	1	2	--	--	3 / 13	0.92	1.2 J	2.0	MW-II	4 / 15	1.5	2	7.7	MW-14-01	0 / 5	--	--	--	--	MW-14-01	Deep Overburden
Barium	1		15.9	--	7 / 13	34	13.2	251	MW-11-01	10 / 15	78	25.3	267	MW-11-02	4 / 5	47	5.0	108	MW-08-02	MW-11-02	Deep Overburden
Chromium	2	8	--	--	0 / 13	--	--	--	--	0 / 15	--	--	--	--	1 / 5	21	94.3		MW-07-02	MW-07-02	Bedrock
Cobalt	2	6	12.8	--	4 / 13	5.8	8.3	21.4	MW-IV	2 / 15	4.8	7.6	8.6	MW-14-01	0 / 5	--	--	--	--	MW-IV	Shallow Overburden
Copper	2	4	--	11.6	4 / 13	8.8	7.2	30.0	MW-IV	2 / 14	5.9	20.3	26.3	MW-03-02	0 / 5	--	--	--	--	MW-IV	Shallow Overburden
Lead	1		--	--	0 / 13	--	--	--	--	1 / 15	0.86	2.3		MW-09-01	0 / 5	--	--	--	--	MW-09-01	Deep Overburden
Manganese	1	2	3,560 J	--	11 / 13	2,000	38.1 J	6,660	MW-04-01	14 / 15	1,800	65.8 J	7,390 J	MW-12-02	4 / 5	240	2.0 J	603 J	MW-04-03	MW-12-02	Deep Overburden
Nickel	5	16	--	--	1 / 13	10	50.0		MW-12-01	5 / 15	11	10.0	31.5	MW-09-01	1 / 5	5.2 *	5.0		MW-04-03	MW-12-01	Shallow Overburden
Vanadium	2	3	--	--	0 / 13	--	--	--	--	0 / 14	--	--	--	--	1 / 5	1.6	3.0		MW-07-02	MW-07-02	Bedrock
Zinc	5	6	--	--	2 / 13	22	6.7 J	131	MW-12-01	3 / 15	15	8.4 J	54.2 J	MW-09-01	0 / 5	--	--	--	--	MW-12-01	Shallow Overburden
WATER QUALITY PARAMETERS																					
Sulfide (mg/L)	0.05		--	--	0 / 13	--	--	--	--	1 / 15	2.3	32 J		MW-05-02	0 / 5	--	--	--	--	MW-05-02	Deep Overburden
Cyanide (μg/L)	10		--	--	1 / 13	5.5	11.1 J		MW-V	0 / 15	--	--	--	--	0 / 5	--	--	--	--	MW-V	Shallow Overburden
Total Organic Carbon (mg/L)	0.5		19.0 J	--	9 / 13	16	7.3	63.9	MW-02-01	10 / 15	26	15.8 J	117.5 J	MW-14-01	1 / 5	2.9	7.8 J		MW-04-03	MW-14-01	Deep Overburden
Biochemical Oxygen Demand (mg/L)	1.0		--	--	4 / 13	3.8	4.0 J	12.7	MW-12-01	7 / 15	9.0	7.0 J	35.0	MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
Hardness (mg/L)	NA		54	50	13 / 13	61	14	237	MW-11-01	15 / 15	140	30	366	MW-14-01	5 / 5	110	26 J	226	MW-07-02	MW-14-01	Deep Overburden
pH	NA		6.2	7.1	13 / 13	6.7	5.8	8.2	MW-I	15 / 15	6.7	6.2	7.3	MW-02-02	5 / 5	8.8	7.5	12.5	MW-07-02	MW-07-02	Bedrock
Specific Conductance (μmhos/cm)	NA		200	110	13 / 13	160	26	440	MW-03-01	15 / 15	650	50	2,150	MW-14-01	5 / 5	440	140	1200	MW-07-02	MW-14-01	Deep Overburden

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.
5. The actual highest concentration for this chemical was detected in a background sample.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

-- Analyte was not detected in samples.

TABLE 4-13. SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER, JANUARY/FEBRUARY 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	MAXIMUM	BACKGROUND CONCENTRATIONS SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN FREQUENCY OF DETECTION (3)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (4) MINIMUM	MAXIMUM	MAXIMUM LOCATION	DEEP OVERBURDEN FREQUENCY OF DETECTION (3)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (4) MINIMUM	MAXIMUM	MAXIMUM LOCATION	BEDROCK FREQUENCY OF DETECTION (3)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (4) MINIMUM	MAXIMUM	MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	FLOW ZONE OF OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)																					
Benzene	10		--	--	1 / 4	6.5		11	MW-11-01	6 / 8	7.6	2 J	27	MW-14-01	2 / 4	4.8	4 J	5 J	MW-04-03	MW-14-01	Deep Overburden
Toluene	10		--	--	1 / 4	4.0 *		1 J	MW-02-01	5 / 8	12	1 J	52	MW-14-01	1 / 4	5.8	8 J		MW-04-03	MW-14-01	Deep Overburden
Ethylbenzene	10		--	--	2 / 4	6.0	1 J	13	MW-11-01	5 / 8	11	2 J	29	OW-27	0 / 4	--	--	--	--	OW-27	Deep Overburden
Total Xylenes	10		--	--	2 / 4	4.2	2 J	5 J	MW-11-01	6 / 8	24	6 J	78	OW-27	2 / 4	3.2 *	1 J	2 J	MW-04-03	OW-27	Deep Overburden
Chlorobenzene	10		--	--	2 / 4	3.5 *	2 J	2 J	MW-11-01	2 / 8	4.9	4 J	5 J	OW-27	0 / 4	--	--	--	--	OW-27	Deep Overburden
2-Butanone	10		--	--	0 / 4	--	--	--	--	0 / 8	--	--	--	--	1 / 4	41	150 J		MW-04-03	MW-04-03	Bedrock
4-Methyl-2-pentanone	10		--	--	0 / 4	--	--	--	--	1 / 8	5.4	8 J		MW-13-02	0 / 4	--	--	--	--	MW-13-02	Deep Overburden
Trichloroethene	10		--	--	0 / 4	--	--	--	--	0 / 8	--	--	--	--	1 / 4	4.5 *	3 J		MW-07-02	MW-07-02	Bedrock
1,1,1-Trichloroethane	10		--	--	0 / 4	--	--	--	--	0 / 8	--	--	--	--	1 / 4	4.5 *	3 J		MW-07-02	MW-07-02	Bedrock
1,2-Dichloroethene(total)	10		--	--	1 / 4	4.2 *		2 J	MW-11-01	3 / 8	5.1	1 J	9 J	MW-07-01	2 / 4	28	7 J	97	MW-07-02	MW-07-02	Bedrock
1,1-Dichloroethane	10		--	--	1 / 4	4.5 *		3 J	MW-11-01	5 / 8	5.4	2 J	12	OW-30	2 / 4	10	5 J	24	MW-07-02	MW-07-02	Bedrock
1,2-Dichloroethane	10		--	--	1 / 4	4.0 *		1 J	MW-11-01	0 / 8	--	--	--	--	0 / 4	--	--	--	--	MW-11-01	Shallow Overburden
1,2-Dichloropropane	10		--	--	1 / 4	4.5 *		3 J	MW-11-01	0 / 8	--	--	--	--	0 / 4	--	--	--	--	MW-11-01	Shallow Overburden
Chloroethane	10		--	--	2 / 4	12	9 J	27	MW-11-01	4 / 8	18	11	62	MW-11-02	1 / 4	5.0	5 J		MW-04-03	MW-11-02	Deep Overburden
Vinyl Chloride	10		--	--	0 / 4	--	--	--	--	0 / 8	--	--	--	--	1 / 4	10	24		MW-07-02	MW-07-02	Bedrock
Carbon Disulfide	10		--	--	0 / 4	--	--	--	--	2 / 8	4.0 *	1 J	1 J	MW-10-01	0 / 4	--	--	--	--	MW-10-01	Deep Overburden
WATER SOLUBLE ORGANICS (µg/L)																					
N,N-DMF	50		--	--	0 / 4	--	--	--	--	2 / 8	110	257 J	495	MW-14-01	2 / 4	490	469	1,440 J	MW-07-02	MW-07-02	Bedrock
SEMIVOLATILE ORGANICS (µg/L)																					
Naphthalene	10		--	--	1 / 4	4.8 *		4 J	MW-11-01	4 / 8	5.2	2 J	9 J	MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
2-Methylnaphthalene	10		--	--	0 / 4	--	--	--	--	1 / 8	5.0	5 J		OW-27	0 / 4	--	--	--	--	OW-27	Deep Overburden
1,2-Dichlorobenzene	10		--	--	1 / 4	4.5 *		3 J	MW-11-01	1 / 8	4.6 *	2 J		MW-11-02	0 / 4	--	--	--	--	MW-11-01	Shallow Overburden
1,3-Dichlorobenzene	10		--	--	0 / 4	--	--	--	--	1 / 8	5.0	5 J		MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
1,4-Dichlorobenzene	10		--	--	1 / 4	5.0		5 J	MW-11-01	4 / 8	3.5 *	1 J	3 J	MW-11-02	0 / 4	--	--	--	--	MW-11-01	Shallow Overburden
2-Methylphenol	10		--	--	0 / 4	--	--	--	--	0 / 8	--	--	--	--	1 / 4	4.2 *	2 J		MW-04-03	MW-04-03	Bedrock
4-Methylphenol	10		--	--	0 / 4	--	--	--	--	1 / 8	13	72		MW-13-02	0 / 4	--	--	--	--	MW-13-02	Deep Overburden
2,4-Dimethylphenol	10		--	--	0 / 4	--	--	--	--	2 / 8	4.9	3 J	6 J	MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
Diethylphthalate	10		--	--	2 / 4	5.5	5 J	7 J	MW-03-01	5 / 8	6.1	1 J	16	OW-27	1 / 4	4.0 *	1 J		MW-04-03	OW-27	Deep Overburden
Di-n-butylphthalate	10		--	--	0 / 4	--	--	--	--	2 / 8	4.1 *	1 J	2 J	MW-14-01	2 / 4	3.8 *	2 J	3 J	MW-07-02	MW-07-02	Bedrock
PESTICIDES (µg/L)																					
beta-BHC	0.05	0.056	--	--	0 / 4	--	--	--	--	1 / 8	0.03	0.094 J		MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
gamma-BHC(Lindane)	0.05	0.056	--	--	0 / 4	--	--	--	--	1 / 8	0.02 *	0.0051 J		MW-07-01	1 / 4	0.03 *	0.024 J		MW-07-02	MW-07-02	Bedrock
4,4'-DDD	0.10	0.11	--	--	1 / 4	0.04 *	0.0050 J		MW-02-01	0 / 8	--	--	--	--	0 / 4	--	--	--	--	MW-02-01	Shallow Overburden
4,4'-DDT	0.10	0.11	--	--	0 / 4	--	--	--	--	1 / 8	0.05 *	0.016 J		MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
Methoxychlor	0.50	0.56	--	--	0 / 4	--	--	--	--	1 / 8	0.23 *	0.013 J		MW-11-02	0 / 4	--	--	--	--	MW-11-02	Deep Overburden
Heptachlor	0.05	0.056	--	0.0023 J	0 / 4	--	--	--	--	0 / 8	--	--	--	--	0 / 4	--	--	--	--	MW-01-02	Background
Heptachlor Epoxide	0.05	0.056	--	--	0 / 4	--	--	--	--	1 / 8	0.02 *	0.0063 J		MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
Endosulfan II	0.10	0.11	--	--	0 / 4	--	--	--	--	1 / 8	0.05 *	0.0066 J		MW-14-01	1 / 4	0.04 *	0.0026 J		MW-04-03	MW-14-01	Deep Overburden
Aldrin	0.05	0.056	--	--	0 / 4	--	--	--	--	1 / 8	0.02 *	0.0043 J		MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
Dieldrin	0.10	0.11	--	--	0 / 4	--	--	--	--	0 / 8	--	--	--	--	1 / 4	0.04 *	0.0034 J		MW-04-03	MW-04-03	Bedrock
Endrin Ketone	0.10	0.11	--	--	1 / 4	0.04 *	0.0028 J		MW-11-01	2 / 8	0.04 *	0.0032 J	0.0066 J	OW-27	0 / 4	--	--	--	--	OW-27	Deep Overburden
alpha-Chlordane	0.05	0.056	--	--	0 / 4	--	--	--	--	1 / 8	0.23 *	0.0036 J		MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
PCBs																					
None Detected																					
METALS - UNFILTERED (µg/L)																					
Aluminum	20	66	43,300	433	4 / 4	37,000	20,400	55,100	MW-04-01	8 / 8	23,000	3,050	110,000	MW-07-01	4 / 4	510	28.5	906	MW-07-02	MW-07-01	Deep Overburden
Iron	11	35	71,200	13,700	4 / 4	79,000	38,450	114,000	MW-04-01	8 / 8	91,000	13,000	268,000	MW-07-01	4 / 4	14,000	858	37,100	MW-03-03	MW-07-01	Deep Overburden
Calcium	39	92	18,700	20,600	4 / 4	30,000	10,190	64,300	MW-11-01	8 / 8	44,000	5,430	87,600	OW-27	4 / 4	40,000	9,670	82,500	MW-07-02	OW-27	Deep Overburden
Magnesium	49	69	7,540	1,900	4 / 4	12,000	6,145	21,500	MW-11-01	8 / 8	17,000	3,260	44,700	MW-14-01	4 / 4	3,000	1,650	4,080	MW-04-03	MW-14-01	Deep Overburden
Sodium	34	38	16,400	10,700	4 / 4	28,000	6,460	69,700	MW-11-01	8 / 8	40,000	6,470	106,000	MW-11-02	4 / 4	36,000	10,900	58,800	MW-07-02	MW-11-02	Deep Overburden
Potassium	76	130	11,700	2,250	4 / 4	14,000	6,375	23,700	MW-11-01	8 / 8	31,000	4,340	119,000	MW-14-01	4 / 4	21,000	1,020	76,500	MW-07-02	MW-14-01	Deep Overburden
Barium	1	4	213	12.8	4 / 4	270	94.4	370	MW-03-01	8 / 8	200	48.9	508	MW-07-01	3 / 4	34	7.0	87.7	MW-11-03	MW-07-01	Deep Overburden
Beryllium	1		5.1 J	--	4 / 4	5.7	2.6	9.2 J	MW-03-01	4 / 8	2.8	1.5 J	13.7	OW-27	0 / 4	--	--	--	--	MW-07-01	Deep Overburden
Cadmium	1		--	--	0 / 4	--	--	--	--	1 / 8	5.0	33.8 J		MW-07-01	0 / 4	--	--	--	--	OW-27	Deep Overburden
Chromium	2	4	57.5	--	2 / 4	24	27.8 J	51.6	MW-04-01	4 / 8	30	5.6 J	154	MW-07-01	1 / 4	4.5	13.0 J		MW-07-02	MW-07-01	Deep Overburden
Cobalt	3		101	--	4 / 4	22	10.0	31.6	MW-04-01	7 / 8	17	5.3	53.8	MW-07-01	0 / 4	--	--	--	--	MW-12-02	Deep Overburden (5)

TABLE 4-13 (Continued). SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER, JANUARY/FEBRUARY 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	BACKGROUND CONCENTRATIONS SHALLOW OVERBURDEN	BACKGROUND CONCENTRATIONS BEDROCK	SHALLOW OVERBURDEN FREQUENCY OF DETECTION (3)	SHALLOW OVERBURDEN ARITHMETIC AVERAGE	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	SHALLOW OVERBURDEN MAXIMUM LOCATION	DEEP OVERBURDEN FREQUENCY OF DETECTION (3)	DEEP OVERBURDEN ARITHMETIC AVERAGE	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	DEEP OVERBURDEN MAXIMUM LOCATION	BEDROCK FREQUENCY OF DETECTION (3)	BEDROCK ARITHMETIC AVERAGE	BEDROCK RANGE OF CONCENTRATIONS (4) MINIMUM	BEDROCK RANGE OF CONCENTRATIONS (4) MAXIMUM	BEDROCK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	FLOW ZONE OF OVERALL MAX. LOC.
Iron	11	35	71,200	13,700	4 / 4	79,000	38,450	114,000	MW-04-01	8 / 8	91,000	13,000	268,000	MW-07-01	4 / 4	14,000	858	37,100	MW-03-03	MW-07-01	Deep Overburden
Calcium	39	92	18,700	20,600	4 / 4	30,000	10,190	64,300	MW-11-01	8 / 8	44,000	5,430	87,600	OW-27	4 / 4	40,000	9,670	82,500	MW-07-02	OW-27	Deep Overburden
Magnesium	49	69	7,540	1,900	4 / 4	12,000	6,145	21,500	MW-11-01	8 / 8	17,000	3,260	44,700	MW-14-01	4 / 4	3,000	1,650	4,080	MW-04-03	MW-14-01	Deep Overburden
Sodium	34	38	16,400	10,700	4 / 4	28,000	6,460	69,700	MW-11-01	8 / 8	40,000	6,470	106,000	MW-11-02	4 / 4	36,000	10,900	58,800	MW-07-02	MW-11-02	Deep Overburden
Potassium	76	130	11,700	2,250	4 / 4	14,000	6,375	23,700	MW-11-01	8 / 8	31,000	4,340	119,000	MW-14-01	4 / 4	21,000	1,020	76,500	MW-07-02	MW-14-01	Deep Overburden
Barium	1	4	213	12.8	4 / 4	270	94.4	370	MW-03-01	8 / 8	200	48.9	508	MW-07-01	3 / 4	34	7.0	87.7	MW-11-03	MW-07-01	Deep Overburden
Beryllium	1		5.1 J	--	4 / 4	5.7	2.6	9.2 J	MW-03-01	4 / 8	2.8	1.5 J	13.7	OW-27	0 / 4	--	--	--	--	MW-07-01	Deep Overburden
Cadmium	1		--	--	0 / 4	--	--	--	--	1 / 8	5.0	33.8 J		MW-07-01	0 / 4	--	--	--	--	OW-27	Deep Overburden
Chromium	2	4	57.5	--	2 / 4	24	27.8 J	51.6	MW-04-01	4 / 8	30	5.6 J	154	MW-07-01	1 / 4	4.5	13.0 J		MW-07-02	MW-07-01	Deep Overburden
Cobalt	3		101	--	4 / 4	22	10.0	31.6	MW-04-01	7 / 8	17	5.3	53.8	MW-07-01	0 / 4	--	--	--	--	MW-12-02	Deep Overburden (5)
Copper	3		115	--	3 / 4	38	33.7 J	73.3 J	MW-04-01	5 / 8	67	19.5 J	367	MW-07-01	0 / 4	--	--	--	--	MW-07-01	Deep Overburden
Lead	1		64.4	--	3 / 4	29	19.3 J	53.0	MW-04-01	3 / 8	29	15.9	148	OW-27	0 / 4	--	--	--	--	OW-27	Deep Overburden
Manganese	1		1,600	113	4 / 4	4,600	2,510	9,130	MW-04-01	8 / 8	2,400	290	5,610	MW-07-01	4 / 4	250	22.8	651	MW-04-03	MW-04-01	Shallow Overburden
Mercury	0.2		--	--	0 / 3	--	--	--	--	1 / 8	0.13	0.29		OW-27	0 / 1	--	--	--	--	OW-27	Deep Overburden
Nickel	4		30.0	--	4 / 4	25	19.3	34.2	MW-04-01	7 / 8	30	6.0	99.4	MW-07-01	1 / 4	3.5	8.0		MW-04-03	MW-07-01	Deep Overburden
Vanadium	2	3	36.3	--	4 / 4	42	27.2	67.2 J	MW-04-01	8 / 8	30	3.7	142 J	MW-07-01	1 / 4	3.0	8.6		MW-07-02	MW-07-01	Deep Overburden
Zinc	4	11	139	--	4 / 4	140	73.5	210 J	MW-04-01	6 / 8	920	25.7 J	6,320	OW-27	1 / 4	5.6	13.2 J		MW-11-03	OW-27	Deep Overburden
METALS - FILTERED (μg/L)																					
Aluminum	66		96.9	--	1 / 4	430	1,610		MW-04-01	1 / 8	45	131		MW-11-02	1 / 4	44	75.0		MW-11-03	MW-04-01	Shallow Overburden
Iron	35		251 J	45.7 J	4 / 4	24,000	764 J	58,000 J	MW-11-01	7 / 8	51,000	20,900 J	101,000 J	OW-27	4 / 4	200	114 J	310 J	MW-03-03	OW-27	Deep Overburden
Calcium	92		5,030	19,500	4 / 4	25,000	8,770	60,900	MW-11-01	8 / 8	41,000	4,220	81,100	MW-11-02	4 / 4	34,000	9,570	57,300	MW-07-02	MW-11-02	Deep Overburden
Magnesium	69		832	1,690	4 / 4	7,100	2,395	18,400	MW-11-01	8 / 8	12,000	1,550	44,200	MW-14-01	4 / 4	2,400	551	4,050	MW-04-03	MW-14-01	Deep Overburden
Sodium	34		12,400	9,920	4 / 4	28,000	5,320	68,400	MW-11-01	8 / 8	39,000	7,880	107,000	MW-11-02	4 / 4	36,000	10,600	61,300	MW-07-02	MW-11-02	Deep Overburden
Potassium	76		2,390	1,910	4 / 4	9,300	2,015	20,500	MW-11-01	8 / 8	25,000	600	116,000	MW-14-01	4 / 4	22,000	1,020	79,500	MW-07-02	MW-14-01	Deep Overburden
Antimony	31		--	--	0 / 4	--	--	--	--	1 / 8	18	31.5		OW-27	0 / 4	--	--	--	--	OW-27	Deep Overburden
Barium	1		--	--	3 / 4	80	39.9	222	MW-11-01	6 / 8	89	38.3	246	MW-11-02	2 / 4	26	34.0	69.0	MW-11-03	MW-11-02	Deep Overburden
Chromium	2		--	--	0 / 4	--	--	--	--	1 / 8	24	183 J		OW-27	1 / 4	4.9	16.6 J		MW-07-02	OW-27	Deep Overburden
Cobalt	3		--	--	1 / 4	5.4	9.9		MW-04-01	2 / 8	4.6	8.7	13.8	MW-04-02	0 / 4	--	--	--	--	MW-04-02	Deep Overburden
Copper	3		--	--	0 / 4	--	--	--	--	1 / 7	1.8	3.3		MW-10-01	0 / 4	--	--	--	--	MW-10-01	Deep Overburden
Manganese	1		159	31.2	4 / 4	2,800	1,335	5,290	MW-04-01	8 / 8	1,500	11.4	3,855	MW-13-02	3 / 4	190	55.2	547	MW-04-03	MW-04-01	Shallow Overburden
Mercury	0.2		--	--	0 / 4	--	--	--	--	0 / 8	--	--	--	--	2 / 4	0.18	0.23 J	0.29	MW-04-03	MW-04-03	Bedrock
Nickel	4		--	--	0 / 4	--	--	--	--	1 / 8	15	102 J		OW-27	0 / 4	--	--	--	--	OW-27	Deep Overburden
Vanadium	3		--	--	1 / 4	2.0	3.7		MW-11-01	2 / 8	2.8	4.0	9.3	MW-14-01	1 / 4	2.6	2.8		MW-07-02	MW-14-01	Deep Overburden
Zinc	11		--	--	1 / 4	7.6	13.7		MW-04-01	3 / 7	7.7	9 J	12.0	MW-07-01	0 / 4	--	--	--	--	MW-04-01	Shallow Overburden
WATER QUALITY PARAMETERS																					
Sulfide (mg/L)	1		--	--	0 / 4	--	--	--	--	1 / 8	1.1	4.94		MW-14-01	0 / 4	--	--	--	--	MW-14-01	Deep Overburden
Cyanide	Not Detected																				
Total Organic Carbon (mg/L)	0.5		15	11	4 / 4	52	28	105	MW-11-01	8 / 8	74	10	220	MW-14-01	3 / 4	15	6.3	34	MW-04-03	MW-14-01	Deep Overburden
Biochemical Oxygen Demand (mg/L)	1		--	--	1 / 4	5.7	19 J		MW-11-01	4 / 8	11	8.7	39 J	MW-13-02	1 / 4	4.6	17		MW-04-03	MW-13-02	Deep Overburden
Hardness (mg/L)	NA		78	59	4 / 4	120	51	249	MW-11-01	8 / 8	180	35	329	MW-14-01	4 / 4	110	31	218	MW-07-02	MW-14-01	Deep Overburden
pH	NA		6.2	7.8	4 / 4	6	6	6.8	MW-04-01	8 / 8	6.6	6.4	6.9	MW-04-02	4 / 4	8.1	6.2	11.2	MW-07-02	MW-07-02	Bedrock
Specific Conductance (μmhos)	NA		68	150	4 / 4	680	280	1,300	MW-11-01	8 / 8	910	125	1,800	MW-11-02	4 / 4	600	130	1,500	MW-07-02	MW-11-02	Deep Overburden

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.
5. The actual highest concentration for this chemical was detected in a background sample.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

-- Analyte was not detected in samples.

R = All sample values were rejected.

TABLE 4-14. SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER, APRIL 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	BACKGROUND CONCENTRATIONS SHALLOW OVERBURDEN	BACKGROUND CONCENTRATIONS BEDROCK	SHALLOW OVERBURDEN FREQUENCY OF DETECTION (3)	SHALLOW OVERBURDEN ARITHMETIC AVERAGE	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	SHALLOW OVERBURDEN MAXIMUM LOCATION	DEEP OVERBURDEN FREQUENCY OF DETECTION (3)	DEEP OVERBURDEN ARITHMETIC AVERAGE	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	DEEP OVERBURDEN MAXIMUM LOCATION	BEDROCK FREQUENCY OF DETECTION (3)	BEDROCK ARITHMETIC AVERAGE	BEDROCK RANGE OF CONCENTRATIONS (4) MINIMUM	BEDROCK RANGE OF CONCENTRATIONS (4) MAXIMUM	BEDROCK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	FLOW ZONE OF OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)																					
Benzene	10	40	--	--	1 / 4	4.0 *	1 J		MW-12-01	4 / 7	5.4	3 J	8 J	MW-06-02	1 / 2	5.0	5 J		MW-07-02	MW-06-02	Deep Overburden
Toluene	10	40	--	--	2 / 4	33	12	110	MW-II	2 / 7	14	26	47	MW-07-01	0 / 2	--	--	--	--	MW-II	Shallow Overburden
Ethylbenzene	10	40	--	--	1 / 4	4.5 *	3 J		MW-12-01	4 / 7	10	3 J	22	OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
Total Xylenes	10	40	--	--	1 / 4	6.0	9 J		MW-12-01	4 / 7	17	6 J	50.5	OW-27	1 / 2	3.5 *	2 J		MW-07-02	OW-27	Deep Overburden
Chlorobenzene	10	40	--	--	2 / 4	5.5	1 J	11	MW-12-01	2 / 7	4.8 *	4 J	4.5 J	OW-27	0 / 2	--	--	--	--	MW-12-01	Shallow Overburden
Styrene	10	40	--	--	0 / 4	--	--	--	--	1 / 7	5.7	10		OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
Acetone	10	40	--	--	1 / 4	79	300		MW-II	1 / 7	71	470		OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
2-Butanone	10	40	--	--	0 / 4	--	--	--	--	0 / 7	--	--	--	--	1 / 2	8.0	11		MW-07-02	MW-07-02	Bedrock
Trichloroethene	10	40	--	--	0 / 4	--	--	--	--	0 / 7	--	--	--	--	1 / 2	3.5 *	2 J		MW-07-02	MW-07-02	Bedrock
1,1,1-Trichloroethane	10	40	--	--	0 / 4	--	--	--	--	0 / 7	--	--	--	--	1 / 2	3.5 *	2 J		MW-07-02	MW-07-02	Bedrock
1,1-Dichloroethene	10	40	--	--	0 / 4	--	--	--	--	0 / 7	--	--	--	--	1 / 2	3.0 *	1 J		MW-07-02	MW-07-02	Bedrock
1,2-Dichloroethene(total)	10	40	--	--	0 / 4	--	--	--	--	5 / 7	35	1 J	130	MW-07-01	1 / 2	42	78		MW-07-02	MW-07-01	Deep Overburden
1,1-Dichloroethane	10	40	--	--	1 / 4	4.5 *	3 J		MW-12-01	3 / 7	20	2 J	100	OW-30	1 / 2	14	22		MW-07-02	OW-30	Deep Overburden
Chloroethane	10	40	--	--	1 / 4	6.0	9 J		MW-12-01	4 / 7	19	5.5 J	58	MW-06-02	0 / 2	--	--	--	--	MW-06-02	Deep Overburden
Vinyl Chloride	10	40	--	--	0 / 4	--	--	--	--	3 / 7	78	8.5 J	340	OW-30	1 / 2	8.5	12		MW-07-02	OW-30	Deep Overburden
Carbon Disulfide	10	40	1 J	11	1 / 4	4.5 *	3 J		MW-06-01	0 / 7	--	--	--	--	1 / 2	5.5 *	2 J		MW-08-02	MW-06-01	Shallow Overburden (5)
WATER SOLUBLE ORGANICS (µg/L)																					
N,N-DMF	50		--	--	0 / 4	--	--	--	--	1 / 7	42	142		OW-30	1 / 2	650	1,270		MW-07-02	MW-07-02	Bedrock
SEMIVOLATILE ORGANICS - CLP (µg/L)																					
Naphthalene	10		--	--	1 / 4	4.0 *	0.8 J		MW-12-01	3 / 7	4.2 *	2 J	4 J	MW-06-02	0 / 2	--	--	--	--	MW-06-02	Deep Overburden
2-Methylnaphthalene	10		--	--	0 / 4	--	--	--	--	1 / 7	4.6 *	2.5 J		OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
1,2-Dichlorobenzene	10		--	--	0 / 4	--	--	--	--	2 / 7	3.9 *	1 J		MW-06-02	0 / 2	--	--	--	--	MW-06-02	Deep Overburden
1,4-Dichlorobenzene	10		--	--	1 / 4	4.0 *	1 J		MW-12-01	2 / 7	4.3 *	1.5 J	3.5 J	MW-07-01	0 / 2	--	--	--	--	MW-07-01	Deep Overburden
4-Chloroaniline	10		--	--	1 / 4	4.0 *	1 J		MW-II	0 / 7	--	--	--	--	0 / 2	--	--	--	--	MW-II	Shallow Overburden
Phenol	10		--	7 J	0 / 4	--	--	--	--	0 / 7	--	--	--	--	0 / 2	--	--	--	--	MW-01-02	Background
2-Methylphenol	10		--	--	2 / 4	3.5 *	0.9 J	3 J	MW-II	0 / 7	--	--	--	--	0 / 2	--	--	--	--	MW-II	Shallow Overburden
4-Methylphenol	10		--	--	1 / 4	19	60		MW-II	2 / 7	8.1	6.5 J	25	OW-30	0 / 2	--	--	--	--	MW-II	Shallow Overburden
2,4-Dimethylphenol	10		--	--	0 / 4	--	--	--	--	2 / 7	4.3 *	1 J	4 J	MW-06-02	0 / 2	--	--	--	--	MW-06-02	Deep Overburden
4-Chloro-3-methylphenol	10		--	--	0 / 4	--	--	--	--	2 / 7	4.3	0.9 J	4.5 J	OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
Diethylphthalate	10		--	--	0 / 4	--	--	--	--	3 / 7	6.8	7 J	11.5	MW-07-01	0 / 2	--	--	--	--	MW-07-01	Deep Overburden
Di-n-butylphthalate	10		--	--	0 / 4	--	--	--	--	1 / 7	4.4 *	0.9 J		OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
bis(2-Ethylhexyl)phthalate	10		--	--	0 / 4	--	--	--	--	1 / 7	4.4 *	0.9 J		MW-06-02	0 / 2	--	--	--	--	MW-06-02	Deep Overburden
PESTICIDES (µg/L)																					
delta-BHC	0.05		--	--	2 / 4	0.02 *	0.009 J	0.010 J	MW-II	1 / 7	0.02 *	0.006 J		MW-07-01	0 / 2	--	--	--	--	MW-II	Shallow Overburden
PCBs																					
None Detected																					
METALS - UNFILTERED (µg/L)																					
Aluminum	22		10,800	--	4 / 4	15,000	2,780	24,200 J	MW-II	6 / 7	8,600	3,460 J	25,850 J	MW-07-01	2 / 2	360	278 J	445 J	MW-08-02	MW-07-01	Deep Overburden
Iron	23		12,100	30,900	4 / 4	61,000	10,900	114,000 J	MW-II	7 / 7	56,000	8,830 J	114,500 J	MW-07-01	1 / 2	4,800	9,430 J		MW-08-02	MW-07-01	Deep Overburden
Calcium	34		11,500	14,100	4 / 4	10,000	6,230	14,300	MW-12-01	7 / 7	30,000	5,520	74,150	OW-27	2 / 2	33,000	25,500	40,500	MW-07-02	OW-27	Deep Overburden
Magnesium	22		2,940	1,500	4 / 4	4,700	2,400	7,100	MW-II	7 / 7	6,700	1,140	22,900	MW-06-02	2 / 2	2,700	1,300	4,140	MW-08-02	MW-06-02	Deep Overburden
Sodium	67		13,000	13,600	4 / 4	9,500	7,130 J	15,000	MW-06-01	7 / 7	23,000	6,730	101,000	MW-06-02	2 / 2	32,000	10,600	52,500	MW-07-02	MW-06-02	Deep Overburden
Potassium	82		4,370	2,590	4 / 4	8,700	4,330	16,500	MW-06-01	7 / 7	12,000	1,640	43,800	MW-06-02	2 / 2	36,000	4,420	67,700	MW-07-02	MW-07-02	Bedrock
Antimony	16		--	--	1 / 4	10	17.5		MW-05-01	0 / 7	--	--	--	--	0 / 2	--	--	--	--	MW-05-01	Shallow Overburden
Barium	1		79.8 J	18.6 J	4 / 4	98	60.8 J	146	MW-12-01	6 / 7	94	27.6	232 J	MW-06-02	2 / 2	72	25.8	118	MW-08-02	MW-06-02	Deep Overburden
Beryllium	1		1.4	--	3 / 4	2.3	2.6	3.4	MW-II	3 / 7	1.2	1.1	3.35	MW-07-01	0 / 2	--	--	--	--	MW-II	Shallow Overburden
Cadmium	2		--	--	0 / 4	--	--	--	--	1 / 7	3.7	19.55 J		OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
Chromium	3		11.5	--	3 / 4	22	4.2	54.3 J	MW-II	3 / 7	13.1	18.6	33.4 J	MW-07-01	0 / 2	--	--	--	--	MW-II	Shallow Overburden
Cobalt	3		31.6	--	3 / 4	12	8.3	26.2	MW-II	4 / 7	7.4	3.2	22.1	OW-27	0 / 2	--	--	--	--	MW-II	Shallow Overburden (5)
Copper	2		24.4	--	2 / 4	28	43 J	55.9	MW-05-01	6 / 7	38	16.35 J	68.75 J	MW-07-01	0 / 2	--	--	--	--	MW-07-01	Deep Overburden
Lead	1	5	22.1	--	3 / 4	23	24 J	39.9 J	MW-II	3 / 7	17	7.8 J	69.85 J	OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
Manganese	1		444	330	4 / 4	3,000	220	6,960	MW-12-01	7 / 7	1,000	338	1,760	MW-07-01	1 / 2	1,700	3,380		MW-08-02	MW-12-01	Shallow Overburden

TABLE 4-14 (Continued). SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER, APRIL 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	BACKGROUND CONCENTRATIONS SHALLOW OVERBURDEN	BACKGROUND CONCENTRATIONS BEDROCK	SHALLOW OVERBURDEN FREQUENCY OF DETECTION (3)	SHALLOW OVERBURDEN ARITHMETIC AVERAGE	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	SHALLOW OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	SHALLOW OVERBURDEN MAXIMUM LOCATION	DEEP OVERBURDEN FREQUENCY OF DETECTION (3)	DEEP OVERBURDEN ARITHMETIC AVERAGE	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MINIMUM	DEEP OVERBURDEN RANGE OF CONCENTRATIONS (4) MAXIMUM	DEEP OVERBURDEN MAXIMUM LOCATION	BEDROCK FREQUENCY OF DETECTION (3)	BEDROCK ARITHMETIC AVERAGE	BEDROCK RANGE OF CONCENTRATIONS (4) MINIMUM	BEDROCK RANGE OF CONCENTRATIONS (4) MAXIMUM	BEDROCK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	FLOW ZONE OF OVERALL MAX. LOC.
Mercury	0.2		--	--	0 / 4	--	--	--	--	1 / 7	0.13	0.3 J		OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
Nickel	3		9.3	4.8	2 / 4	17	3.6	49.4 J	MW-II	3 / 7	14	15.8	40.3 J	OW-27	0 / 2	--	--	--	--	MW-II	Shallow Overburden
Vanadium	2		--	--	3 / 4	20	19.7	35.2	MW-II	2 / 7	9.4	17.15	31.9	MW-07-01	0 / 2	--	--	--	--	MW-II	Shallow Overburden
Zinc	11		28.2 J	--	3 / 4	81	52.6 J	192 J	MW-II	7 / 7	450	18.8 J	2750 J	OW-27	1 / 2	9.4	13.3 J		MW-07-02	OW-27	Deep Overburden
METALS - FILTERED (μg/L)																					
Iron	23	5	--	--	3 / 4	39,000	3,040	80,300	MW-II	6 / 7	36,000	4,740	89,850	OW-27	1 / 2	2,900	5,770		MW-08-02	OW-27	Deep Overburden
Calcium	28	4	4,190	14,500	4 / 4	9,100	5,230	14,000	MW-12-01	7 / 7	29,000	5,150	66,100	OW-27	2 / 2	29,000	20,900	36,300	MW-07-02	OW-27	Deep Overburden
Magnesium	22	5	756	1,560	4 / 4	2,300	1,670	2,940	MW-12-01	7 / 7	5,100	1,150	22,200	MW-06-02	2 / 2	2,000	505	3,590	MW-08-02	MW-06-02	Deep Overburden
Sodium	34	7	14,000	14,300	4 / 4	9,000	5,430	15,300	MW-06-01	7 / 7	23,000	6,860	104,000	MW-06-02	2 / 2	33,000	10,800	55,000	MW-07-02	MW-06-02	Deep Overburden
Potassium	82	94	1,950	2,820	4 / 4	6,000	747	16,400	MW-06-01	7 / 7	10,000	787	44,000	MW-06-02	2 / 2	37,000	4,340	69,400	MW-07-02	MW-07-02	Bedrock
Barium	1	5	--	--	3 / 4	38	29.2	76.2	MW-12-01	3 / 7	49	36.7	215	MW-06-02	2 / 2	62	28.7	95.3	MW-08-02	MW-06-02	Deep Overburden
Lead	1	5	--	--	0 / 4	--	--	--	--	1 / 7	1.4	2.3		OW-27	0 / 2	--	--	--	--	OW-27	Deep Overburden
Manganese	1		47.4	64.8	4 / 4	2,700	26.4	6,770	MW-12-01	6 / 7	790	416	1,340	MW-06-02	1 / 2	1,400	2,800		MW-08-02	MW-12-01	Shallow Overburden
Nickel	3	5	--	--	0 / 4	--	--	--	--	2 / 7	4.5	5.8	18.3	MW-12-02	0 / 2	--	--	--	--	MW-12-02	Deep Overburden
Zinc	8	1	--	--	1 / 4	9.5	23 J		MW-12-01	2 / 7	11	18.4 J	35.8 J	MW-12-02	0 / 2	--	--	--	--	MW-12-02	Deep Overburden
WATER QUALITY PARAMETERS																					
Cyanide - Not Detected																					
Ammonia (mg/L)	0.0300		--	0.0750	3 / 4	5.9	0.320	17.1	MW-II	6 / 7	9.8	0.0340	51.7	MW-06-02	2 / 2	0.59	0.300	0.880	MW-08-02	MW-06-02	Deep Overburden
Total Organic Carbon (mg/L)	0.50		9.3	12.7	4 / 4	31	7.9	55.0 J	MW-II	7 / 7	48	9.7	99.5	OW-27	2 / 2	87	24.0	150	MW-07-02	MW-07-02	Bedrock
Biochemical Oxygen Demand (mg/L)	1.0		--	2.2	2 / 3	6.3	4.9	13.4 J	MW-II	5 / 5	17	1.0	31.5 J	OW-30	2 / 2	2.6	1.6	3.7	MW-07-02	OW-30	Deep Overburden
Hardness (mg/L)	NA		41	41	4 / 4	44	26	62	MW-II	7 / 7	100	18	257	MW-06-02	2 / 2	94	81	106	MW-07-02	MW-06-02	Deep Overburden
pH	NA		7.7	8.4	4 / 4	6.3	5.9	6.6	MW-II	7 / 7	6.5	6.2	6.7	MW-08-01	2 / 2	9.4	7.1	11.7	MW-07-02	MW-06-01	Shallow Overburden
Specific Conductance (μmhos/cm)	NA		100	150	4 / 4	860	78	2500	MW-06-01	7 / 7	360	77	730	MW-06-02	2 / 2	620	200	1050	MW-07-02	MW-07-02	Bedrock

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.
5. The actual highest concentration for this chemical was detected in a background sample.

* The calculated average is greater than the maximum value

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

-- Analyte was not detected in samples.

TABLE 4-15. SUMMARY OF CHEMICALS DETECTED IN RESIDENTIAL WELLS, JUNE 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	MAXIMUM	FREQUENCY OF DETECTION (3)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (4) MINIMUM	MAXIMUM	MAXIMUM LOCATION
VOLATILE ORGANICS (μg/L)							
Ethylbenzene	1.0		1 / 9	0.60	1.4		RES#3
o-Xylene	1.0		1 / 9	0.53	0.8 J		RES#3
Trichloroethene	5		1 / 9	2.0	2 J		RES#9
1,1-Dichloroethane	1.0		1 / 9	0.79	3.1		RES#3
Chloroethane	1.0		1 / 9	0.56	1.0		RES#3
Carbon Disulfide	1.0		1 / 9	1.8	12.0		RES#3
SEMIVOLATILE ORGANICS							
None Detected							
PESTICIDES/PCBs							
None Detected							
METALS - UNFILTERED (μg/L)							
Aluminum	10	27	2 / 9	100	294 J	470 J	RES#3
Iron	7	18	5 / 9	9,300	180 J	81,000 J	RES#3
Calcium	7	28	9 / 9	8,500	4,670	17,800	RES#3
Magnesium	13	33	9 / 9	2,000	1,190	4,580	RES#3
Sodium	22	30	9 / 9	12,000	5,890	31,400	RES#7
Potassium	42	251	9 / 9	2,000	619	7,470	RES#4
Barium	1	2	6 / 9	12	5.8	44.3	RES#4
Copper	3	11	2 / 9	14	11 J	58.6	RES#9
Manganese	1	9	6 / 9	1,200	21.4 J	3,100 J	RES#3
METALS - FILTERED (μg/L)							
Aluminum	10	27	1 / 9	41	175		RES#4
Iron	7	18	2 / 9	3,400	774	30,000	RES#3
Calcium	7	28	9 / 9	8,700	4,890	18,500	RES#3
Magnesium	13	33	9 / 9	2,000	1,030	4,890	RES#3
Sodium	22	30	9 / 9	13,000	5,320	32,500	RES#7
Potassium	42	251	9 / 9	2,000	491	7,420	RES#4
Antimony	11	17	3 / 9	8.2	8.6 J	14.1	RES#6
Barium	1	2	3 / 9	11	18.6	41.2	RES#4
Copper	3	11	3 / 9	8.5	7.7	29.6	RES#4
Manganese	1	9	7 / 9	1,100	11.6	3,100	RES#1
Nickel	4	6	2 / 9	3.4	6.9	8.0	RES#9
Zinc	3	8	1 / 9	13	57.3		RES#2
WATER QUALITY PARAMETERS							
Sulfide (mg/L)	0.05		9 / 9	1.6	0.45	3.70	RES#3
Cyanide	Not Detected						
Total Organic Carbon (mg/L)	1.0		1 / 9	1.1	5.6 J		RES#3
Biochemical Oxygen Demand	Not Detected						
Hardness (mg/L)	NA		9 / 9	29	17	63	RES#3
pH	NA		9 / 9	6.4	5.9	7.8	RES#7
Specific Conductance (μmhos/cm)	NA		9 / 9	240	95	520	RES#4

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-16. SUMMARY OF CHEMICALS DETECTED IN RESIDENTIAL WELLS, SEPTEMBER/OCTOBER 1991 (1)

CHEMICAL	DETECTION LIMIT	FREQUENCY OF DETECTION (2)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (3) MINIMUM	MAXIMUM	MAXIMUM LOCATION
VOLATILE ORGANICS - 524 (µg/L)						
Benzene	1	1 / 9	0.53	0.8 J		RES#3
Toluene	1	2 / 9	0.91	0.6 J	4.1 J	RES#7
Ethylbenzene	1	1 / 9	0.46 *	0.1 J		RES#7
Trichloroethene	1	2 / 9	0.62	0.6 J	1.5	RES#2
trans-1,2-Dichloroethene	1	1 / 9	0.48 *	0.3 J		RES#4
1,1-Dichloroethane	1	1 / 9	0.66	1.9		RES#3
WATER SOLUBLE ORGANICS (µg/L)						
N,N-DMF	50	2 / 9	21 *	1.9 J	14 J	RES#3
SEMIVOLATILE ORGANICS (µg/L)						
4-Methylphenol	10	1 / 9	11	63		RES#3
PESTICIDES/PCBs						
None Detected						
METALS - UNFILTERED (µg/L)						
Aluminum	13	1 / 9	94	552 J		RES#3
Iron	6	6 / 9	7,000	160	41,700	RES#2
Calcium	20	9 / 9	11,000	3,220	23,400	RES#4
Magnesium	26	9 / 9	2,000	708	4,520	RES#3
Sodium	13	9 / 9	11,000	7,110	17,700	RES#9
Potassium	442	1 / 9	860	4,010		RES#3
Barium	1	2 / 9	5.5	15.2	20.7	RES#5
Copper	4	2 / 9	16	51.8	58.4	RES#2
Manganese	2	7 / 9	810	2.6	3,100	RES#1
METALS - FILTERED (µg/L)						
Iron	6	4 / 9	230	117	1,050	RES#1
Calcium	20	9 / 9	11,000	3,210	23,000	RES#4
Magnesium	26	9 / 9	2,100	757	4,550	RES#3
Sodium	13	9 / 9	11,000	6,870	16,800	RES#9
Potassium	442	1 / 9	920	3,880		RES#3
Antimony	25	2 / 9	18	28.4	32.4	RES#9
Arsenic	1	1 / 9	0.56	1.0		RES#3
Barium	1	1 / 9	3.9	19.7		RES#5
Manganese	2	6 / 9	780	8.4	3,160	RES#1
WATER QUALITY PARAMETERS						
Sulfide	Not Detected					
Cyanide	Not Detected					
Total Organic Carbon (mg/L)	0.5	7 / 9	3.5	0.8	17.7 J	RES#3
Biochemical Oxygen Demand (mg/L)	1.0	1 / 9	3.0	22.0		RES#3
Hardness (mg/L)	NA	9 / 9	35	11	67	RES#4
pH	NA	9 / 9	6.7	5.8	7.5	RES#7
Specific Conductance (µmhos/cm)	NA	9 / 9	120	55	180	RES#3

NOTES:

1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-17. SUMMARY OF CHEMICALS DETECTED IN RESIDENTIAL WELLS, JANUARY/FEBRUARY 1992 (1)

CHEMICAL	DETECTION LIMITS	FREQUENCY OF DETECTION (2)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (3) MINIMUM	MAXIMUM	MAXIMUM LOCATION
VOLATILE ORGANICS - (μg/L)						
Acetone	5.0	1 / 3	1.9 *	0.6 J		RES#8
WATER SOLUBLE ORGANICS						
None Detected						
SEMIVOLATILE ORGANICS						
None Detected						
PESTICIDES (μg/L)						
Dieldrin	0.10	1 / 3	0.03 *	0.002 J		RES#7
Endrin Aldehyde	0.10	1 / 3	0.07	0.10 J		RES#7
Endrin Ketone	0.10	1 / 3	0.07	0.10 J		RES#7
PCBs						
None Detected						
METALS - UNFILTERED (μg/L)						
Aluminum	20	2 / 3	22	20.0	36.6	RES#10
Iron	11	1 / 3	260	742		RES#8
Calcium	39	3 / 3	12,000	7,390	14,400	RES#10
Magnesium	49	3 / 3	2,200	2,110	2,220	RES#10
Sodium	38	3 / 3	310,000	12,300	891,000	RES#10
Potassium	130	3 / 3	910	572	1,220	RES#8
Manganese	1	2 / 3	330	4.1	978	RES#8
Mercury	0.2	1 / 1	0.46	0.46 J		RES#10
Zinc	4	1 / 3	56	165		RES#10
METALS - FILTERED (μg/L)						
Iron	35	2 / 3	87	94.2 J	149 J	RES#8
Calcium	92	3 / 3	12,000	7,310	15,300	RES#10
Magnesium	69	3 / 3	2,100	1,970	2,240	RES#10
Sodium	34	3 / 3	20,000	12,300	24,900	RES#7
Potassium	76	3 / 3	900	724	1,220	RES#8
Manganese	1	1 / 3	310	932		RES#8
Zinc	11	1 / 3	8.7	15.1		RES#8
WATER QUALITY PARAMETERS						
Sulfide	Not Detected					
Cyanide	Not Detected					
Total Organic Carbon (mg/L)	0.50	3 / 3	9.8	8.3	12	RES#7
Biochemical Oxygen Demand - Not Detected						
Hardness (mg/L)	NA	3 / 3	38	27	45	RES#10
pH	NA	2 / 2	7.2	6.1	8.3	RES#10
Specific Conductance (μmhos/cm)	NA	3 / 3	190	165	220	RES#10

NOTES:

1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred. * The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-17a. SUMMARY OF CHEMICALS DETECTED IN RESIDENTIAL WELLS, SEPTEMBER 1993 (1)

CHEMICAL	DETECTION LIMITS	FREQUENCY OF DETECTION (2)	ARITHMETIC AVERAGE	RANGE OF CONCENTRATIONS (3) MINIMUM	MAXIMUM	MAXIMUM LOCATION
VOLATILE ORGANICS - 524 (µg/L)						
Bromodichloromethane	1.0	3 / 3	1.0	1.0 J		RES#7
WATER SOLUBLE ORGANICS						
None Detected						
SEMIVOLATILE ORGANICS						
None Detected						
PESTICIDES (µg/L)						
None Detected						
PCBs						
None Detected						
METALS - UNFILTERED (µg/L) (4)						
Aluminum	31	1 / 7	49	90.6		RES#11
Iron	8.0	1 / 7	120	203		RES#11
Calcium	200	1 / 7	4,712 *	3,520		RES#11
Magnesium	114	1 / 7	1,124	1,450		RES#11
Sodium	183	1 / 7	7,977 *	7,030		RES#11
Potassium	796	1 / 7	708	1,140		RES#11
Barium	6.0	1 / 7	4.3	8.5		RES#11
Copper	3.0	1 / 7	34	142		RES#11
Lead	3.0	1 / 7	2.3	7.0		RES#9
Manganese	2.0	3 / 7	461	30	2,120	RES#6
Zinc	7.0	1 / 7	4.4	10.1		RES#9
METALS - FILTERED (µg/L) (4)						
Calcium	200	1 / 7	4,770 *	3,455		RES#11
Magnesium	114	1 / 7	1,114	1,415		RES#11
Potassium	796	1 / 7	677	1,130		RES#11
Arsenic	3.0	1 / 7	1.8	3.6		RES#5
Barium	6.0	1 / 7	4.4	7.6		RES#11
Copper	3.0	1 / 7	26	116.5 J		RES#11
Manganese	2.0	3 / 7	454	30	2,070	RES#6
WATER QUALITY PARAMETERS						
pH	NA	7 / 7	6.6	5.70	8.24	RES#7
Specific Conductance (µmhos/cm)	NA	7 / 7	108	66	150	RES#10

NOTES:

1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred. * The calculated average is greater than the maximum value.
4. Includes analysis of antimony at lower detection limit.

NA = Not Applicable

* = The calculated average is greater than the maximum value.

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

TABLE 4-18. SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER, JUNE 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (3)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (3)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	UNNAMED BROOK FREQUENCY OF DETECTION (3)	UNNAMED BROOK CONCEN-TRATIONS	UNNAMED BROOK LOCATION	UNNAMED TRIBUTARY FREQUENCY OF DETECTION (3)	UNNAMED TRIBUTARY CONCEN-TRATIONS	UNNAMED TRIBUTARY LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)																				
Benzene		5	0 / 6	—	—	—	—	1 / 6	2.6	3 J		SW-12	0 / 1	—	—	0 / 1	—	—	SW-12	Mitchell Brook
Total Xylenes		5	1 / 6	3.6	9		SW-05	1 / 6	3.4	8		SW-07	0 / 1	—	—	0 / 1	—	—	SW-05	Saugatucket
Chlorobenzene		5	0 / 6	—	—	—	—	1 / 6	2.4 *	2 J		SW-12	0 / 1	—	—	0 / 1	—	—	SW-12	Mitchell Brook
1,2-Dichloroethene(total)		5	0 / 6	—	—	—	—	1 / 6	2.8	4 J		SW-14	0 / 1	—	—	0 / 1	—	—	SW-14	Mitchell Brook
Chloroethane		10	0 / 6	—	—	—	—	1 / 6	5.2	6 J		SW-12	0 / 1	—	—	0 / 1	—	—	SW-12	Mitchell Brook
Carbon Disulfide		5	4 / 6	4.5	4 J	10 J	SW-08	1 / 6	2.2 *	1 J		SW-09	0 / 1	—	—	0 / 1	—	—	SW-08	Saugatucket
SEMIVOLATILE ORGANICS (µg/L)																				
bis(2-Ethylhexyl)phthalate		10	0 / 6	—	—	—	—	1 / 6	5.5	8 J		SW-09	0 / 1	—	—	0 / 1	—	—	SW-09	Mitchell Brook
PESTICIDES/PCBs																				
None Detected																				
METALS - UNFILTERED (µg/L)																				
Aluminum	10	27	1 / 6	39	88.5 J		SW-02	5 / 6	480	177 J	968 J	SW-12	0 / 1	—	—	1 / 1	272 J	SW-01	SW-12	Mitchell Brook
Iron	7	18	6 / 6	6,500	234	34,600	SW-05	6 / 6	14,000	547 J	65,000 J	SW-12	1 / 1	5,140 J	SW-10	1 / 1	3,250 J	SW-01	SW-12	Mitchell Brook
Calcium	7	28	6 / 6	8,500	3,950	27,100	SW-05	6 / 6	7,000	2,430	23,200	SW-12	1 / 1	11,100	SW-10	1 / 1	2,980	SW-01	SW-05	Saugatucket
Magnesium	13	33	6 / 6	3,500	1,270	12,900	SW-05	6 / 6	2,300	960	7,380	SW-12	1 / 1	2,680	SW-10	1 / 1	1,070	SW-01	SW-05	Saugatucket
Sodium	22	30	6 / 6	17,000	7,900	59,900	SW-05	6 / 6	12,000	6,550	35,300	SW-12	1 / 1	9,930	SW-10	1 / 1	6,840	SW-01	SW-05	Saugatucket
Potassium	42	251	6 / 6	8,500	777	45,000	SW-05	6 / 6	3,000	650	11,600	SW-12	1 / 1	2,970	SW-10	1 / 1	1,050	SW-01	SW-05	Saugatucket
Arsenic	2	4	1 / 6	2.2	4.1		SW-05	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-05	Saugatucket
Barium	1	2	5 / 6	52	5.3	279	SW-05	3 / 6	37	10.6	173	SW-12	1 / 1	31.6	SW-10	0 / 1	—	—	SW-05	Saugatucket
Manganese	1	9	6 / 6	530	22.2 J	2,030	SW-05	6 / 6	570	29.6	1,610 J	SW-12	1 / 1	1,690	SW-10	1 / 1	161	SW-01	SW-05	Saugatucket
Nickel	4	6	0 / 6	—	—	—	—	0 / 6	—	—	—	—	0 / 1	—	—	1 / 1	5.0	SW-01	SW-01	Unnamed trib.
Zinc	3	8	0 / 6	—	—	—	—	2 / 6	11	20.5	22.8	SW-12	0 / 1	—	—	0 / 1	—	—	SW-12	Mitchell Brook
METALS - FILTERED (µg/L)																				
Aluminum	10	27	1 / 6	41	116 J		SW-05	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-05	Saugatucket
Iron	7	18	4 / 6	570	361 J	1,520 J	SW-05	6 / 6	1,500	194 J	4,890	SW-12	1 / 1	3,620 J	SW-10	1 / 1	787 J	SW-01	SW-12	Mitchell Brook
Calcium	7	28	6 / 6	5,000	4,130	7,140	SW-08	6 / 6	6,500	2,430	20,100	SW-12	1 / 1	11,300	SW-10	1 / 1	2,970	SW-01	SW-12	Mitchell Brook
Magnesium	13	33	6 / 6	1,600	1,370	2,180	SW-08	6 / 6	2,100	873	6,320	SW-12	1 / 1	2,800	SW-10	1 / 1	1,020	SW-01	SW-12	Mitchell Brook
Sodium	22	30	6 / 6	10,000	8,310	12,350	SW-08	6 / 6	13,000	8,090	31,700	SW-12	1 / 1	12,100	SW-10	1 / 1	9,010	SW-01	SW-12	Mitchell Brook
Potassium	42	251	6 / 6	1,200	859	2,025	SW-08	6 / 6	2,800	684	9,840	SW-12	1 / 1	3,170	SW-10	1 / 1	1,120	SW-01	SW-12	Mitchell Brook
Antimony	11	17	1 / 6	7.9	10.7 J		SW-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-08	Saugatucket
Barium	1	2	1 / 6	3.9	6.6		SW-05	2 / 6	22	24.1	92.9	SW-12	1 / 1	30.2	SW-10	0 / 1	—	—	SW-12	Mitchell Brook
Lead	1	2	0 / 6	—	—	—	—	1 / 6	1.8	3.3		SW-09	0 / 1	—	—	0 / 1	—	—	SW-09	Mitchell Brook
Manganese	1	9	6 / 6	240	17.6	550	SW-08	6 / 6	520	16.4 J	1,450	SW-12	1 / 1	1,740 J	SW-10	1 / 1	134 J	SW-01	SW-10	Unnamed brook
Nickel	4	6	0 / 6	—	—	—	—	1 / 6	2.8	5.0 J		SW-09	0 / 1	—	—	0 / 1	—	—	SW-09	Mitchell Brook
Silver	2	4	1 / 6	1.6	1.8 J		SW-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-08	Saugatucket
WATER QUALITY PARAMETERS																				
Sulfide (mg/L)	0.05		6 / 6	1.4	0.64	2.2	SW-02	6 / 6	1.4	0.32	1.90	SW-14	1 / 1	1.90	SW-10	1 / 1	0.80	SW-01	SW-02	Saugatucket
Cyanide	Not Detected																			
Total Organic Carbon	Not Detected																			
Hardness (mg/L)	NA		6 / 6	36	15.1	121	SW-05	6 / 6	27	10	88	SW-12	1 / 1	39	SW-10	1 / 1	11.8	SW-01	SW-05	Saugatucket
pH	NA		6 / 6	5.9	5.77	6.02	SW-06	6 / 6	5.8	5.52	6.18	SW-07	1 / 1	7.2	SW-10	1 / 1	5.52	SW-01	SW-10	Unnamed brook
Specific Conductance (µmhos/cm)	NA		6 / 6	93	77	133	SW-08	6 / 6	270	55	1,200	SW-12	1 / 1	26	SW-10	1 / 1	73	SW-01	SW-12	Mitchell Brook
Dissolved Oxygen (mg/L)	NA		6 / 6	8.7	6.62	9.66	SW-03	6 / 6	6.6	1.85	8.40	SW-07	1 / 1	6.48	SW-10	1 / 1	1.9	SW-01	SW-03	Saugatucket
Biochemical Oxygen Demand (mg/L)	2.4		0 / 6	--	—	--	--	0 / 6	—	--	—	—	0 / 1	—	—	1 / 1	2.8 J	SW-01	SW-01	Unnamed trib.

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-19. SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER, SEPTEMBER/OCTOBER 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (3)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (3)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	UNNAMED BROOK FREQUENCY OF DETECTION (3)	UNNAMED BROOK CONCEN-TRATIONS	UNNAMED BROOK LOCATION	UNNAMED TRIBUTARY FREQUENCY OF DETECTION (3)	UNNAMED TRIBUTARY CONCEN-TRATIONS	UNNAMED TRIBUTARY LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)																				
Toluene		10	1 / 7	4.6 *	2 J		SW-05	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-05	Saugatucket
Carbon Disulfide		10	4 / 7	5.9	3 J	14	SW-03	1 / 6	4.5 *	2 J		SW-12	0 / 1	—	—	0 / 1	—	—	SW-03	Saugatucket
WATER SOLUBLE ORGANICS (µg/L)																				
Acrylamide		200	0 / 7	—	—	—	—	1 / 6	130	272 J		SW-12	0 / 1	—	—	0 / 1	—	—	SW-12	Mitchell Brook
N,N-DMF		50	0 / 7	—	—	—	—	0 / 6	—	—	—	—	1 / 1	5 J	SW-10	0 / 1	—	—	SW-10	Unnamed brook
SEMIVOLATILE ORGANICS (µg/L)																				
None Detected																				
PESTICIDES (µg/L)																				
gamma-BHC(Lindane)		0.050	0 / 7	—	—	—	—	0 / 6	—	—	—	—	1 / 1	0.002 J	SW-10	0 / 1	—	—	SW-10	Unnamed brook
PCBs																				
None Detected																				
METALS - UNFILTERED (µg/L)																				
Aluminum	13	31	3 / 7	130	121 J	331 J	SW-04	0 / 6	—	—	—	—	0 / 1	—	--	1 / 1	573 J	SW-01	SW-01	Unnamed trib.
Iron	6	12	5 / 7	1,000	882 J	1,825 J	SW-08	3 / 6	1,600	292 J	5,000 J	SW-07	1 / 1	6,160 J	SW-10	1 / 1	1,360 J	SW-01	SW-10	Unnamed brook
Calcium	15	20	7 / 7	5,200	4,010	6,740	SW-08	6 / 6	5,200	3,650 J	10,000	SW-12	1 / 1	9,110	SW-10	1 / 1	2,500	SW-01	SW-12	Mitchell Brook
Magnesium	26	46	7 / 7	1,700	1,460	2,075	SW-08	6 / 6	1,700	1,210 J	3,260	SW-12	1 / 1	2,060	SW-10	1 / 1	975	SW-01	SW-12	Mitchell Brook
Sodium	13	57	7 / 7	11,000	9,640	12,500	SW-08	6 / 6	13,000	10,800	18,800	SW-12	1 / 1	9,545	SW-10	1 / 1	4,620	SW-01	SW-12	Mitchell Brook
Potassium	133	442	0 / 7	—	—	—	—	1 / 6	1,100	4,220		SW-12	0 / 1	—	--	0 / 1	—	—	SW-12	Mitchell Brook
Antimony	25	47	1 / 7	14	25.0		SW-04	1 / 6	15	28.8		SW-07	0 / 1	—	--	0 / 1	—	—	SW-07	Mitchell Brook
Arsenic	1	2	1 / 7	0.57	1		SW-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-08	Saugatucket
Barium	1	2	2 / 7	6.1	9.1	13.2	SW-06	4 / 6	13	9.1	28.4	SW-12	1 / 1	24.9	SW-10	0 / 1	—	—	SW-12	Mitchell Brook
Copper	4	5	1 / 7	5.6	11.6		SW-04	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-04	Saugatucket
Manganese		2	7 / 7	270	42.3	470	SW-08	4 / 6	220	10.2	708	SW-12	1 / 1	1,410	SW-10	1 / 1	155	SW-01	SW-10	Unnamed brook
Zinc	6	7	0 / 7	—	—	—	—	1 / 6	9.1	17.9 J		SW-09	0 / 1	—	—	0 / 1	—	—	SW-09	Mitchell Brook
METAL - FILTERED (µg/L)																				
Aluminum	13	17	4 / 7	190	132 J	620	SW-03	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-03	Saugatucket
Iron	6	7	6 / 7	530	241 J	997	SW-03	2 / 6	890	1,950	3,160	SW-12	1 / 1	3,325 *	SW-10	1 / 1	440	SW-01	SW-10	Unnamed brook
Calcium	8	20	7 / 7	5,600	4,390	7,170 J	SW-11	6 / 6	5,200	3,790 J	9,830	SW-12	1 / 1	9,530 *	SW-10	1 / 1	2,530	SW-01	SW-12	Mitchell Brook
Magnesium	14	26	7 / 7	1,800	1,480	2,160 J	SW-11	6 / 6	1,700	1,220 J	3,120	SW-12	1 / 1	2,430	SW-10	1 / 1	904	SW-01	SW-12	Mitchell Brook
Sodium	13	38	7 / 7	12,000	11,400	14,800	SW-11	6 / 6	14,000	10,600	20,200	SW-12	1 / 1	10,900	SW-10	0 / 1	—	—	SW-12	Mitchell Brook
Potassium	73	442	0 / 7	—	—	—	—	1 / 6	1,000	3,810		SW-12	0 / 1	—	--	0 / 1	—	—	SW-12	Mitchell Brook
Barium		1	3 / 7	7.7	8.5	13.2	SW-05	4 / 6	9.8	4.0	25.2	SW-12	1 / 1	22.7	SW-10	0 / 1	—	—	SW-12	Mitchell Brook
Chromium	2	8	2 / 7	7.0	13.1	13.5	SW-05	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-05	Saugatucket
Copper	2	4	3 / 7	12	9.8	29.8	SW-05	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-05	Saugatucket
Manganese	1	2	6 / 7	300	136	547	SW-03	4 / 6	200	9.4	690	SW-12	1 / 1	1,295	SW-10	1 / 1	102	SW-01	SW-10	Unnamed brook
Zinc	5	6	0 / 7	—	—	—	—	1 / 6	15	36.6 J		SW-09	0 / 1	—	—	0 / 1	—	—	SW-09	Mitchell Brook
WATER QUALITY PARAMETERS																				
Sulfide	Not Detected																			
Cyanide (µg/L)		10	1 / 7	5.7	10.2 J		SW-04	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SW-04	Saugatucket
Total Organic Carbon (mg/L)		0.5	7 / 7	5.8	4.9 J	7.2 J	SW-02	6 / 6	4.5	3.2 J	5.4 J	SW-12	1 / 1	3.4 J	SW-10	1 / 1	9.9 J	SW-01	SW-01	Unnamed trib.
Hardness (mg/L)		NA	7 / 7	20	16	25	SW-08	6 / 6	20	14 J	38.4	SW-12	1 / 1	31	SW-10	1 / 1	10	SW-01	SW-12	Mitchell Brook
pH		NA	7 / 7	6.2	5.7	6.5	SW-05	6 / 6	5.9	5.3	7.0	SW-12	1 / 1	5.9	SW-10	1 / 1	4.4	SW-01	SW-12	Mitchell Brook
Specific Conductance (µmhos/cm)		NA	7 / 7	120	91	170	SW-05	6 / 6	100	29	222	SW-12	1 / 1	146	SW-10	1 / 1	50	SW-01	SW-12	Mitchell Brook
Dissolved Oxygen (mg/L)		NA	7 / 7	9.0	7.7	10.2	SW-02	6 / 6	9.0	8.6	9.5	SW-13	1 / 1	8.4	SW-10	1 / 1	8	SW-01	SW-02	Saugatucket
Biochemical Oxygen Demand (mg/L)		1.0	2 / 4	0.82	1.1	1.2 J	SW-08	1 / 3	0.70	1.1		SW-12	1 / 1	0.9 J	SW-10	0 / 1	—	—	SW-08	Saugatucket

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-20. SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER, JANUARY/FEBRUARY 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (3)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (3)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	UNNAMED BROOK FREQUENCY OF DETECTION (3)	UNNAMED BROOK CONCEN-TRATIONS	UNNAMED BROOK LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)																	
Carbon Disulfide		10	1 / 4	4.2 *	2 J		SW-05	2 / 3	5.0	1 J	9 J	SW-12	1 / 1	6 J	SW-10	SW-12	Mitchell Brook
WATER SOLUBLE ORGANICS																	
None Detected																	
SEMIVOLATILE ORGANICS (µg/L)																	
Dimethylphthalate	10	250	1 / 4	34 *	1 J		SW-04	0 / 3	—	—	—	—	0 / 1	—	—	SW-04	Saugatucket
Diethylphthalate	10	250	0 / 4	—	—	—	—	1 / 3	4.0 *	2 J		SW-12	0 / 1	—	—	SW-12	Mitchell Brook
Di-n-butylphthalate	10	250	0 / 4	—	—	—	—	1 / 3	4.3 *	3 J		SW-12	0 / 1	—	—	SW-12	Mitchell Brook
PESTICIDES (µg/L)																	
4,4'-DDD		0.10	1 / 4	0.04 *	0.00 J		SW-11	0 / 3	—	—	—	—	0 / 1	—	—	SW-11	Saugatucket
Methoxychlor		0.50	1 / 4	0.19 *	0.01 J		SW-11	0 / 3	—	—	—	—	0 / 1	—	—	SW-11	Saugatucket
PCBs																	
None Detected																	
METALS - UNFILTERED (µg/L)																	
Aluminum		66	4 / 4	110	105	140	SW-04	3 / 3	130	109	147	SW-09	1 / 1	160	SW-10	SW-10	Unnamed brook
Iron		35	4 / 4	660	108	1360	SW-05	3 / 3	740	280	1,105	SW-12	1 / 1	6,500	SW-10	SW-10	Unnamed brook
Calcium		92	4 / 4	3,600	3,030	4,060	SW-11	3 / 3	3,200	2,810	3,660	SW-12	1 / 1	8,110	SW-10	SW-10	Unnamed brook
Magnesium		69	4 / 4	1,400	1,250	1,510	SW-11	3 / 3	1,200	1,070	1,335	SW-12	1 / 1	2,160	SW-10	SW-10	Unnamed brook
Sodium		34	4 / 4	9,500	9,290	10,100	SW-11	3 / 3	8,700	8,080	9,330	SW-12	1 / 1	7,910	SW-10	SW-11	Saugatucket
Potassium		76	4 / 4	870	612	1,090	SW-11	3 / 3	680	472	889	SW-12	1 / 1	2,350	SW-10	SW-10	Unnamed brook
Barium		1	0 / 4	—	—	—	—	1 / 3	6.9	10.8		SW-12	1 / 1	25.2	SW-10	SW-10	Unnamed brook
Manganese		1	4 / 4	150	62.5 J	195	SW-05	3 / 3	120	53.4 J	173	SW-12	1 / 1	905	SW-10	SW-10	Unnamed brook
Zinc		11	0 / 4	—	—	—	—	0 / 3	—	—	—	—	1 / 1	17.2 J	SW-10	SW-10	Unnamed brook
METALS - FILTERED (µg/L)																	
Aluminum		66	4 / 4	95	89.2	102	SW-06	3 / 3	120	114	126	SW-09	0 / 1	—	—	SW-09	Mitchell Brook
Iron		35	4 / 4	430	82.1 J	702 J	SW-05	3 / 3	620	232 J	940 J	SW-12	1 / 1	3,660 J	SW-10	SW-10	Unnamed brook
Calcium		92	4 / 4	3,700	3,270	4,210	SW-11	3 / 3	3,500	3,160	3,770	SW-12	1 / 1	7,850	SW-10	SW-10	Unnamed brook
Magnesium		69	4 / 4	1,300	1,240	1,460	SW-11	3 / 3	1,200	1,100	1,325	SW-12	1 / 1	2,080	SW-10	SW-10	Unnamed brook
Sodium		34	4 / 4	11,000	10,700	11,300	SW-11	3 / 3	11,000	10,100	11,500	SW-07	1 / 1	7,490	SW-10	SW-07	Mitchell Brook
Potassium		76	4 / 4	910	701	1,130	SW-11	3 / 3	830	603	999	SW-12	1 / 1	2,140	SW-10	SW-10	Unnamed brook
Barium		1	0 / 4	—	—	—	—	0 / 3	—	—	—	—	1 / 1	24.7	SW-10	SW-10	Unnamed brook
Manganese		1	4 / 4	130	56.0	172	SW-11	3 / 3	110	52.7	166	SW-12	1 / 1	789	SW-10	SW-10	Unnamed brook
Zinc		11	0 / 4	—	—	—	—	1 / 3	9.6	17.9		SW-07	1 / 1	14.9	SW-10	SW-07	Mitchell Brook
WATER QUALITY PARAMETERS																	
Sulfide	Not Detected																
Cyanide	Not Detected																
Total Organic Carbon (mg/L)		0.5	4 / 4	6.0	5.0	7.0	SW-11	3 / 3	4.5	3.3	5.7	SW-12	1 / 1	11	SW-10	SW-10	Unnamed brook
Hardness (mg/L)		NA	4 / 4	15	13	16	SW-11	3 / 3	13	11	15	SW-12	1 / 1	29	SW-10	SW-10	Unnamed brook
pH		NA	4 / 4	6.2	6.0	6.5	SW-06	3 / 3	6.0	5.4	6.4	SW-12	1 / 1	6.4	SW-10	SW-06	Saugatucket
Specific Conductance (µmhos/cm)		NA	4 / 4	300	90	900	SW-04	3 / 3	83	80	90	SW-12	1 / 1	130	SW-10	SW-04	Saugatucket
Dissolved Oxygen (mg/L)		NA	2 / 2	13	12.5	13.2	SW-05	NA	—	—	—	—	NA	—	—	SW-05	Saugatucket
Biochemical Oxygen Demand																	
Not Detected																	

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-21. SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER, APRIL 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS (2) MINIMUM	RANGE OF DETECTION LIMITS (2) MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (3)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (4) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (3)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (4) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/L)														
Carbon Disulfide		10	1 / 5	4.2 *	1 J		SW-04	0 / 3	—	—	—	—	SW-04	Saugatucket
WATER SOLUBLE ORGANICS														
None Detected														
SEMIVOLATILE ORGANICS														
None Detected														
PESTICIDES/PCBs														
None Detected														
METALS UNFILTERED (µg/L)														
Iron		23	3 / 5	500	636 J	861 J	SW-11	2 / 3	920	1,300	1,310	SW-07	SW-07	Mitchell Brook
Calcium		34	5 / 5	3,700	3,240	4,690	SW-11	3 / 3	3,500	2,870	4,260	SW-12	SW-11	Saugatucket
Magnesium		22	5 / 5	1,300	1,210	1,590	SW-11	3 / 3	1,300	1,050	1,500	SW-12	SW-11	Saugatucket
Sodium		67	5 / 5	8,800	8,285	9,790	SW-11	3 / 3	9,200	8,150	10,400	SW-12	SW-12	Mitchell Brook
Potassium		82	5 / 5	860	624	1,190	SW-11	3 / 3	910	590	1,320	SW-12	SW-12	Mitchell Brook
Antimony		16	1 / 5	10	19.8		SW-11	1 / 3	14	24.8		SW-09	SW-09	Mitchell Brook
Barium		1	2 / 5	5.8	8.6 J	8.85 J	SW-04	2 / 3	11	12.6 J	15.7 J	SW-12	SW-12	Mitchell Brook
Chromium		3	0 / 5	—	—	—	—	1 / 3	2.1	3.2		SW-12	SW-12	Mitchell Brook
Manganese		1	5 / 5	140	20.6	237	SW-11	3 / 3	140	51.1	212	SW-12	SW-11	Saugatucket
METALS FILTERED (µg/L)														
Iron	23	25	1 / 5	310	866		SW-05	2 / 3	790	1,050	1,170	SW-07	SW-07	Mitchell Brook
Calcium	28	34	5 / 5	4,100	3,510	5,050	SW-11	2 / 3	3,200	3,300	4,570	SW-12	SW-11	Saugatucket
Magnesium	22	55	5 / 5	1,400	1,250	1,640	SW-11	3 / 3	1,300	1,100	1,540	SW-12	SW-11	Saugatucket
Sodium	34	67	5 / 5	10,000	9,380	10,500	SW-06	3 / 3	11,000	9,070	12,500	SW-12	SW-12	Mitchell Brook
Potassium	82	194	5 / 5	980	729	1,320	SW-11	3 / 3	970	654	1,350	SW-12	SW-12	Mitchell Brook
Manganese	1		5 / 5	140	20.2	245	SW-11	3 / 3	140	52.8	207	SW-12	SW-11	Saugatucket
Zinc	8	11	1 / 5	10	31.3 J		SW-05	0 / 3	—	—	—	—	SW-05	Saugatucket
WATER QUALITY PARAMETERS														
Cyanide	Not Detected													
Ammonia (mg/L)	0.0300		5 / 5	0.32	0.042	0.640	SW-06	2 / 3	0.23	0.220	0.460	SW-12	SW-06	Saugatucket
Total Organic Carbon (mg/L)	0.50		5 / 5	6.2	5.4	7.9	SW-11	3 / 3	5.0	4.5	5.7	SW-12	SW-11	Saugatucket
Hardness (mg/L)	NA		5 / 5	15	13	18	SW-11	3 / 3	14	11	17	SW-12	SW-11	Saugatucket
pH	NA		5 / 5	6.0	5.7	6.08	SW-11	3 / 3	6.0	5.75	6.25	SW-12	SW-12	Mitchell Brook
Specific Conductance (µmhos/cm)	NA		5 / 5	83	74	98	SW-11	3 / 3	95	74	125	SW-12	SW-12	Mitchell Brook
Dissolved Oxygen (mg/L)	NA		5 / 5	11	10.21	11.45	SW-11	3 / 3	11	10.42	11.38	SW-07	SW-04	Saugatucket
Biochemical Oxygen Demand (mg/L)	1.0		2 / 2	1.3	1.1	1.5	SW-02	2 / 2	1.4	1.0 J	1.7 J	SW-12	SW-12	Mitchell Brook

NOTES:

1. Analytical data is presented in Appendix D.
2. If all sample detection limits are the same, a single detection limit is presented.
3. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
4. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-22. SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER, MAY 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	RANGE OF DETECTION LIMITS MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (2)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (2)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS														
None Detected														
SEMIVOLATILE ORGANICS														
None Detected														
PESTICIDES/PCBs														
None Detected														
METALS - UNFILTERED (µg/L)														
Aluminum	100	100	7 / 7	240	153	424	SW-18	4 / 4	440	132	1,140	SW-16	SW-16	Mitchell Brook
Iron	10	10	7 / 7	980	234	1,640	SW-06	4 / 4	3,600	403	6,760	SW-07	SW-07	Mitchell Brook
Calcium	20	20	7 / 7	4,200	3,230	5,950	SW-11	4 / 4	4,400	2,990	6,330	SW-12	SW-12	Mitchell Brook
Magnesium	20	20	7 / 7	1,400	1,110	1,920	SW-11	4 / 4	1,500	1,100	2,170	SW-12	SW-12	Mitchell Brook
Sodium	300	300	7 / 7	8,600	7,040	10,800	SW-11	4 / 4	9,700	7,905	12,500	SW-12	SW-12	Mitchell Brook
Barium	1	1	7 / 7	7.0	4.9	9.9	SW-11	4 / 4	14	8.2	17.4	SW-12	SW-12	Mitchell Brook
Copper	2	2	2 / 7	1.3	2.1	2.1	SW-02	3 / 4	2.0	2.2	2.5	SW-07	SW-07	Mitchell Brook
Lead	2	2	0 / 7	—	—	—	—	1 / 4	1.7	3.7		SW-16	SW-16	Mitchell Brook
Manganese	1	1	7 / 7	200	21.2	373	SW-11	4 / 4	300	58.65	443	SW-07	SW-07	Mitchell Brook
Zinc	2	2	7 / 7	4.5	2.8	8.2	SW-18	4 / 4	6.3	3.2	12.1	SW-16	SW-16	Mitchell Brook
METALS - FILTERED (µg/L)														
Aluminum	100	100	7 / 7	190	120	348	SW-18	4 / 4	200	104	437	SW-16	SW-16	Mitchell Brook
Iron	10	10	5 / 7	460	356	830	SW-11	3 / 4	970	662	1,710	SW-12	SW-12	Mitchell Brook
Calcium	20	20	7 / 7	4,300	3,460	6,050	SW-11	4 / 4	4,400	2,950	6,310	SW-12	SW-12	Mitchell Brook
Magnesium	20	20	7 / 7	1,400	1,120	1,910	SW-11	4 / 4	1,400	1,060	2,130	SW-12	SW-12	Mitchell Brook
Sodium	300	300	0 / 7	—	—	—	—	1 / 4	6,900	13,000		SW-12	SW-12	Mitchell Brook
Barium	1	1	1 / 7	3.5	5.0		SW-04	1 / 4	8.5	16.9		SW-12	SW-12	Mitchell Brook
Lead	1	1	0 / 7	—	—	—	—	1 / 4	0.68	1.2		SW-16	SW-16	Mitchell Brook
Manganese	1	1	7 / 7	170	19.0	369	SW-11	4 / 4	260	54.2	417	SW-12	SW-12	Mitchell Brook
Mercury	0.1	0.1	0 / 7	—	—	—	—	1 / 4	0.07	0.115 J		SW-09	SW-09	Mitchell Brook
WATER QUALITY PARAMETERS														
Cyanide (µg/L)	10	10	0 / 7	—	—	—	—	2 / 4	61	25 J	210 J	SW-07	SW-07	Mitchell Brook
Ammonia (mg/L)	0.0300	0.0300	6 / 7	0.36	0.0700	1.43	SW-11	4 / 4	1.2	0.033	3.53	SW-12	SW-12	Mitchell Brook
Hardness (mg/L)	NA		7 / 7	16	12	23	SW-11	4 / 4	17	12	25	SW-12	SW-12	Mitchell Brook
pH	NA		7 / 7	5.8	5.56	6.35	SW-11	4 / 4	6.1	5.72	6.27	SW-12	SW-11	Saugatucket
Specific Conductance (µmhos/cm)	NA		7 / 7	81	64	112	SW-11	4 / 4	95	68	141	SW-12	SW-12	Mitchell Brook
Dissolved Oxygen (mg/L)	NA		7 / 7	9.3	8.93	10.21	SW-02	4 / 4	9.6	8.93	9.97	SW-09	SW-02	Saugatucket

NOTES:
1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.
NA = Not Applicable
J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.
— Analyte was not detected in samples.

TABLE 4-23. SUMMARY OF CHEMICALS DETECTED IN SEDIMENT, JUNE 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	RANGE OF DETECTION LIMITS MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (2)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (2)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	UNNAMED BROOK FREQUENCY OF DETECTION (2)	UNNAMED BROOK CONCENTRATIONS	UNNAMED BROOK LOCATION	UNNAMED TRIBUTARY FREQUENCY OF DETECTION (2)	UNNAMED TRIBUTARY CONCENTRATIONS	UNNAMED TRIBUTARY LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/kg)																				
Ethylbenzene	6	10	1 / 6	4.8	8 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Total Xylenes	6	10	2 / 6	16	10 J	67 J	SD-08	2 / 6	4.9	7 J	8	SD-07	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Trichloroethene	6	10	3 / 6	30	7 J	150 J	SD-08	3 / 6	5.4	6 J	9 J	SD-09	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
1,2-Dichloroethene(total)	6	10	1 / 6	4.3	5 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Carbon Disulfide	6	10	1 / 6	5.0	9 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
SEMIVOLATILE ORGANICS (µg/kg)																				
Phenanthrene	820	1,400	1 / 6	500 *	220 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Fluoranthene	820	1,400	1 / 6	520 *	330 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Pyrene	820	1,400	1 / 6	510 *	280 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Chrysene	820	1,400	1 / 6	500 *	180 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Benzo(b)fluoranthene	820	1,400	1 / 6	490 *	130 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Benzo(k)fluoranthene	820	1,400	1 / 6	490 *	130 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Benzo(a)pyrene	820	1,400	1 / 6	490 *	140 J		SD-08	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-08	Saugatucket
Butylbenzylphthalate	820	1,400	1 / 6	530 *	440 J		SD-06	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-06	Saugatucket
PESTICIDES/PCBs																				
None Detected																				
METALS (mg/kg)																				
Aluminum	2.26	10.64	6 / 6	3,300	749	6,280	SD-05	6 / 6	3,300	1,360	5,640	SD-14	1 / 1	3,210	SD-10	1 / 1	6,050	SD-01	SD-05	Saugatucket
Iron	1.58	7.09	6 / 6	5,000	780	1,600	SD-04	6 / 6	4,400	2,750	6,490	SD-07	1 / 1	113,000	SD-10	1 / 1	7,530	SD-01	SD-10	Unnamed brook
Calcium	1.58	11.03	4 / 6	640	547	1,270	SD-03	3 / 6	350	339	921	SD-13	1 / 1	1,070	SD-10	1 / 1	378	SD-01	SD-03	Saugatucket
Magnesium	2.94	13.00	3 / 6	490	488	1,040	SD-05	4 / 6	470	506	764	SD-14	1 / 1	597	SD-10	1 / 1	1,100	SD-01	SD-01	Unnamed trib.
Sodium	4.98	11.82	1 / 6	44	115		SD-06	3 / 6	40	38.1	82.3	SD-13	1 / 1	84.6	SD-10	1 / 1	47.1	SD-01	SD-06	Saugatucket
Potassium	9.50	98.91	1 / 6	96	191		SD-06	3 / 6	170	191	308	SD-14	1 / 1	415	SD-10	1 / 1	549	SD-01	SD-01	Unnamed trib.
Arsenic	0.47	1.46	3 / 6	0.97	0.79	2.1	SD-05	2 / 6	0.60	0.52	1.1	SD-07	1 / 1	2.0	SD-10	0 / 1	—	—	SD-05	Saugatucket
Barium	0.23	0.79	6 / 6	12	2.7	26.2	SD-04	6 / 6	12	7.0	22.2	SD-13	1 / 1	64.6	SD-10	1 / 1	13.6	SD-01	SD-10	Unnamed brook
Beryllium	0.23	0.39	5 / 6	0.78	0.40	2.0	SD-04	5 / 6	0.59	0.29	1.3	SD-14	1 / 1	1.2	SD-10	0 / 1	—	—	SD-04	Saugatucket
Chromium	0.45	2.76	3 / 6	3.9	1.9 J	8.7	SD-04	3 / 6	2.1	2.5	3.6	SD-14	0 / 1	—	—	1 / 1	4.4	SD-01	SD-04	Saugatucket
Cobalt	0.45	1.58	3 / 6	2.2	3.4 J	4.2	SD-05	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-05	Saugatucket
Copper	0.68	4.33	0 / 6	—	—	—	—	1 / 6	2.2	4.2		SD-14	0 / 1	—	—	1 / 1	3.3	SD-01	SD-14	Mitchell Brook
Lead	0.24	0.39	1 / 6	5.1	10.9		SD-06	3 / 6	8.6	5.2	21.7	SD-14	1 / 1	7.4	SD-10	1 / 1	10.8	SD-01	SD-14	Mitchell Brook
Manganese	0.23	3.55	6 / 6	110	13.5	193	SD-06	6 / 6	54	36.3	84.0	SD-13	1 / 1	1,150 J	SD-10	1 / 1	74.4	SD-01	SD-10	Unnamed brook
Nickel	0.90	2.36	5 / 6	3.5	1.4	9.5	SD-05	6 / 6	2.2	1.4 J	3.0	SD-14	1 / 1	3.0	SD-10	1 / 1	4.1	SD-01	SD-05	Saugatucket
Selenium	0.95	1.55	1 / 6	0.85	2.1 J		SD-05	0 / 6	—	—	—	—	0 / 1	—	—	0 / 1	—	—	SD-05	Saugatucket
Vanadium	0.45	1.18	5 / 6	7.7	4.1	14.2	SD-05	5 / 6	4.7	3.5	7.6	SD-13	1 / 1	15.2	SD-10	1 / 1	10.8	SD-01	SD-10	Unnamed brook
Zinc	0.68	3.15	1 / 6	14	20.5		SD-06	3 / 6	16	17.3	30.6	SD-13	1 / 1	236	SD-10	1 / 1	25.2	SD-01	SD-10	Unnamed brook
SOIL QUALITY PARAMETERS																				
Sulfide (mg/kg)	0.04	0.07	6 / 6	48	15.0	129.0	SD-06	6 / 6	19	3.70	34.0	SD-07	1 / 1	25.00	SD-10	1 / 1	8.70	SD-01	SD-06	Saugatucket
Cyanide - Not Detected																				
TOTAL COMBUSTIBLE ORGANICS (%)																				
Organic Content	NA		6 / 6	5.5	1.0	14.7	SD-03	6 / 6	3.4	0.8	7.0	SD-13	1 / 1	4.7	SD-10	1 / 1	2.8	SD-01	SD-03	Saugatucket
Solids Content	NA		6 / 6	56	33.6	74.1	SD-02	6 / 6	67	54.1	80.5	SD-12	1 / 1	53.2	SD-10	1 / 1	68.1	SD-01	SD-12	Mitchell Brook
Moisture Content	NA		6 / 6	44	25.9	66.3	SD-03	6 / 6	29	15.6	45.9	SD-13	1 / 1	46.7	SD-10	1 / 1	31.9	SD-01	SD-03	Saugatucket
GRAIN SIZE (%)																				
Clay	NA		6 / 6	4.1	0.4	11.8	SD-04	6 / 6	1.4	0	3.6	SD-14	1 / 1	10.4	SD-10	1 / 1	2.9	SD-01	SD-04	Saugatucket
Gravel	NA		6 / 6	1.7	0.3	2.9	SD-05	6 / 6	5.6	1	13.8	SD-13	1 / 1	3	SD-10	1 / 1	6.6	SD-01	SD-13	Mitchell Brook
Sand	NA		6 / 6	72	37.7	95	SD-02	6 / 6	79	57.3	97	SD-12	1 / 1	67.7	SD-10	1 / 1	56.9	SD-01	SD-12	Mitchell Brook
Silt	NA		6 / 6	22	3.8	48.5	SD-04	6 / 6	14	1.6	26.5	SD-13	1 / 1	18.8	SD-10	1 / 1	33.5	SD-01	SD-04	Saugatucket

NOTES:

1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-24. SUMMARY OF CHEMICALS DETECTED IN SEDIMENT, SEPTEMBER 1991 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	RANGE OF DETECTION LIMITS MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (2)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (2)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	UNNAMED BROOK FREQUENCY OF DETECTION (2)	UNNAMED BROOK CONCEN-TRATIONS	UNNAMED BROOK LOCATION	UNNAMED TRIBUTARY FREQUENCY OF DETECTION (2)	UNNAMED TRIBUTARY CONCEN-TRATIONS	UNNAMED TRIBUTARY LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/kg)																				
Benzene	12	24	0 / 7	--	--	--	--	1 / 5	7.2 *	1 J		SD-12	0 / 1	--	--	0 / 1	--	--	SD-12	Mitchell Brook
Ethylbenzene	12	24	1 / 7	7.9 *	3 J		SD-05	0 / 6	--	--	--	--	0 / 1	--	--	0 / 1	--	--	SD-05	Saugatucket
Total Xylenes	12	24	1 / 7	8.6 *	8 J		SD-05	0 / 6	--	--	--	--	0 / 1	--	--	0 / 1	--	--	SD-05	Saugatucket
Acetone	12	24	3 / 7	92	42 J	215 J	SD-08	2 / 6	73	190	200	SD-09	0 / 1	--	--	0 / 1	--	--	SD-08	Saugatucket
2-Butanone	12	24	1 / 7	12	28 J		SD-08	1 / 6	16	46		SD-07	0 / 1	--	--	0 / 1	--	--	SD-07	Mitchell Brook
4-Methyl-2-pentanone	12	24	0 / 7	--	--	--	--	0 / 6	--	--	--	--	1 / 1	3 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
Tetrachloroethene	12	24	1 / 7	8.3 *	4 J		SD-08	2 / 6	5.8 *	2 J	3 J	SD-14	0 / 1	--	--	0 / 1	--	--	SD-08	Saugatucket
Chloroform	12	24	0 / 7	--	--	--	--	1 / 6	7.8 *	5 J		SD-15	0 / 1	--	--	0 / 1	--	--	SD-15	Mitchell Brook
Carbon Disulfide	12	24	1 / 7	11	22 J		SD-08	0 / 6	--	--	--	--	0 / 1	--	--	0 / 1	--	--	SD-08	Saugatucket
SEMIVOLATILE ORGANICS (µg/kg)																				
Fluoranthene	400	800	0 / 7	--	--	--	--	3 / 6	140 *	31 J	34 J	SD-09	NA	R		0 / 1	--	--	SD-09	Mitchell Brook
Pyrene	400	800	1 / 7	260 *	39 J		SD-03	3 / 6	150 *	35 J	40 J	SD-15	NA	R		0 / 1	--	--	SD-15	Mitchell Brook
Di-n-butylphthalate	400	800	0 / 7	--	--	--	--	1 / 6	330	650 J		SD-09	NA	R		0 / 1	--	--	SD-09	Mitchell Brook
PESTICIDES (µg/kg)																				
delta-BHC	2.1	3.7	0 / 4	--	--	--	--	0 / 6	--	--	--	--	1 / 1	0.5 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
4,4'-DDE	4.0	7.1	0 / 4	--	--	--	--	2 / 6	2.8	1.6 J	4.9 J	SD-09	1 / 1	0.65 J	SD-10	0 / 1	--	--	SD-09	Mitchell Brook
4,4'-DDD	4.0	7.1	0 / 4	--	--	--	--	1 / 6	3.6	8.2		SD-09	0 / 1	--	--	0 / 1	--	--	SD-09	Mitchell Brook
4,4'-DDT	4.0	7.1	0 / 4	--	--	--	--	0 / 6	--	--	--	--	1 / 1	0.90 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
Methoxychlor	21.0	37	0 / 4	--	--	--	--	0 / 6	--	--	--	--	1 / 1	2.6 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
Endosulfan II	4.0	7.1	0 / 4	--	--	--	--	0 / 6	--	--	--	--	1 / 1	0.31 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
Dieldrin	4.0	7.1	0 / 4	--	--	--	--	0 / 6	--	--	--	--	1 / 1	1.3 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
gamma-Chlordane	2.1	3.7	0 / 4	--	--	--	--	0 / 6	--	--	--	--	1 / 1	0.23 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
PCBs																				
None Detected																				
METALS (mg/kg)																				
Aluminum	3.1	12.08	7 / 7	3,800	1,260	8,420	SD-05	6 / 6	4,400	1,660	6,080	SD-13	1 / 1	4,000	SD-10	1 / 1	8,650	SD-01	SD-01	Unnamed trib.
Iron	1.4	4.68	7 / 7	5,600	1,020	16,400	SD-04	6 / 6	7,300	5,010	14,600	SD-07	1 / 1	85,500	SD-10	1 / 1	10,500	SD-01	SD-10	Unnamed brook
Calcium	4.8	11.3	7 / 7	910	350 J	1,760 J	SD-03	6 / 6	580	290	949	SD-07	1 / 1	1,125	SD-10	1 / 1	751 J	SD-01	SD-03	Saugatucket
Magnesium	6.2	17.93	7 / 7	980	362	2,560	SD-06	6 / 6	700	350	933	SD-07	1 / 1	816	SD-10	1 / 1	1,550	SD-01	SD-06	Saugatucket
Sodium	3.1	22.22	2 / 7	41	59.6	63.2	SD-08	5 / 6	49	31.5	67.4	SD-07	0 / 1	--	--	0 / 1	--	--	SD-07	Mitchell Brook
Potassium	51.8	250	4 / 7	200	111 J	488	SD-05	6 / 6	340	230	583	SD-07	1 / 1	654	SD-10	1 / 1	775	SD-01	SD-01	Unnamed trib.
Antimony	6.0	18.32	0 / 7	--	--	--	--	0 / 6	--	--	--	--	1 / 1	62.1 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
Arsenic	0.24	0.75	3 / 7	0.47	0.43	1.2	SD-05	4 / 6	0.44	0.35 J	0.7	SD-09	1 / 1	4.6	SD-10	1 / 1	1.2	SD-01	SD-10	Unnamed brook
Barium	0.24	0.78	7 / 7	13	3.1	30.5	SD-04	6 / 6	17	9.3	25.6	SD-13	1 / 1	46.8 J	SD-10	1 / 1	21.5	SD-01	SD-10	Unnamed brook
Beryllium	0.24	0.56	1 / 7	0.56	2.3		SD-04	0 / 6	--	--	--	--	1 / 1	1.2	SD-10	0 / 1	--	--	SD-04	Saugatucket
Cadmium	0.72	1.7	0 / 7	--	--	--	--	1 / 6	0.60	1.3 J		SD-13	0 / 1	--	--	0 / 1	--	--	SD-13	Mitchell Brook
Chromium	1.9	4.5	4 / 7	8.5	11.4	18.1	SD-06	0 / 6	--	--	--	--	0 / 1	--	--	1 / 1	11.1	SD-01	SD-06	Saugatucket
Cobalt	1.4	3.4	4 / 7	2.9	1.9	6.5	SD-05	4 / 6	2.3	2.0	4.4	SD-13	1 / 1	5.7	SD-10	1 / 1	5.0	SD-01	SD-05	Saugatucket
Copper	1.0	2.3	0 / 7	--	--	--	--	0 / 6	--	--	--	--	1 / 1	56.1 J	SD-10	0 / 1	--	--	SD-10	Unnamed brook
Lead	0.24	0.75	7 / 7	9.8	4.3 J	24.2 J	SD-03	6 / 6	13	3.5 J	27.7 J	SD-13	1 / 1	243.4 J	SD-10	1 / 1	12.2 J	SD-01	SD-10	Unnamed brook
Manganese	0.48	1.1	7 / 7	97	20.4	207	SD-05	6 / 6	91	41.1	222	SD-07	1 / 1	530 J	SD-10	1 / 1	113	SD-01	SD-10	Unnamed brook
Nickel	3.51	9.0	2 / 7	6.9	12.8	20.5	SD-06	0 / 6	--	--	--	--	1 / 1	3.4	SD-10	1 / 1	7.3	SD-01	SD-06	Saugatucket
Selenium	0.24	1.5	3 / 7	0.46	0.37 J	1.3 J	SD-05	0 / 6	--	--	--	--	0 / 1	--	--	0 / 1	--	--	SD-05	Saugatucket
Thallium	0.24	0.56	0 / 7	--	--	--	--	2 / 6	0.22	0.37	0.37	SD-15	0 / 1	--	--	0 / 1	--	--	SD-15	Mitchell Brook
Vanadium	0.72	1.95	7 / 7	8.3	2.0	17.7	SD-05	5 / 6	7.7	6.0	11.5	SD-13	1 / 1	12.4	SD-10	1 / 1	16.8	SD-01	SD-05	Saugatucket
Zinc	1.4	3.4	2 / 7	20	43.6	49.8	SD-05	2 / 6	20	33.6 J	43.9 J	SD-15	1 / 1	229 J	SD-10	1 / 1	33.7	SD-01	SD-10	Unnamed brook
SOIL QUALITY PARAMETERS																				
Sulfide (mg/kg)	10	17	0 / 7	--	--	--	--	1 / 6	150	850 J		SD-12	0 / 1	--	--	0 / 1	--	--	SD-12	Mitchell Brook
Cyanide - Not Detected																				
TOTAL COMBUSTIBLE ORGANICS (%)																				
Organic Content	NA		7 / 7	5.6	1.8	9.3	SD-03	6 / 6	4.2	0.8	7.6	SD-13	1 / 1	6.0	SD-10	1 / 1	4.7	SD-01	SD-03	Saugatucket
Solids Content	NA		7 / 7	57	43.2	68.9	SD-04	6 / 6	68	53.3	81.8	SD-12	1 / 1	52.3	SD-10	1 / 1	62.9	SD-01	SD-12	Mitchell Brook
Moisture Content	NA		7 / 7	43	31.0	56.7	SD-11	6 / 6	32	18.2	46.6	SD-09	1 / 1	47.8	SD-10	1 / 1	37.2	SD-01	SD-11	Saugatucket
GRAIN SIZE (%)																				
Clay	NA		7 / 7	4.0	0	11.6	SD-04	6 / 6	1.1	0	3.2	SD-13	1 / 1	7.8	SD-10	1 / 1	7.5	SD-01	SD-04	Saugatucket
Gravel	NA		7 / 7	1.7	0.1	4.2	SD-05	6 / 6	7.0	0.2	12.9	SD-14	1 / 1	0.9	SD-10	1 / 1	1.8	SD-01	SD-14	Mitchell Brook
Sand	NA		7 / 7	71	31.1	93.4	SD-06	6 / 6	76	57	97.3	SD-12	1 / 1	64.0	SD-10	1 / 1	51.2	SD-01	SD-12	Mitchell Brook
Silt	NA		7 / 7	23	5	54.2	SD-04	6 / 6	16	2.2	29.1	SD-13	1 / 1	27.4	SD-10	1 / 1	39.5	SD-01	SD-04	Saugatucket

NOTES:
1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was rejected.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.
NA = Not Applicable
J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.
R = All sample values were rejected.
-- Analyte was not detected in samples.

TABLE 4-25. SUMMARY OF CHEMICALS DETECTED IN SEDIMENT , MAY 1992 (1)

CHEMICAL	RANGE OF DETECTION LIMITS MINIMUM	RANGE OF DETECTION LIMITS MAXIMUM	SAUGATUCKET RIVER FREQUENCY OF DETECTION (2)	SAUGATUCKET RIVER ARITHMETIC AVERAGE	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MINIMUM	SAUGATUCKET RIVER RANGE OF CONCENTRATIONS (3) MAXIMUM	SAUGATUCKET RIVER MAXIMUM LOCATION	MITCHELL BROOK FREQUENCY OF DETECTION (2)	MITCHELL BROOK ARITHMETIC AVERAGE	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MINIMUM	MITCHELL BROOK RANGE OF CONCENTRATIONS (3) MAXIMUM	MITCHELL BROOK MAXIMUM LOCATION	OVERALL MAXIMUM LOCATION	WATER BODY ASSOC. WITH OVERALL MAX. LOC.
VOLATILE ORGANICS - (µg/kg)														
None Detected														
SEMIVOLATILE ORGANICS (µg/kg)														
Phenanthrene	350	500	1 / 7	180 *	57 J		SD-11	0 / 4	—	—	—	—	SD-11	Saugatucket
Anthracene	350	500	1 / 7	190 *	64 J		SD-11	0 / 4	—	—	—	—	SD-11	Saugatucket
Fluoranthene	350	500	1 / 7	190 *	81 J		SD-11	0 / 4	—	—	—	—	SD-11	Saugatucket
Pyrene	350	500	1 / 7	180 *	39 J		SD-11	0 / 4	—	—	—	—	SD-11	Saugatucket
PESTICIDES (µg/kg)														
delta-BHC	1.9	2.7	6 / 7	0.78	0.46 J	1.3 J	SD-11	4 / 4	0.64	0.57 J	0.73 J	SD-12	SD-11	Saugatucket
4,4'-DDE	3.6	5.3	2 / 7	2.2	1.2 J	4.3 J	SD-11	0 / 4	—	—	—	—	SD-11	Saugatucket
4,4'-DDD	3.6	5.3	1 / 7	2.9	8.0		SD-11	0 / 4	—	—	—	—	SD-11	Saugatucket
PCBs														
None Detected														
METALS (mg/kg)														
Aluminum	10.9	18.8	7 / 7	1,500	836	1,860	SD-11	4 / 4	2,100	1,860	2,640	SD-07	SD-07	Mitchell Brook
Iron	1.1	1.9	7 / 7	7,700	885	25,900	SD-05	4 / 4	8,700	3,985	12,400	SD-07	SD-05	Saugatucket
Calcium	2.2	3.8	5 / 7	280	258	555	SD-11	4 / 4	210	176.5	242	SD-16	SD-11	Saugatucket
Magnesium	2.2	3.8	7 / 7	260	114	489	SD-17	4 / 4	490	388	613	SD-07	SD-07	Mitchell Brook
Arsenic	0.19	0.41	2 / 7	1.2	2.0 J	6.1	SD-05	4 / 4	0.72	0.31 J	1.1	SD-12	SD-05	Saugatucket
Barium	0.11	0.19	7 / 7	7.2	2.9	13.7 J	SD-05	4 / 4	9.2	6.2	11.5	SD-07	SD-05	Saugatucket
Beryllium	0.11	0.19	2 / 7	0.20	0.25	0.79	SD-06	3 / 4	0.25	0.27	0.42	SD-07	SD-06	Saugatucket
Chromium	0.44	0.75	7 / 7	1.7	1.1	2.5	SD-18	4 / 4	1.9	1.35	2.5	SD-07	SD-07	Mitchell Brook
Cobalt	0.33	0.56	4 / 7	0.76	0.91	1.4	SD-06	4 / 4	1.1	0.59 J	1.8	SD-07	SD-07	Mitchell Brook
Lead	0.09	0.21	7 / 7	6.5	3.7	13.5	SD-18	4 / 4	3.1	2.3	4.1	SD-16	SD-18	Saugatucket
Manganese	0.11	0.19	7 / 7	110	22.6	200	SD-04	4 / 4	110	57.8	241	SD-07	SD-07	Mitchell Brook
Nickel	2.2	3.8	1 / 7	1.8	4.7		SD-06	1 / 4	1.8	3.8		SD-12	SD-06	Saugatucket
Selenium	0.19	0.41	2 / 7	0.24	0.43	0.58	SD-18	0 / 4	—	—	—	—	SD-18	Saugatucket
Vanadium	0.22	0.38	1 / 7	1.9	3.4 J		SD-05	1 / 4	3.2	6.4		SD-07	SD-07	Mitchell Brook
Zinc	0.22	0.38	1 / 7	5.9	11.2		SD-05	0 / 4	—	—	—	—	SD-05	Saugatucket
SOIL QUALITY PARAMETERS														
Cyanide - Not Detected														
Ammonia (mg/kg)	0.980	1.37	3 / 7	1.4	2.01	3.17	SD-05	2 / 4	7.7	4.36	25.6	SD-12	SD-12	Mitchell Brook
TOTAL COMBUSTIBLE ORGANICS (%)														
Organic Content	NA		7 / 7	2.4	1.3	5.6	SD-11	4 / 4	1.3	1.1	1.8	SD-16	SD-11	Saugatucket
Solids Content	NA		7 / 7	71	50.5	78.3	SD-04	4 / 4	80	76.05	85.5	SD-12	SD-12	Mitchell Brook
Moisture Content	NA		7 / 7	43	27.7	97.9	SD-11	4 / 4	25	16.9	31.5	SD-09	SD-11	Saugatucket
GRAIN SIZE (%)														
Clay	NA		7 / 7	0	0	0	SD-11	4 / 4	0	0	0	SD-12	SD-12	Mitchell Brook
Gravel	NA		7 / 7	14	0.7	33.2	SD-05	4 / 4	6.8	0.9	10.65	SD-09	SD-05	Saugatucket
Sand	NA		7 / 7	82	64.6	95.8	SD-06	4 / 4	91	86.45	95.7	SD-16	SD-06	Saugatucket
Silt	NA		7 / 7	3.9	1.8	6.2	SD-11	4 / 4	2.4	1.5	3.4	SD-16	SD-11	Saugatucket

NOTES:

1. Analytical data is presented in Appendix D.
2. Frequency of detection is the number of samples with positive values. Positive values include approximated values and approximated values less than sample detection limits. Number of samples include all analyzed samples for which analytical values were reported, unless the sample value was reje cted.
3. Presents the minimum and maximum values for positive detections. Approximated values and approximated values less than sample detection limits are also included. A single concentration is presented when only one positive detection occurred.

* The calculated average is greater than the maximum value.

NA = Not Applicable

J = Quantitation is approximate due to limitations identified during laboratory analysis or data validation.

— Analyte was not detected in samples.

TABLE 4-26. MONTHLY LANDFILL GAS MONITORING RESULTS FROM MONITORING POINTS LFG-AD, LFG-LHR, AND LFG-GT.

Date of Sampling	LFG-AD			LFG-LHR			LFG-GT		
	Total VOCs		Methane	Total VOCs		Methane	Total VOCs		Methane
	11.7 eV	10.2 eV	(% by Vol)	11.7 eV	10.2 eV	(% by Vol)	11.7 eV	10.2 eV	(% by Vol)
DECEMBER 1991	ND	—	ND	ND	—	ND	ND	—	ND
JANUARY 1992	ND	—	ND	ND	—	1	ND	—	ND
FEBRUARY 1992	—	(1) 28	ND	—	19	0.5	—	(2) 2	ND
MARCH 1992	ND	—	ND	ND	13	0.1	ND	—	ND
APRIL 1992	ND	19	ND	ND	9	1.6	ND	3.2	ND

Lamps with different electron-volt(eV) intensities were used because the 10.2 eV lamp was found to be more sensitive then the 11.7eV lamp. The 11.7 eV lamp, however, can detect a wider range of compounds.

NOTES: 1. Trace concentrations of cis-1,2-Dichloroethene were found at this time.

2. Trace concentrations of cis-1,2-Dichloroethene and Toluene were found at this point.

VOCs - Volatile Organic Compounds

Vol - Volume

ND - Not detected.

— The sample was not analyzed under the given conditions during that round of sampling.

Analytical data is presented in Appendix D.

TABLE 5-1. CHEMICAL AND PHYSICAL PROPERTIES OF ORGANICS AND INORGANICS DETECTED DURING THE RI

CHEMICAL	Molecular Weight	Kow (Log)	Solubility in Water (mg/L)	Koc (ml/g)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m3/mol)	Density (g/cm3)
REFERENCES:		(1,3,4,5,7,9,12,14)	(1,2,3,4,5,7,9,10,12,14)	(1,3,6,7,9,12,14)	(1,3,4,5,6,7,9,10,14)	(1,3,6,7,9,10,12,14)	(4,8,9,13,14)
VOLATILE ORGANICS							
Benzene	78	1.56 to 2.13	1.00E+03 to 1.79E+03	4.80E+00 to 9.20E+02	4.55E+01 to 9.51E+01	5.43E-03 to 5.59E-03	0.876 to 0.879
Toluene	92	2.69 to 2.79	2.20E+02 to 5.35E+02	3.74E+01 to 3.00E+02	2.20E+01 to 3.74E+01	5.93E-03 to 6.66E-03	0.867
Ethylbenzene	106	3.15	1.52E+02 to 2.06E+02	2.50E+02 to 1.10E+03	7.00E+00 to 1.25E+01	6.43E-03 to 8.43E-03	0.867
Total Xylenes	106	3.26	1.60E+02 to 1.98E+02	2.40E+02	1.00E+01	7.04E-03 to 8.04E-03	0.86
m-Xylene	106	3.2	1.46E+02	NDA	8.3	7.68E-03	NDA
o-Xylene	106	2.94 to 6.62	1.75E+02 to 2.13E+02	4.77E+01 to 1.29E+02	2.55E+00 to 1.00E+01	4.945E-03 to 5.19E-03	NDA
p-Xylene	106	3.15	1.56E+02	NDA	8.7	7.68E-03	NDA
Acetone	58	-0.24	miscible	2.20E+00 to 1.80E+01	1.86E+02 to 2.70E+02	2.06E-05 to 3.97E-05	0.7899
4-Methyl-2-pentanone	100	1.19	1.90E+04 to 2.00E+04	1.90e+01	1.60E+00 to 1.99E+01	1.38E-04	0.7978
Trichloroethene	131	1.42 to 2.42	1.10E+03	8.72E+01 to 1.50E+02	5.78E+01 to 7.40E+01	8.92E-03 to 2.00E-02	1.464 to 1.465
1,1,1-Trichloroethane	133	1.4 to 2.5	9.50E+02 to 1.50E+03	1.04E+02 to 1.79E+02	1.00E+02 to 1.68E+02	4.08E-03 to 2.76E-02	1.3376
1,1-Dichloroethene	202	1.84 to 2.13	2.25E+03 to 5.00E+03	6.50E+01 to 3.43E+02	5.00E+02 to 7.78E+02	1.50E-02 to 1.90E-01	1.218
1,2-Dichloroethene (cis & trans)	97	0.48 to 0.70	3.50E+03 to 6.30E+03	4.90E+01 to 5.90E+01	5.30E+00 to 3.24E+02	4.05E-03 to 7.58E-02	1.2565 to 1.2837
1,1-Dichloroethane	99	1.79	5.06E+03 to 5.50E+03	3.00E+01 to 4.00E+01	1.82E+02 to 3.08E+02	4.31E-03 to 5.70E-03	1.168
Chloroethane	65	NDA	NDA	NDA	1.00E+03	1.10E-02	0.9214
Vinyl Chloride	63	1.38	2.67E+03	5.70E+01	2.30E+03 to 2.66E+03	8.19E-02 to 6.95E-01	0.9106
Carbon Disulfide	76	1.70 to 4.16	1.19E+03 to 2.94E+03	5.40E+01	1.27E+02 to 3.60E+02	1.22E-03 to 3.03E-02	1.2632
Methylene chloride	85	0.95 to 1.3	20E+03	NDA	2.25E+02 to 5.99E+02	2.03E-03	1.3326
Dichlorodifluoromethane	164	2.16	NDA	8.8 to 3.5E+01	NDA	NDA	NDA
1,2,4-Trichlorobenzene	182	4.02	48.8	5.8E+01	0.29	1.42E-3	NDA
1,2,4-Trimethylbenzene	181	NDA	NDA	1.0E+03to9.2E+03	NDA	NDA	NDA
1,3,5-Trimethylbenzene	181	4.49	6.01	NDA	0.578	1.9E-3	NDA
WATER SOLUBLE ORGANICS							
Acrylamide	72	NDA	2.16E+02	NDA	NDA	NDA	NDA
N,N-Dimethylformamide	73	-1.01	NDA	7.00E+00	3.85E+00	7.39E-08	1.428
SEMIVOLATILE ORGANICS							
2-Methylnaphthalene	131	-1.89 to 4.10	2.45E+01	1.30E+03 to 8.50E+03	NDA	NDA	NDA
Benzo(a)anthracene	228	5.60	5.70E-03 to 1.40E-02	1.38E+06	5.00E-09 to 2.20E-08	1.16E-06	NDA
Chrysene	228	5.61 to 5.66	1.50E-03 to 1.40E-02	1.33E+05 to 2.00E+05	5.00E-09 to 6.30E-09	1.05E-06 to 9.46E-05	1.274
Benzo(b)fluoranthene	252	5.06 to 6.84	1.20E-03 to 1.40E-02	1.56E+04 to 5.50E+05	5.00E-07 to 5.50E-04	1.19E-05 to 1.11E-04	NDA
Benzo(k)fluoranthene	252	6.06 to 6.12	5.50E-04 to 4.30E-03	5.10E+04 to 5.50E+05	9.65E-10 to 5.50E-07	4.00E-07 to 3.94E-05	NDA
Benzo(a)pyrene	252	5.97 to 6.06	1.20E-03 to 3.80E-03	5.07E+06 to 5.50E+06	5.49E-09 to 5.00E-07	4.90E-07 to 1.13E-04	1.351
Indeno(1,2,3-c,d)pyrene	276	6.50 to 7.66	2.20E-05 to 6.20E-02	1.90E+04 to 1.60E+06	1.00E-10	6.86E-08 to 1.60E-06	NDA
4-Methylphenol	108	1.94 to 1.97	3.10E-02 to 3.10E+04	1.90E+01 to 2.67E+04	1.10E-01 to 3.75E-01	7.92E-07 to 1.10E-06	1.03 to 1.038
2,4-Dimethylphenol	122	NDA	1.70E+01	9.60E+01	6.00E-03 to 6.70E-03	6.70E-06 to 5.67E-04	NDA
4-Chloro-3-methylphenol	143	NDA	NDA	NDA	NDA	NDA	NDA
Pentachlorophenol	266	5.00 to 5.12	2.00 to 2.00E+01	5.30E+04	1.10E-04	2.75E-06 to 3.40E-06	1.978
Bis(2-ethylhexyl)phthalate	391	3.98 to 5.30	2.85E-01 to 1.30E+00	8.74E+04	6.20E-08 to 9.75E-06	3.61E-07 to 1.00E-04	0.985 to 0.986
PESTICIDES							
Dieldrin	381	3.50	1.86E-01 to 1.95E-01	1.70E+03	1.78E-07 to 3.10E-06	2.00E-07 to 5.80E-05	1.75
INORGANICS							
Cyanide (a)	27	0.66	miscible	NDA	6.58E+02 to 2.64E+02	NDA	0.699
Ammonia	19	0.00	NDA	3.10 to 5.30E+05	7.6E+03	3.21E-04	NDA
Sulfide	32	NDA	NDA	NDA	NDA	NDA	NDA

NDA - No Data Available

REFERENCES:

1 USEPA 1986
2 GRI 1987a
3 Washeleski 1988
4 Clement 1985
5 USEPA 1979
6 GRI 1987b
7 SRC 1991
8 Weast and Astle (1981-1982)
9 ASTDR (1987-1990)
10 Warner et. al. 1987
11 Fujita et. al. 1964
12 Howard 1990a, b
13 Windholz 1983
14 USEPA 1990

TABLE 5-2. CHEMICAL AND PHYSICAL PROPERTIES OF INORGANIC CHEMICALS DETECTED DURING THE RI

	Molecular Weight	Physical State	Solubility in Water	Solubility in Organics	Solubility in Acids	Specific Gravity
REFERENCES:			(1,2,3,4,5)	(2,4,5)	(2,4,5)	(2,4,5)
METALS						
Aluminum	27	solid	insoluble	NDA	soluble	2.702
Iron	56	solid	insoluble	soluble	soluble	7.86
Barium	137	solid	decomposes	variable	NDA	3.51
Beryllium	9	solid	insoluble	NDA	soluble	1.85
Antimony	122	solid	insoluble	NDA	soluble	6.684 to 6.688
Arsenic	75	solid	insoluble	NDA	soluble	5.727
Cadmium	112	solid	insoluble	variable	soluble	8.642
Chromium	52	solid	insoluble	insoluble	soluble	7.20
Cobalt	59	solid	insoluble	insoluble	soluble	8.9
Copper	64	solid	insoluble	NDA	soluble	8.92
Lead	207	solid	insoluble	insoluble	soluble	11.344
Manganese	55	solid	decomposes	NDA	soluble	7.20
Mercury	201	liquid	insoluble	soluble	variable	15.594
Nickel	59	solid	insoluble	NDA	soluble	8.90
Selenium	79	solid	insoluble	soluble	soluble	4.26 to 4.81
Thallium	204	solid	insoluble	NDA	soluble	11.85
Vanadium	51	solid	insoluble	NDA	soluble	5.96
Zinc	65	solid	insoluble	NDA	soluble	7.14

NOTES:

NDA - No Data Available

REFERENCES:
1 USEPA, 1986
2 Clement 1985
3 USEPA 1979
4 Weast and Astle (1981-1982)
5 ASTDR (1987-1990)

TABLE 6 - 1 CHEMICALS OF CONCERN AT THE ROSE HILL REGIONAL LANDFILL SITE

CHEMICAL NAME	Groundwater	Residential Wells	Leachate	Surface Water	Sediment	Surface Soils	Landfill Gas	Residential Ambient Air ***
VOLATILE ORGANICS								
Acetone						x	x	
Benzene	x	x					x	x
Carbon Disulfide							x	
Chloroethane	x	x	x					
1,1 Dichloroethane	x						x	
1,1 Dichloroethene							x	
cis-1,2-Dichloroethene *	x		x				x	
trans-1,2-Dichloroethene							x	
Dichlorodifluoromethane							x	
Ethylbenzene							x	x
4-Methyl-2-pentanone							x	
Methylene Chloride							x	x
1,1,2,2-Tetrachloroethane								x
Toluene							x	x
1,2,4-Trichlorobenzene							x	
1,1,1-Trichloroethane								x
Trichloroethene		x					x	
1,2,4-Trimethylbenzene							x	
1,3,5-Trimethylbenzene							x	
Vinyl chloride **	x					x	x	x
m,p-Xylene							x	x
o-Xylene								x
SEMIVOLATILE ORGANICS								
2- Methylnaphthalene	x							
Benzo (a) anthracene						x		
Benzo (a) pyrene						x		
Benzo (b) fluoranthene						x		
Benzo (k) fluoranthene						x		
Chrysene						x		
Indeno (1,2,3 - c,d) pyrene						x		

TABLE 6 - 1 CHEMICALS OF CONCERN AT THE ROSE HILL REGIONAL LANDFILL SITE

CHEMICAL NAME	Groundwater	Residential Wells	Leachate	Surface Water	Sediment	Surface Soils	Landfill Gas	Residential Ambient Air ***
Bis (2-ethylhexyl) phthalate	x		x					
4-Chloro-3-methylphenol	x							
4-Methyl phenol		x						
Pentachlorophenol	x							
Acrylamide	x			x				
N N dimethylformamide	x	x		x				
PESTICIDES								
Dieldrin		x						
METALS								
Aluminum	x	x	x	x	x	x		
Antimony	x			x				
Arsenic	x		x		x	x		
Barium	x	x	x	x	x	x		
Beryllium	x		x		x	x		
Cadmium	x							
Chromium *	x		x		x	x		
Cobalt	x		x		x	x		
Copper	x	x	x		x	x		
Lead	x		x		x	x		
Manganese	x	x	x	x	x	x		
Mercury		x				x		
Nickel	x				x			
Selenium					x			
Thallium						x		
Vanadium	x		x		x	x		
Zinc	x	x			x			
INORGANICS								
Ammonia	x		x	x	x			
Sulfide	x	x		x	x			

* Laboratory reported 1,2-dichloroethene (total) in all media except soil gas; this was conservatively assumed to be cis-1,2-dichloroethane. Laboratory reported [total] chromium; this was conservatively assumed to be chromium VI.

** Vinyl chloride was the only chemical of concern used to evaluate potential future risk from indoor air exposure at nearby residences.

*** All(ıicals detected in ambient air at nearby residences were included as(ıicals of concern, except for those rejected during data validation. (

TABLE 6-2.
DOSE-RESPONSE VALUES FOR CHEMICALS OF CONCERN AT
THE ROSE HILL REGIONAL LANDFILL SITE

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	CHRONIC INHALATION RfC (mg/cu.m)	CRITICAL EFFECTS oral/ inhal.	RfD/RfC REFERENCE	WEIGHT OF EVIDENCE	ORAL SLOPE FACTOR /(mg/kg/day)	INHALATION UNIT RISK /(ug/cu.m)	SF/UNIT RISK REFERENCE	NOTES
Acetone	0.1	ND	increased liver, kidney weight, nephrotox/ NA	IRIS 8/93	D	NA	NA	IRIS 8/93	
Benzene	ND	ND	ND	IRIS 5/92	A	0.029	0.0000083	IRIS 5/92	
Carbon disulfide	0.1	0.01	malformation, fetal toxicity/ fetal toxicity	IRIS 1/92/ HEAST '93	ND	ND	ND	IRIS 1/92	
Chloroethane	ND	10	NA/ developmental toxicity	IRIS 1/92	ND	ND	ND	IRIS 1/92	
Dichlorodifluoromethane	0.2	0.2	reduced body weight/ liver	IRIS 1/92/ HEAST '93	ND	ND	ND	IRIS 1/92	a
1,1-Dichloroethane	0.1	0.5	none/ kidney damage	HEAST '93/ HEAST '93	C	ND	ND	IRIS 1/92	a
1,1-Dichloroethene	0.009	ND	hepatic lesion/ ND	IRIS 1/92	C	0.6	0.00005	IRIS 1/92	
cis-1,2-Dichloroethene	0.01	ND	decreased hemoglobin & hematocrit/ NA	HEAST '93	D	NA	NA	IRIS 1/92	
trans-1,2-Dichloroethene	0.02	ND	increased serum alkaline phosphatase/ NA	IRIS I/92	ND	ND	ND	IRIS 1/92	

TABLE 6-2.
DOSE-RESPONSE VALUES FOR CHEMICALS OF CONCERN AT
THE ROSE HILL REGIONAL LANDFILL SITE
CONTINUED

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	CHRONIC INHALATION RfC (mg/cu.m)	CRITICAL EFFECTS oral/inhal.	RfD/RfC REFERENCE	WEIGHT OF EVIDENCE	ORAL SLOPE FACTOR /(mg/kg/day)	INHALATION UNIT RISK /(ug/cu.m)	SF/UNIT RISK REFERENCE	NOTES
Ethylbenzene	0.1	1	liver, kidney toxicity/ developmental toxicity	IRIS 5/92	D	NA	NA	IRIS 5/92	
4-Methyl-2-pentanone	0.05	0.08	liver, kidney effects/ liver, kidney toxicity	HEAST '93	ND	ND	ND	IRIS 8/93	a
Methylene chloride	0.06	3	liver toxicity/ liver toxicity	IRIS 1/92/ HEAST '93	B2	0.0075	0.00000047	IRIS 1/92	
1,1,2,2-Tetrachloroethane	ND	ND	ND	IRIS 2/94	C	0.2	0.000058	IRIS 2/94	
Toluene	0.2	0.4	Changes in liver, kidney wts./ CNS effects	IRIS 8/92	D	NA	NA	IRIS 8/92	
1,2,4-Trichlorobenzene	0.01	0.009	increased adrenal wts., vacuolization of zona fasciculata in the cortex/ liver porphyria	IRIS 8/93/ HEAST '93	D	NA	NA	IRIS 8/93	a
1,1,1-Trichloroethane	0.09	1	hepatotoxicity/ hepatotoxicity	HEAST '92/ HEAST '92	D	NA	NA	IRIS 4/93	a,b
Trichloroethene	ND	ND	ND	IRIS 11/93	B2	0.011	0.0000017	HEAST '91	b
Trimethylbenzenes	DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT (HEAST '93)								
Vinyl chloride	ND	ND	ND	IRIS 8/91	A	1.9	0.000084	HEAST '93	c

TABLE 6-2.
DOSE-RESPONSE VALUES FOR CHEMICALS OF CONCERN AT
THE ROSE HILL REGIONAL LANDFILL SITE
CONTINUED

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	CHRONIC INHALATION RfC (mg/cu.m)	CRITICAL EFFECTS oral/inhal.	RfD/RfC REFERENCE	WEIGHT OF EVIDENCE	ORAL SLOPE FACTOR /(mg/kg/day)	INHALATION UNIT RISK /(ug/cu.m)	SF/UNIT RISK REFERENCE	NOTES
m-Xylene	2	0.3	hyperactivity, decreased body weight/ hepatomegaly	IRIS 1/92/ HEAST '91	D	NA	NA	IRIS 1/92	d
p-Xylene	2	0.3	hyperactivity, decreased body weight/ nose and throat irrit., CNS effects	IRIS 1/92 HEAST '91	D	NA	NA	IRIS 1/92	d
o-Xylene	2	0.7	hyperactivity, decreased body weight/ hepatomegaly	IRIS 1/92 HEAST '91	D	NA	NA	IRIS 1/92	d
2-Methylnaphthalene	ND	ND	ND		ND	ND	ND		
Benzo (a) anthracene	ND	ND	ND	IRIS 11/93	B2	7.3	ND	REGION I	e
Benzo (a) pyrene	ND	ND	ND	IRIS 9/93	B2	7.3	0.0017	IRIS 9/93/ HEAST '92	f
Benzo (b) fluoranthene	ND	ND	ND	IRIS 11/93	B2	7.3	ND	REGION I	e
Benzo (k) fluoranthene	ND	ND	ND	IRIS 11/93	B2	7.3	ND	REGION I	e
Chrysene	ND	ND	ND	IRIS 11/93	B2	7.3	ND	REGION I	e
Indeno (1,2,3-c,d) pyrene	ND	ND	ND	IRIS 11/93	B2	7.3	ND	REGION I	e
Bis (2-ethylhexyl) phthalate	0.02	ND	increased liver wt./ NA	IRIS 2/93	B2	0.014	ND	IRIS 2/93	
4-Chloro-3-methylphenol	ND	ND	ND	IRIS 12/91	ND	ND	ND	IRIS 12/91	

TABLE 6-2.
DOSE-RESPONSE VALUES FOR CHEMICALS OF CONCERN AT
THE ROSE HILL REGIONAL LANDFILL SITE
CONTINUED

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	CHRONIC INHALATION RfC (mg/cu.m)	CRITICAL EFFECTS oral/inhal.	RfD/RfC REFERENCE	WEIGHT OF EVIDENCE	ORAL SLOPE FACTOR /(mg/kg/day)	INHALATION UNIT RISK /(ug/cu.m)	SF/UNIT RISK REFERENCE	NOTES
4-Methylphenol	0.005	ND	maternal death, respiratory distress, eye discharge, hypoactivity, cyanosis/ NA	HEAST '93	C	ND	ND	IRIS 8/93	
Pentachlorophenol	0.03	ND	liver & kidney pathology/ NA	IRIS 7/93	B2	0.12	ND	IRIS 7/93	
Acrylamide	0.0002	ND	nerve damage/ NA	IRIS 7/93	B2	4.5	0.0013	IRIS 7/93	
N,N'-Dimethylformamide	0.1	0.03	liver effects/ digestive, liver effects	HEAST '93/ IRIS 5/91	ND	ND	ND	IRIS 5/91	
Dieldrin	0.00005	ND	liver lesions/ NA	IRIS 7/93	B2	16	0.0046	IRIS 7/93	
Aluminum	DATA INADEQUATE FOR QUANTITATIVE RISK ASSESSMENT (HEAST '93)								
Antimony	0.0004	ND	reduced life span, blood glucose, cholesterol effects/ NA	IRIS 1/92	ND	ND	ND	IRIS 1/92	g

TABLE 6-2.
DOSE-RESPONSE VALUES FOR CHEMICALS OF CONCERN AT
THE ROSE HILL REGIONAL LANDFILL SITE
CONTINUED

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	CHRONIC INHALATION RfC (mg/cu.m)	CRITICAL EFFECTS oral/inhal.	RfD/RfC REFERENCE	WEIGHT OF EVIDENCE	ORAL SLOPE FACTOR /(mg/kg/day)	INHALATION UNIT RISK /(ug/cu.m)	SF/UNIT RISK REFERENCE	NOTES
Arsenic	0.0003	ND	keratosis & hyperpigmentation/ NA	IRIS 3/93	A	1.75	0.0043	IRIS 3/93	h
Barium	0.07	0.0005	increased blood press./ fetotoxicity	IRIS 1/92/ HEAST '93	D	ND	ND	HEA '84	a
Beryllium	0.005	ND	none observed/ NA	IRIS 2/93	B2	4.3	0.0024	IRIS 2/93	
Cadmium	0.0005	ND	renal damage/ NA	IRIS 6/92	B1	ND	0.0018	IRIS 6/92	i
Chromium III	1	ND	none observed/ NA	IRIS 6/92	ND	ND	ND	IRIS 6/92	
Chromium VI	0.005	ND	no effects reported/ NA	IRIS 3/93	A	ND	0.012	IRIS 3/93	
Cobalt	ND	ND	ND	IRIS 6/92	ND	ND	ND	IRIS 6/92	
Copper	ND	ND	GI irritant/ NA	IRIS 1/92	D	NA	NA	IRIS 1/92	
Lead	ND	ND	CNS effects/ CNS effects	IRIS 11/93	B2	ND	ND	IRIS 11/93	
Manganese	0.005	0.0004	CNS effects/ increased resp. symptoms & psychomotor disturbances	IRIS 11/93	D	NA	NA	IRIS 11/93	i

TABLE 6-2.
DOSE-RESPONSE VALUES FOR CHEMICALS OF CONCERN AT
THE ROSE HILL REGIONAL LANDFILL SITE
CONTINUED

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	CHRONIC INHALATION RfC (mg/cu.m)	CRITICAL EFFECTS oral/inhal.	RfD/RfC REFERENCE	WEIGHT OF EVIDENCE	ORAL SLOPE FACTOR /(mg/kg/day)	INHALATION UNIT RISK /(ug/cu.m)	SF/UNIT RISK REFERENCE	NOTES
Mercury	0.0003	0.0003	kidney effects/ neurotoxicity	HEAST '93	D	NA	NA	IRIS 1/92	
Nickel	0.02	ND	reduced body, organ weight/ NA	IRIS 1/92	D	NA	NA		j
Selenium	0.005	ND	respiratory effects, liver and kidney toxicity/NA	IRIS 1/92	D	NA	NA	IRIS 1/92	
Thallium	0.00007	ND	increased SGOT & serum LDH levels/ NA	IRIS 1/92	ND	ND	ND	HEAST '93	k
Vanadium	0.007	ND	none observed/ NA	HEAST '93	ND	ND	ND	IRIS 8/91	
Zinc	0.3	ND	decreased blood enzyme/ NA	IRIS 10/92	D	NA	NA	IRIS 10/92	
Ammonia	ND	0.1	taste threshold/ respiratory effects	HEAST '93/ IRIS 9/92	ND	ND	ND	IRIS 9/92	l
Sulfide	ND	ND	ND		ND	ND	ND		

TABLE 6-2.
DOSE-RESPONSE VALUES FOR CHEMICALS OF CONCERN AT
THE ROSE HILL REGIONAL LANDFILL SITE
CONTINUED

FOOTNOTES:

a. Chronic RfC is from HEAST '93, Alternate Methods Table.

b. Both the oral slope factor and the inhalation unit risk for trichloroethene are listed in HEAST '91 and have since been withdrawn also, the inhalation unit risk is based on metabolized dose, not absorbed dose. In addition, both the chronic oral RfD and inhalation RfC for 1,1,1-Trichloroethane are listed in HEAST '92 and have since been withdrawn.

c. Vinyl chloride values are from 1984 and 1985 EPA documents; use of these values has been validated by USEPA for interim use.

d. RfC for xylenes, listed in HEAST '91, has since been withdrawn.

e. Slope factor for benzo (a) pyrene was used per Region I procedure.

f. Inhalation Unit Risk for benzo (a) pyrene listed in Heast '92 has since been withdrawn.

g. Study done with antimony trioxide provides qualitative evidence of lung cancer in animals.

h. Slope factor derived from oral unit risk of 5E-5 /ug/L in drinking water.

i. Water oral RfDs for cadmium and manganese were used, not the food oral RfDs, which are 0.001 mg/kg/day and 0.14 mg/kg/day, respectively.

j. Nickel refinery dust and nickel subsulfide only are classified as Group A carcinogens.

k. Calculated by analogy to thallium sulfate by correcting for ratio of molecular weights.

l. No reference dose. A taste threshold of 34 mg/L in water is reported in HEAST 1993.

ND = No data.

NA = Not applicable or not available.

REFERENCES:

IRIS. USEPA, 1991, 1992 and 1993, IRIS, Integrated Risk Information System.

HEAST. USEPA, 1991, 1992 and 1993 HEAST, Health Effects Assessment Summary Tables.

REGION I. USEPA, Region I procedure.

HEA. USEPA, 1984, Health Effects Assessment document.

TABLE 6-3

POTENTIAL HUMAN HEALTH EXPOSURE PATHWAYS FOR THE ROSE HILL REGIONAL LANDFILL SITE

CURRENT LAND USE

Exposure Medium	Mechanism(s) of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete? Basis.	How Evaluated
Surface Soil (0-1 foot deep)	Direct disposal onto surface soil; deposition of eroded soil from landfill; adsorption from soil gas; adsorption from seepage contaminants	Solid Waste Area	Site Visitors	Incidental ingestion	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Bulky Waste Area	Site Visitors	Incidental ingestion	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Sewage Sludge Area	Site Visitors	Incidental ingestion	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	Direct disposal onto surface soil; deposition of eroded soil from landfill; deposition of soil gas; deposition of seepage contaminants	Solid Waste Area	Site Visitors	Dermal absorption	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Bulky Waste Area	Site Visitors	Dermal absorption	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Sewage Sludge Area	Site Visitors	Dermal absorption	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Subsurface Soil (> 1 foot deep)	Deposition of leachate contaminants	Periphery of disposal areas	Site Visitors	Incidental ingestion Dermal absorption	No. Visitors are not expected to engage in activities which would result in exposures to sub-surface material.	Not evaluated
Disposal Area Contents (> 1 foot deep)	Direct disposal into disposal areas	Interior of disposal areas	Site Visitors	Incidental ingestion Dermal absorption	No. Visitors are not expected to engage in activities which would result in exposures to sub-surface material.	Not evaluated

TABLE 6-3

POTENTIAL HUMAN HEALTH EXPOSURE PATHWAYS FOR THE ROSE HILL REGIONAL LANDFILL SITE

CURRENT LAND USE

Exposure Medium	Mechanism(s) of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete? Basis.	How Evaluated
Leachate	Seepage of leachate onto land surface	Solid waste area leachate seeps	Site Visitors	Ingestion	No. Visitors are not expected to ingest seepage water.	Not evaluated
Leachate	Seepage of leachate onto land surface	Bulky waste area leachate seeps	Site Visitors	Ingestion	No. Visitors are not expected to ingest seepage water.	Not evaluated
Leachate	Seepage of leachate onto land surface	Solid waste area leachate seeps	Site Visitors	Dermal absorption	Yes. Visitors may walk through wet soil areas or seeps without waterproof footwear.	Quantitative
Leachate	Seepage of leachate onto land surface	Bulky waste area leachate seeps	Site Visitors	Dermal absorption	Yes. Visitors may walk through wet soil areas or seeps without waterproof footwear.	Quantitative
Groundwater: Monitoring Wells	Leaching from soil or disposal area contents to groundwater as measured at monitoring wells	Periphery of disposal areas	Site Visitors	Ingestion and dermal absorption; inhalation of vapor	No. Visitors are not expected to engage in activities which would result in exposures to ground-water.	Not evaluated
Groundwater: Residential Wells	Groundwater migration from disposal areas	Within existing homes	Residents adjacent to site	Ingestion	Yes. Under "baseline" conditions, wells could be in use.	Quantitative
Groundwater: Residential Wells	Groundwater migration from disposal areas	Within existing homes	Residents adjacent to site	Dermal absorption	No. USEPA procedure is to consider as related to ingestion.	Not evaluated
Groundwater: Residential Wells	Groundwater migration from disposal areas	Within existing homes	Residents adjacent to site	Inhalation of vapor	No. USEPA procedure is to consider as related to ingestion.	Not evaluated
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Swimmers	Incidental ingestion	Yes. Swimmers may ingest water.	Quantitative
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Swimmers	Dermal absorption	Yes. Swimmers may absorb contaminants.	Quantitative
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Incidental ingestion	No. Mitchell Brook is too shallow for ingestion to be significant.	Not evaluated

TABLE 6-3
POTENTIAL HUMAN HEALTH EXPOSURE PATHWAYS FOR THE ROSE HILL REGIONAL LANDFILL SITE
CURRENT LAND USE

Exposure Medium	Mechanism(s) of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete? Basis.	How Evaluated
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Dermal absorption	Yes. Visitors may walk through Mitchell Brook without water-proof footwear.	Quantitative
Sediments	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Swimmers	Incidental ingestion	No. Sediments would typically rinse off skin before hand-to-mouth contact occurs.	Not evaluated
Sediments	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Incidental ingestion	No. Areal extent of Mitchell Brook sediments is minimal.	Not evaluated
Sediments	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Swimmers	Dermal absorption	No. COCs are inorganic, and have negligible dermal absorption.	Not evaluated
Sediments	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Dermal absorption	No. COCs are inorganic, and have negligible dermal absorption.	Not evaluated
Fish	Bioaccumulation in fish	Saugatucket River	Fishermen & Families	Ingestion	No. Contaminant concentrations in river water and sediments are low.	Not evaluated
Ambient Air	Release of landfill soil gas to air	Surface of solid waste area	Site Visitors	Inhalation	Yes. Frequent use of surfaces; disposal areas have internal gas generation.	Quantitative
Ambient Air	Release of landfill soil gas to air	Surface of bulky waste area	Site Visitors	Inhalation	Yes. Frequent use of land surface; disposal areas have internal gas generation.	Quantitative
Ambient Air	Release of landfill soil gas to air	Surface of sewage sludge area	Site Visitors	Inhalation	Yes. Frequent use of land surface.	Quantitative
Ambient Air/ Indoor Air	Release of landfill soil gas to ambient air and indoor air	Houses, mostly on Rose Hill Road	Nearby Residents	Inhalation	Yes. Nearby residents may inhale contaminants inside and outside homes.	Quantitative

TABLE 6-4
POTENTIAL HUMAN HEALTH EXPOSURE PATHWAYS FOR THE ROSE HILL REGIONAL LANDFILL SITE
FUTURE LAND USE

Exposure Medium	Mechanism(s) of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete? Basis.	How Evaluated
Surface Soil (0-1 foot deep)	Direct disposal onto surface soil; deposition of eroded soil from landfill; adsorption from soil gas; adsorption from seepage contaminants	Solid Waste Area	Site Visitors	Incidental ingestion	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Bulky Waste Area	Site Visitors	Incidental ingestion	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Sewage Sludge Area	Site Visitors	Incidental ingestion	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	Direct disposal onto surface soil; deposition of eroded soil from landfill; deposition of soil gas; deposition of seepage contaminants	Solid Waste Area	Site Visitors	Dermal absorption	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Bulky Waste Area	Site Visitors	Dermal absorption	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Surface Soil (0-1 foot deep)	See above.	Sewage Sludge Area	Site Visitors	Dermal absorption	Yes. Site visitors may contact surface soils during normal activities.	Quantitative
Subsurface Soil * (> 1 foot deep)	Deposition of leachate contaminants	Periphery of disposal areas	Future Site Residents	Incidental ingestion Dermal absorption	No. Excavation at margin of disposal areas is not anticipated.	Not evaluated

TABLE 6-4
POTENTIAL HUMAN HEALTH EXPOSURE PATHWAYS FOR THE ROSE HILL REGIONAL LANDFILL SITE
FUTURE LAND USE

Exposure Medium	Mechanism(s) of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete? Basis.	How Evaluated
Disposal Area Contents (> 1 foot deep) *	Direct disposal into disposal areas	Interior of disposal areas	Future Site Residents	Incidental ingestion Dermal absorption	No. Excavation of disposal areas is not anticipated.	Not evaluated
Leachate	Seepage of leachate onto land surface	Solid waste area leachate seeps	Site Visitors	Ingestion	No. Visitors are not expected to ingest seepage water.	Not evaluated
Leachate	Seepage of leachate onto land surface	Bulky waste area leachate seeps	Site Visitors	Ingestion	No. Visitors are not expected to ingest seepage water.	Not evaluated
Leachate	Seepage of leachate onto land surface	Solid waste area leachate seeps	Site Visitors	Dermal absorption	Yes. Visitors may walk through wet soil areas or seeps without waterproof footwear.	Quantitative
Leachate	Seepage of leachate onto land surface	Bulky waste area leachate seeps	Site Visitors	Dermal absorption	Yes. Visitors may walk through wet soil areas or seeps without waterproof footwear.	Quantitative
Groundwater: Monitoring Wells *	Leaching from soil or disposal area contents to groundwater as measured at monitoring wells	Solid Waste Area	Future Site Residents	Ingestion and dermal absorption; inhalation of vapor	Yes (ingestion only). Future groundwater consumption is possible around the site.	Quantitative (ingestion only)
Groundwater: Monitoring Wells *	Leaching from soil or disposal area contents to groundwater as measured at monitoring wells	Bulky Waste Area	Future Site Residents	Ingestion and dermal absorption; inhalation of vapor	Yes (ingestion only). Future groundwater consumption is possible around the site.	Quantitative (ingestion only)
Groundwater: Monitoring Wells *	Leaching from soil or disposal area contents to groundwater as measured at monitoring wells	Sewage Sludge Area	Future Site Residents	Ingestion and dermal absorption; inhalation of vapor	Yes (ingestion only). Future groundwater consumption is possible around the site.	Quantitative (ingestion only)

TABLE 6-4
POTENTIAL HUMAN HEALTH EXPOSURE PATHWAYS FOR THE ROSE HILL REGIONAL LANDFILL SITE
FUTURE LAND USE

Exposure Medium	Mechanism(s) of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete? Basis.	How Evaluated
Groundwater: Residential Wells	Groundwater migration from disposal areas	Within existing homes	Residents adjacent to site	Ingestion	Yes. Under baseline conditions, wells could be in use.	Quantitative
Groundwater: Residential Wells	Groundwater migration from disposal areas	Within existing homes	Residents adjacent to site	Dermal absorption	No. USEPA procedure is to consider as related to ingestion.	Not evaluated
Groundwater: Residential Wells	Groundwater migration from disposal areas	Within existing homes	Residents adjacent to site	Inhalation of vapor	No. USEPA procedure is to consider as related to ingestion.	Not evaluated
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Adolescent Swimmers	Incidental ingestion	Yes. Swimmers may ingest water.	Quantitative
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Adolescent Swimmers	Dermal absorption	Yes. Swimmers may absorb contaminants.	Quantitative
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Incidental ingestion	No. Mitchell Brook is too shallow for ingestion to be significant.	Not evaluated
Surface Water	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Dermal absorption	Yes. Visitors may walk through Mitchell Brook without water-proof footwear.	Quantitative
Sediments	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Swimmers	Incidental ingestion	No. Sediments would typically rinse off skin before hand-to-mouth contact occurs.	Not evaluated

TABLE 6-4
POTENTIAL HUMAN HEALTH EXPOSURE PATHWAYS FOR THE ROSE HILL REGIONAL LANDFILL SITE
FUTURE LAND USE

Exposure Medium	Mechanism(s) of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete? Basis.	How Evaluated
Sediments	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Incidental ingestion	No. Areal extent of Mitchell Brook sediments is minimal.	Not evaluated
Sediments	Groundwater and leachate discharge to surface; direct runoff	Saugatucket River	Swimmers	Dermal absorption	No. COCs are inorganic and have negligible dermal absorption.	Not evaluated
Sediments	Groundwater and leachate discharge to surface; direct runoff	Mitchell Brook	Site Visitors	Dermal absorption	No. COCs are inorganic and have negligible dermal absorption.	Not evaluated
Fish	Bioaccumulation in fish	Saugatucket River	Fishermen & Families	Ingestion	No. Contaminant concentrations in river water and sediments are low.	Not evaluated
Ambient Air	Release of landfill soil gas to air	Surface of solid waste area	Site Visitors	Inhalation	Yes. Frequent use of land surface; disposal areas have internal gas generation.	Quantitative
Ambient Air	Release of landfill soil gas to air	Surface of bulky waste area	Site Visitors	Inhalation	Yes. Frequent use of land surface; disposal areas have internal gas generation.	Quantitative
Ambient Air	Release of landfill soil gas to air	Surface of sewage sludge area	Site Visitors	Inhalation	Yes. Frequent use of land surface.	Quantitative
Ambient Air/ Indoor Air *	Release of landfill soil gas to ambient air and indoor air	Houses, mostly on Rose Hill Road	Nearby Residents	Inhalation	Yes. Nearby residents may inhale contaminants inside and outside homes.	Quantitative

NOTES:

* - These potential human health exposure pathways are marked with an asterisk if the evaluation or basis presented here is different from current land use (Table 6-3).

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TABLE 6-5. SUMMARY STATISTICS FOR SURFACE SOIL FROM THE SOLID WASTE AREA
(Units: mg/kg)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Acetone	6 / 13	6 / 13	0.011 - 0.017	0.015 - 160	14.134	160	14
Vinyl Chloride	2 / 13	2 / 13	0.011 - 0.017	0.004 - 0.25	0.025	0.25	0.025
Benzo(a)anthracene	4 / 13	4 / 13	0.35 - 0.55	0.022 - 0.078	0.166	0.078	0.078
Benzo(a)pyrene	4 / 13	4 / 13	0.35 - 0.55	0.023 - 0.068	0.164	0.068	0.068
Benzo(b)fluoranthene	4 / 13	4 / 13	0.35 - 0.55	0.026 - 0.076	0.167	0.076	0.076
Benzo(k)fluoranthene	4 / 13	4 / 13	0.35 - 0.55	0.024 - 0.064	0.165	0.064	0.064
Chrysene	4 / 13	4 / 13	0.35 - 0.55	0.021 - 0.095	0.168	0.095	0.095
Indeno(1,2,3-cd)pyrene	3 / 13	3 / 13	0.35 - 0.55	0.023 - 0.052	0.175	0.052	0.052
Aluminum	13 / 13	13 / 13	2.7 - 7.10	1740 - 14400	8032.308	14400	8000
Arsenic	7 / 13	7 / 13	0.2 - 0.63	0.81 - 3.5	1.450	3.5	1.5
Barium	13 / 13	13 / 13	0.2 - 0.32	5.2 - 20.5	15.731	20.5	16
Beryllium	6 / 13	6 / 13	0.2 - 0.32	0.37 - 1.1	0.408	1.1	0.41
Chromium	8 / 13	8 / 13	0.62 - 2.3	3.2 - 13.9	7.527	13.9	7.5
Cobalt	6 / 13	6 / 13	0.62 - 1.7	3.8 - 6.2	2.942	6.2	2.9
Copper	8 / 12	8 / 12	0.45 - 1.2	5.4 - 253	26.988	253	27
Lead	13 / 13	13 / 13	0.2 - 3.00	3.1 - 31.1	11.808	31.1	12
Manganese	13 / 13	13 / 13	0.21 - 0.6	12.9 - 257	109.715	257	110
Mercury	1 / 13	1 / 13	0.09 - 0.16	0.2	0.067	0.2	0.067
Thallium	1 / 13	1 / 13	0.2 - 0.32	0.36	0.147	0.36	0.15
Vanadium	13 / 13	13 / 13	0.41 - 0.9	3.2 - 27.2	14.131	27.2	14

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

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TABLE 6-6. SUMMARY STATISTICS FOR SURFACE SOIL FROM THE BULKY WASTE AREA
(Units: mg/kg)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Acetone	3 / 5	3 / 5	0.012 - 0.032	0.037 - 23.7	4.772	23.7	4.8
Vinyl Chloride	0 / 5	0 / 5	0.012 - 0.032	--	0.000	0	0
Benzo(a)anthracene	0 / 5	0 / 5	0.38 - 1.1	--	0.000	0	0
Benzo(a)pyrene	0 / 5	0 / 5	0.38 - 1.1	--	0.000	0	0
Benzo(b)fluoranthene	1 / 5	1 / 5	0.38 - 1.1	0.057	0.176	0.057	0.057
Benzo(k)fluoranthene	0 / 5	0 / 5	0.38 - 1.1	--	0.000	0	0
Chrysene	1 / 5	1 / 5	0.38 - 1.1	0.055	0.176	0.055	0.055
Indeno(1,2,3-cd)pyrene	0 / 5	0 / 5	0.38 - 1.1	--	0.000	0	0
Aluminum	5 / 5	5 / 5	2.9 - 13.90	3065 - 8940	6379.000	8940	6400
Arsenic	2 / 5	2 / 5	0.2 - 1.30	1.05 - 1.3	1.160	1.3	1.2
Barium	5 / 5	5 / 5	0.2 - 0.63	14.4 - 86.2	34.160	86.2	34
Beryllium	3 / 5	3 / 5	0.2 - 0.63	0.52 - 0.88	0.573	0.88	0.57
Chromium	2 / 5	2 / 5	0.65 - 2.0	7.7 - 9.8	5.790	9.8	5.8
Cobalt	4 / 5	4 / 5	0.65 - 1.90	3.3 - 12.8	6.040	12.8	6.0
Copper	2 / 4	2 / 4	0.44 - 0.99	2.8 - 5.6	3.250	5.6	3.3
Lead	5 / 5	5 / 5	0.2 - 6.40	4.3 - 124	29.340	124	29
Manganese	5 / 5	5 / 5	0.22 - 0.63	105 - 6120	1361.000	6120	1400
Mercury	1 / 5	1 / 5	0.1 - 0.32	0.41	0.128	0.41	0.13
Thallium	0 / 5	0 / 5	0.2 - 0.64	--	0.000	0	0
Vanadium	5 / 5	5 / 5	0.44 - 1.30	5.7 - 18.1	12.430	18.1	12

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

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TABLE 6-7. SUMMARY STATISTICS FOR SURFACE SOIL FROM THE SEWAGE SLUDGE AREA
(Units: mg/kg)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Acetone	2 / 3	2 / 3	0.011 - 0.012	0.014 - 0.023	0.014	0.023	0.014
Vinyl Chloride	0 / 3	0 / 3	0.011 - 0.012	--	0.000	0	0
Benzo(a)anthracene	0 / 3	0 / 3	0.36 - 0.40	--	0.000	0	0
Benzo(a)pyrene	0 / 3	0 / 3	0.36 - 0.40	--	0.000	0	0
Benzo(b)fluoranthene	0 / 3	0 / 3	0.36 - 0.40	--	0.000	0	0
Benzo(k)fluoranthene	0 / 3	0 / 3	0.36 - 0.40	--	0.000	0	0
Chrysene	0 / 3	0 / 3	0.36 - 0.40	--	0.000	0	0
Indeno(1,2,3-cd)pyrene	0 / 3	0 / 3	0.36 - 0.40	--	0.000	0	0
Aluminum	3 / 3	3 / 3	2.7 - 4.90	3450 - 6740	5516.667	6740	5500
Arsenic	2 / 3	2 / 3	0.2 - 0.42	0.52 - 0.86	0.793	0.86	0.79
Barium	3 / 3	3 / 3	0.2 - 0.22	8.5 - 58.9	27.733	58.9	28
Beryllium	1 / 3	1 / 3	0.2 - 0.22	0.4	0.345	0.4	0.35
Chromium	2 / 3	2 / 3	0.66 - 1.9	5.3 - 9.8	6.383	9.8	6.4
Cobalt	2 / 3	2 / 3	0.66 - 1.4	3.0 - 3.6	2.933	3.6	2.9
Copper	2 / 3	2 / 3	0.44 - 0.9	9.9 - 99.3	37.067	99.3	37
Lead	3 / 3	3 / 3	0.2 - 0.21	2.6 - 11.8	6.267	11.8	6.3
Manganese	3 / 3	3 / 3	0.22 - 0.5	96.4 - 135	109.567	135	110
Mercury	1 / 3	1 / 3	0.1	0.28	0.127	0.28	0.13
Thallium	1 / 3	1 / 3	0.2 - 0.21	0.25	0.152	0.25	0.15
Vanadium	2 / 3	2 / 3	0.44 - 0.7	12.0 - 12.1	9.183	12.1	9.2

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

TABLE 6-8. SUMMARY STATISTICS FOR LEACHATE FROM THE SOLID WASTE AREA
(Units: $\mu g/L$)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Detection Limits	Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Average Case (5)
Chloroethane	0 / 1	0 / 1	10	--	0.000	0	0
1,2-Dichloroethene(total)	1 / 1	1 / 1	5	44	44.000	44	44
bis(2-Ethylhexyl)phthalate	0 / 1	0 / 1	10	--	0.000	0	0
Aluminum	1 / 1	1 / 1	10	60500	60500.000	60500	60500
Arsenic	1 / 1	1 / 1	2	3.7	3.700	3.7	3.7
Barium	1 / 1	1 / 1	1	328	328.000	328	328
Beryllium	1 / 1	1 / 1	1	11.2	11.200	11.2	11
Chromium	1 / 1	1 / 1	2	23.9	23.900	23.9	23.9
Cobalt	0 / 1	0 / 1	2	--	0.000	0	0
Copper	1 / 1	1 / 1	3	37.8	37.800	37.8	37.8
Lead	1 / 1	1 / 1	1	150	150.000	150	150
Manganese	1 / 1	1 / 1	1	814	814.000	814	810
Vanadium	1 / 1	1 / 1	2	49.8	49.800	49.8	49.8

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

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TABLE 6-9. SUMMARY STATISTICS FOR LEACHATE FROM THE BULKY WASTE AREA
(Units: μg/L)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Chloroethane	3 / 5	4 / 8	10	2 - 8	5.650	8	5.7
1,2-Dichloroethene(total)	1 / 5	1 / 7	5 - 10	1	2.733	1	1
bis(2-Ethylhexyl)phthalate	1 / 5	1 / 8	10	230	50.000	230	50
Aluminum	4 / 5	6 / 8	10 - 27	184 - 9220	2085.418	9220	2100
Arsenic	0 / 5	0 / 7	1 - 4	--	0.000	0	0
Barium	5 / 5	8 / 8	1 - 5	22.2 - 2120	513.030	2120	510
Beryllium	1 / 5	1 / 8	1	8.7	2.170	8.7	2.2
Chromium	1 / 5	1 / 8	2 - 7	5	2.368	5	2.4
Cobalt	4 / 5	4 / 8	2 - 4	5.6 - 295	62.545	295	63
Copper	0 / 5	0 / 8	2 - 11	--	0.000	0	0
Lead	2 / 5	2 / 8	1 - 2	10.5 - 174	37.130	174	37
Manganese	5 / 5	8 / 8	1 - 9	1490 - 14700	8234.250	14700	8200
Vanadium	2 / 5	2 / 8	2 - 3	22.2 - 65.2	15.230	65.2	15
Ammonia	1 / 1	3 / 3	30.0	5060 - 21800	12570.000	21800	13000

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

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TABLE 6-10. SUMMARY STATISTICS FOR GROUNDWATER FROM THE SOLID WASTE AREA

(Units: μg/L)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Benzene	9 / 10	25 / 40	5 - 40	2 - 31	10.575	31	11
Chloroethane	6 / 10	21 / 40	10 - 40	2 - 86	16.954	86	17
1,1-Dichloroethane	7 / 10	24 / 40	5 - 40	1 - 220	13.650	220	14
1,2-Dichloroethene(total)	8 / 10	21 / 40	5 - 40	1 - 730	33.767	730	34
Vinyl Chloride	5 / 10	11 / 40	10 - 40	3 - 690	34.154	690	34
Acrylamide	1 / 9	1 / 17	200 - 2000	229	160.556	229	160
N,N-DMF	5 / 9	12 / 37	50 - 500	50 - 1440	199.259	1440	200
4-Chloro-3-methylphenol	3 / 10	5 / 39	10	0.9 - 5	4.702	5	4.7
bis(2-Ethylhexyl)phthalat	2 / 10	2 / 40	10	0.9 - 36	5.581	36	5.6
2-Methylnaphthalene	2 / 10	4 / 40	10	1 - 5	4.796	5	4.8
Pentachlorophenol	1 / 10	1 / 39	25 - 50	3	13.746	3	3
Aluminum	10 / 10	37 / 40	13 - 66	228 - 110000	13886.190	110000	14000
Antimony	0 / 10	0 / 40	8 - 47	--	0.000	0	0
Arsenic	8 / 10	11 / 39	1 - 4	1.1 - 9.7	2.718	9.7	2.7
Barium	10 / 10	39 / 40	1 - 4	7.0 - 508	165.200	508	170
Beryllium	7 / 10	10 / 40	1	1.1 - 13.7	1.669	13.7	1.7
Cadmium	1 / 10	4 / 40	1 - 3	19.6 - 40.0	4.448	40.0	4.4
Chromium	7 / 10	17 / 40	2 - 8	4.2 - 154	23.967	154	24
Cobalt	9 / 10	21 / 40	3 - 8	3.2 - 53.8	14.587	53.8	15
Copper	8 / 10	15 / 40	2 - 11	16 - 367	41.675	367	42
Lead	9 / 10	14 / 40	1 - 5	7.8 - 181	39.773	181	40
Manganese	10 / 10	38 / 40	1 - 9	22.8 - 9790	1923.843	9790	1900
Nickel	9 / 10	21 / 40	3 - 16	3.6 - 125	26.202	125	26
Vanadium	8 / 10	22 / 40	2 - 5	3 - 142	21.273	142	21
Zinc	9 / 10	21 / 39	4 - 11	13.2 - 7360	680.242	7360	680
Ammonia	5 / 5	8 / 8	30.0	34.0 - 51700	8094.000	51700	8100
Sulfide	4 / 10	4 / 32	50 - 1000	1700 - 4940	815.000	4940	820

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean whichever is lower.

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TABLE 6-11. SUMMARY STATISTICS FOR GROUNDWATER FROM THE BULKY WASTE AREA
(Units: μg/L)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Benzene	1 / 5	1 / 17	5 - 50	1	6.550	1	1
Chloroethane	1 / 5	2 / 17	10 - 50	9 - 16	7.750	16	7.8
1,1-Dichloroethane	2 / 5	3 / 17	5 - 50	1 - 5	6.490	5	5
1,2-Dichloroethene(total)	2 / 5	4 / 17	5 - 50	1 - 5	6.225	5	5
Vinyl Chloride	0 / 5	0 / 17	10 - 50	--	0.000		0
Acrylamide	0 / 5	0 / 9	200	--	0.000	0	0
N,N-DMF	1 / 5	1 / 16	50	183	32.900	183	33
4-Chloro-3-methylphenol	0 / 5	0 / 17	10 - 20	--	0.000	0	0
bis(2-Ethylhexyl)phthalate	0 / 5	0 / 17	10 - 20	--	0.000	0	0
2-Methylnaphthalene	1 / 5	1 / 17	10 - 20	2	4.950	2	2
Pentachlorophenol	0 / 5	0 / 17	25 - 50	--	0.000	0	0
Aluminum	5 / 5	15 / 17	13 - 66	28.5 - 61000	12318.738	61000	12000
Antimony	2 / 5	2 / 17	8 - 47	17.5 - 104.9	18.663	104.9	19
Arsenic	1 / 5	2 / 16	1 - 2	1 - 2.3	0.837	2.3	0.84
Barium	5 / 5	14 / 17	1 - 4	9.1 - 430	81.428	430	81
Beryllium	3 / 5	4 / 17	1	2.6 - 10.5	1.988	10.5	2.0
Cadmium	0 / 5	0 / 17	1 - 3	--	0.000	0	0
Chromium	3 / 5	5 / 17	2 - 8	8.1 - 66.6	9.877	66.6	9.9
Cobalt	4 / 5	6 / 17	3 - 8	3.7 - 27.2	7.149	27.2	7.1
Copper	5 / 5	11 / 17	2 - 11	12.4 - 104	32.813	104	33
Lead	3 / 5	5 / 17	1 - 2	24 - 307	23.188	307	23
Manganese	5 / 5	17 / 17	1 - 9	43.3 - 9995	1637.850	9995	1600
Nickel	2 / 5	3 / 17	3 - 16	24.8 - 71.3	12.923	71.3	13
Vanadium	4 / 5	10 / 17	2 - 5	6.5 - 91.0	14.746	91.0	15
Zinc	4 / 5	9 / 16	4 - 11	48.4 - 215	60.713	215	61
Ammonia	1 / 2	2 / 4	30.0	500 - 6030	1640.000	6030	1600
Sulfide	2 / 5	2 / 13	50 - 1000	2400 - 32000	3670.000	32000	3700

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

gwsewa

TABLE 6-12. SUMMARY STATISTICS FOR GROUNDWATER FROM THE SEWAGE SLUDGE AREA
(Units: μg/L)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Average Case (5)
Benzene	0 / 6	0 / 13	5 - 10	--	0.000	0	0
Chloroethane	0 / 6	0 / 13	10	--	0.000	0	0
1,1-Dichloroethane	0 / 6	0 / 13	5 - 10	--	0.000	0	0
1,2-Dichloroethene(total)	0 / 6	0 / 13	5 - 10	--	0.000	0	0
Vinyl Chloride	0 / 6	0 / 13	10	--	0.000	0	0
Acrylamide	0 / 6	0 / 6	200	--	0.000	0	0
N,N-DMF	0 / 6	0 / 9	50	--	0.000	0	0
4-Chloro-3-methylphenol	0 / 6	0 / 13	10	--	0.000	0	0
bis(2-Ethylhexyl)phthalate	0 / 6	0 / 13	10	--	0.000	0	0
2-Methylnaphthalene	0 / 6	0 / 13	10	--	0.000	0	0
Pentachlorophenol	0 / 6	0 / 13	25 - 50	--	0.000	0	0
Aluminum	6 / 6	13 / 13	10 - 66	627 - 55600	16422.306	55600	16000
Antimony	1 / 6	1 / 13	11 - 47	74.2	17.097	74.2	17
Arsenic	2 / 6	3 / 13	1 - 4	2.7 - 5.5	1.800	5.5	1.8
Barium	6 / 6	11 / 13	1 - 2	19.3 - 284	97.497	284	97
Beryllium	3 / 6	3 / 13	1	2.6 - 3.4	1.701	3.4	1.7
Cadmium	1 / 6	1 / 13	1 - 3	19.4	3.325	19.4	3.3
Chromium	3 / 6	3 / 13	2 - 8	23.0 - 54.5	14.451	54.5	14
Cobalt	5 / 6	8 / 13	2 - 8	10.0 - 45.0	20.560	45.0	21
Copper	5 / 6	9 / 13	2 - 11	15.3 - 123	58.178	123	58
Lead	5 / 6	8 / 13	1 - 2	10.9 - 82.4	26.542	82.4	27
Manganese	6 / 6	13 / 13	1 - 9	44.0 - 6230	2541.444	6230	2500
Nickel	6 / 6	11 / 13	3 - 16	5.4 - 76.6	32.851	76.6	33
Vanadium	5 / 6	8 / 13	2 - 5	6.5 - 101.0	22.019	101.0	22
Zinc	6 / 6	9 / 13	3 - 11	32.5 - 362	137.426	362	140
Ammonia	1 / 1	1 / 1	30.0	17100	17100.000	17100	17000
Sulfide	4 / 6	4 / 12	50 - 1000	640 - 2700	565.000	2700	560

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure" `xposure point concentration is maximum detected or arithmetic mea 'hichever is lower.

swsr

TABLE 6-13. SUMMARY STATISTICS FOR SURFACE WATER FROM THE SAUGATUCKET RIVER
(Units: $\mu g/L$)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Acrylamide	0 / 4	0 / 4	200	--	0.000	0	0
N,N-DMF	0 / 4	0 / 10	50	--	0.000	0	0
Aluminum	5 / 6	11 / 19	10 - 100	105 - 424	201.223	424	200
Antimony	1 / 6	1 / 19	11 - 31	25.0 - 25.0	10.752	25.0	11
Barium	6 / 6	10 / 19	1 - 2	4.9 - 279	15.071	279	15
Manganese	6 / 6	19 / 19	1 - 9	42.3 - 2030	235.495	2030	240
Ammonia	5 / 5	8 / 8	30.0	42 - 670	211.000	670	210
Sulfide	4 / 4	4 / 11	50 - 1000	740 - 1900	791.000	1900	790

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

swmb

TABLE 6-14. SUMMARY STATISTICS FOR SURFACE WATER FROM THE MITCHELL BROOK
(Units: μg/L)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Acrylamide	1 / 5	1 / 5	200	272	134.400	272	130
N,N-DMF	0 / 5	0 / 11	50	--	0.000	0	0
Aluminum	6 / 6	11 / 20	10 - 100	109 - 1140	398.032	1140	400
Antimony	2 / 6	2 / 20	11 - 31	24.8 - 28.8	11.783	28.8	12
Barium	6 / 6	13 / 20	1 - 2	8.2 - 173	16.617	173	17
Manganese	6 / 6	18 / 20	1 - 9	24.3 - 1610	280.254	1610	280
Ammonia	4 / 4	6 / 7	30.0	33 - 3530	675.000	3530	670
Sulfide	5 / 5	5 / 13	50 - 1000	320 - 1900	765.000	1900	760

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

gwres

TABLE 6-15. SUMMARY STATISTICS FOR GROUNDWATER FROM RESIDENTIAL WELLS
(Units: $\mu g/L$)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Exposure Point Concentrations RME Case (4)	Selected Exposure Point Concentrations Average Case (5)
Benzene	1 / 10	1 / 21	1	0.8 - 0.8	0.515	0.8	0.52
Chloroethane	1 / 10	1 / 21	1	1.0 - 1.0	0.525	1.0	0.53
Trichloroethene	2 / 10	2 / 21	1	0.6 - 2*	0.555	2*	0.56
N,N-DMF	2 / 10	2 / 12	50	1.9 - 14	22.745	14	14
4-Methylphenol	1 / 10	1 / 19	10	63	7.900	63	7.9
Dieldrin	1 / 10	1 / 21	0.10	0.0024	0.048	0.0024	0.0024
Aluminum	4 / 10	5 / 21	10 - 27	20.0 - 552	90.475	552	90
Barium	6 / 10	8 / 21	1 - 4	5.8 - 44.3	8.273	44.3	8.3
Copper	3 / 10	4 / 21	3 - 11	11 - 58.6	13.503	58.6	14
Manganese	9 / 10	15 / 21	1 - 9	2.6 - 3100	887.830	3100	890
Mercury	1 / 10	1 / 19	0.2	0.46	0.136	0.46	0.14
Zinc	1 / 10	1 / 21	3 - 8	165	24.204	165	24
Sulfide	9 / 10	9 / 21	50 - 1000	450 - 3700	1571.000	3700	1600

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

TABLE 6-16. SUMMARY STATISTICS FOR SOIL GAS FROM THE SOLID WASTE AREA
(Units: mg/m3)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Soil Gas Concentrations RME Case (4)	Selected Soil Gas Concentrations Average Case (5)
Acetone	0 / 3	0 / 4	0.4 - 300	--	0.000	--	0
Benzene	3 / 4	3 / 4	0.5 - 400	2.0 - 8.0	115.650	8.0	8.0
Carbon Disulfide	2 / 4	2 / 4	0.5 - 400	0.12 - 0.87	132.748	0.87	0.87
Dichlorodifluoromethane	4 / 4	4 / 4	0.8 - 700	1.0 - 100	51.250	100	51
1,1-Dichloroethane	4 / 4	4 / 4	0.7 - 600	0.21 - 140	61.303	140	61
1,1-Dichloroethene	4 / 4	4 / 4	0.6 - 600	0.04 - 32	17.260	32	17
cis-1,2-Dichloroethene	4 / 4	4 / 4	0.6 - 600	1.5 - 23000	9800.375	23000	9800
trans-1,2-Dichloroethen	4 / 4	4 / 4	0.6 - 600	0.087 - 27	11.272	27	11
Ethylbenzene	2 / 4	2 / 4	0.7 - 600	10 - 25	211.250	25	25
Methylene Chloride	4 / 4	4 / 4	0.6 - 500	0.7 - 66	26.250	66	26
4-Methyl-2-pentanone	1 / 4	1 / 4	0.7 - 600	6.5 - 6.5	146.138	6.5	6.5
Toluene	4 / 4	4 / 4	0.6 - 500	21 - 230	101.250	230	100
1,2,4-Trichlorobenzene	0 / 4	0 / 4	1 - 1000	--	0.000	--	0
Trichloroethene	3 / 4	3 / 4	0.9 - 800	0.45 - 31	198.863	31	31
1,2,4-Trimethylbenzene	2 / 4	2 / 4	0.8 - 700	1.1 - 2	223.275	2	2
1,3,5-Trimethylbenzene	3 / 4	3 / 4	0.8 - 700	0.74 - 4.3	174.010	4.3	4.3
Vinyl Chloride	4 / 4	4 / 4	0.4 - 400	3.1 - 3100	1350.775	3100	1400
m,p-Xylene	2 / 4	2 / 4	0.7 - 600	24 - 41	218.750	41	41

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

TABLE 6-17. SUMMARY STATISTICS FOR SOIL GAS FROM THE BULKY WASTE AREA
(Units: mg/m3)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentration	Calculated Arithmetic Mean (3)	Selected Soil Gas Concentrations RME Case (4)	Selected Soil Gas Concentrations Average Case (5)
Acetone	1 / 2	1 / 2	0.8 - 0.9	1.3	1.040	1.3	1.0
Benzene	2 / 2	2 / 2	1	0.30 - 2.9	1.600	2.9	1.6
Carbon Disulfide	0 / 2	0 / 2	1	--	0.000	--	0
Dichlorodifluoromethane	2 / 2	2 / 2	2	1.39 - 26	13.695	26	14
1,1-Dichloroethane	2 / 2	2 / 2	1	2.1 - 6.9	4.500	6.9	4.5
1,1-Dichloroethene	2 / 2	2 / 2	1	0.091 - 0.31	0.201	0.31	0.20
cis-1,2-Dichloroethene	2 / 2	2 / 2	1	4.8 - 17	10.900	17	11
trans-1,2-Dichloroethene	2 / 2	2 / 2	1	0.11 - 0.30	0.205	0.30	0.21
Ethylbenzene	2 / 2	2 / 2	1 - 2	5.6 - 12	8.800	12	8.8
Methylene Chloride	2 / 2	2 / 2	1	0.90 - 2.4	1.650	2.4	1.7
4-Methyl-2-pentanone	0 / 2	0 / 2	1	--	0.000	--	0
Toluene	2 / 2	2 / 2	1	21 - 34	27.500	34	28
1,2,4-Trichlorobenzene	1 / 2	1 / 2	2 - 3	0.27	1.485	0.27	0.27
Trichloroethene	2 / 2	2 / 2	2	3.1 - 3.8	3.450	3.8	3.5
1,2,4-Trimethylbenzene	2 / 2	2 / 2	2	0.78 - 2.3	1.540	2.3	1.5
1,3,5-Trimethylbenzene	2 / 2	2 / 2	2	0.30 - 1.5	0.900	1.5	0.90
Vinyl Chloride	2 / 2	2 / 2	0.8 - 0.9	1.2 - 14	7.600	14	7.6
m,p-Xylene	2 / 2	2 / 2	1 - 2	3.3 - 24	13.650	24	14

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

TABLE 6-18. SUMMARY STATISTICS FOR SOIL GAS FROM THE SEWAGE SLUDGE AREA
(Units: mg/m3)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Detection Limits	Concentration	Calculated Arithmetic Mean (3)	Selected Soil Gas Concentrations RME Case (4)	Selected Soil Gas Concentrations Average Case (5)
Acetone	1 / 1	1 / 1	0.02	0.081	0.081	0.081	0.081
Benzene	0 / 1	0 / 1	0.03	--	0.000	--	0
Carbon Disulfide	0 / 1	0 / 1	0.02	--	0.000	--	0
Dichlorodifluoromethane	0 / 1	0 / 1	0.04	--	0.000	--	0
1,1-Dichloroethane	0 / 1	0 / 1	0.03	--	0.000	--	0
1,1-Dichloroethene	0 / 1	0 / 1	0.03	--	0.000	--	0
cis-1,2-Dichloroethene	0 / 1	0 / 1	0.03	--	0.000	--	0
trans-1,2-Dichloroethene	0 / 1	0 / 1	0.03	--	0.000	--	0
Ethylbenzene	1 / 1	1 / 1	0.04	0.01	0.010	0.01	0.01
Methylene Chloride	1 / 1	1 / 1	0.03	0.002	0.002	0.002	0.002
4-Methyl-2-pentanone	0 / 1	0 / 1	0.03	--	0.000	--	0
Toluene	0 / 1	0 / 1	0.03	--	0.000	--	0
1,2,4-Trichlorobenzene	0 / 1	0 / 1	0.06	--	0.000	--	0
Trichloroethene	0 / 1	0 / 1	0.04	--	0.000	--	0
1,2,4-Trimethylbenzene	1 / 1	1 / 1	0.04	0.005	0.005	0.005	0.005
1,3,5-Trimethylbenzene	1 / 1	1 / 1	0.04	0.003	0.003	0.003	0.003
Vinyl Chloride	0 / 1	0 / 1	0.02	--	0.000	--	0
m,p-Xylene	1 / 1	1 / 1	0.04	0.02	0.020	0.02	0.02

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

TABLE 6-19. SUMMARY STATISTICS FOR AMBIENT AIR FROM NEARBY RESIDENCES
(Units: mg/m3)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Range of Detection Limits	Range of Concentrations	Calculated Arithmetic Mean (3)	Selected Soil Gas Concentrations RME Case (4)	Selected Soil Gas Concentrations Average Case (5)
Benzene	4 / 4	4 / 4	0.003	0.003 - 0.075	0.024	0.075	0.024
Ethylbenzene	1 / 1	1 / 1	0.003 - 0.004	0.002	0.002	0.002	0.002
Methylene Chloride	4 / 4	4 / 4	0.003	0.001	0.001	0.001	0.001
1,1,2,2-Tetrachloroethane	1 / 4	1 / 4	0.005 - 0.007	0.002 - 0.007	0.003	0.004	0.004
Toluene	4 / 4	4 / 4	0.003 - 0.004	0.001 - 0.002	0.001	0.002	0.001
1,1,1-Trichloroethane	4 / 4	4 / 4	0.004 - 0.005	0.001 - 0.002	0.002	0.002	0.002
Vinyl Chloride	3 / 4	6 / 11	0.001	0.001 - 0.004	0.001	0.004	0.001
m,p-Xylene	4 / 4	4 / 4	0.003 - 0.004	0.001 - 0.007	0.004	0.007	0.004
o-Xylene	3 / 3	3 / 3	0.003 - 0.004	0.004 - 0.007	0.005	0.007	0.005

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

TABLE 6-20. SUMMARY STATISTICS FOR INDOOR AIR FROM 220 ROSE HILL ROAD
(Units: mg/m3)

Chemical	Frequency of Detection/Location (1)	Frequency of Detection/Samples (2)	Detection Limit	Range of Concentrations	Calculated Arithmetic Mean (3)	Selected Ambient Air Concentrations RME Case (4)	Average Case (5)
Vinyl Chloride	1 / 1	8 / 8	0.001	0.004 - 0.056	0.023	0.056	0.023

NOTES:

1. This value represents the number of locations which had detected concentrations per the number of locations sampled. The number of locations sampled varies due to rejected values and locations not sampled.
2. This value represents the number of detected concentrations per the total sum of samples collected at all locations in the specific area. The total number of samples collected varies due to rejected values and locations not sampled.
3. When an analyte was not detected, the mean was calculated using 1/2 of the detection limit for that sample. Refer to section 6.1.3 for a detailed discussion of averaging.
4. Maximum detected is defined as the exposure point concentration for "Reasonable Maximum Exposure"
5. Exposure point concentration is maximum detected or arithmetic mean, whichever is lower.

TABLE 6 - 21
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	14	1	8.2E-06	0.1	8.2E-05	2.8E-06	na	---
Vinyl Chloride	0.025	1	1.5E-08	na	---	5.0E-09	1.9	9.6E-09
Benzo(a)anthracene	0.078	1	4.6E-08	na	---	1.6E-08	7.3	1.1E-07
Benzo(a)pyrene	0.068	1	4.0E-08	na	---	1.4E-08	7.3	1.0E-07
Benzo(b)fluoranthene	0.076	1	4.5E-08	na	---	1.5E-08	7.3	1.1E-07
Benzo(k)fluoranthene	0.064	1	3.8E-08	na	---	1.3E-08	7.3	9.4E-08
Chrysene	0.095	1	5.6E-08	na	---	1.9E-08	7.3	1.4E-07
Indeno(1,2,3-cd)pyrene	0.052	1	3.1E-08	na	---	1.0E-08	7.3	7.6E-08
Aluminum	8000	1	4.7E-03	na	---	1.6E-03	na	---
Arsenic	1.5	1	8.8E-07	0.0003	2.9E-03	3.0E-07	1.75	5.3E-07
Barium	16	1	9.4E-06	0.07	1.3E-04	3.2E-06	na	---
Beryllium	0.41	1	2.4E-07	0.005	4.8E-05	8.3E-08	4.3	3.5E-07
Chromium (d)	7.5	1	4.4E-06	0.005	8.8E-04	1.5E-06	na	---
Cobalt	2.9	1	1.7E-06	na	---	5.8E-07	na	---
Copper	27	1	1.6E-05	na	---	5.4E-06	na	---
Lead	12	1	7.0E-06	na	---	2.4E-06	na	---
Manganese (e)	110	1	6.5E-05	0.005	1.3E-02	2.2E-05	na	---
Mercury	0.067	1	3.9E-08	0.0003	1.3E-04	1.3E-08	na	---
Thallium	0.15	1	8.8E-08	0.00007	1.3E-03	3.0E-08	na	---
Vanadium	14	1	8.2E-06	0.007	1.2E-03	2.8E-06	na	---
			Total Hazard Index =		2.0E-02	Total Risk =		1.5E-06

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration			Weight		Time		Factor
DOSE	Conc.	100		150	24		R.A.F	70		(f)	365	x 1E+06
		mg/day		days/yr	years			kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD
(c) Cancer risk = lifetime exposure dose x slope factor
(d) The reference dose for chromium VI was used.
(e) The reference dose for manganese in water was used.
(f) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available
nd = not detected
--- = not calculated due to absence of data

TABLE 6 - 22
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	160	1	9.4E-05	0.1	9.4E-04	3.2E-05	na	---
Vinyl Chloride	0.25	1	1.5E-07	na	---	5.0E-08	1.9	9.6E-08
Benzo(a)anthracene	0.078	1	4.6E-08	na	---	1.6E-08	7.3	1.1E-07
Benzo(a)pyrene	0.068	1	4.0E-08	na	---	1.4E-08	7.3	1.0E-07
Benzo(b)fluoranthene	0.076	1	4.5E-08	na	---	1.5E-08	7.3	1.1E-07
Benzo(k)fluoranthene	0.064	1	3.8E-08	na	---	1.3E-08	7.3	9.4E-08
Chrysene	0.095	1	5.6E-08	na	---	1.9E-08	7.3	1.4E-07
Indeno(1,2,3-cd)pyrene	0.052	1	3.1E-08	na	---	1.0E-08	7.3	7.6E-08
Aluminum	14400	1	8.5E-03	na	---	2.9E-03	na	---
Arsenic	3.5	1	2.1E-06	0.0003	6.8E-03	7.0E-07	1.75	1.2E-06
Barium	20.5	1	1.2E-05	0.07	1.7E-04	4.1E-06	na	---
Beryllium	1.1	1	6.5E-07	0.005	1.3E-04	2.2E-07	4.3	9.5E-07
Chromium (d)	13.9	1	8.2E-06	0.005	1.6E-03	2.8E-06	na	---
Cobalt	6.2	1	3.6E-06	na	---	1.2E-06	na	---
Copper	253	1	1.5E-04	na	---	5.1E-05	na	---
Lead	31.1	1	1.8E-05	na	---	6.3E-06	na	---
Manganese (e)	257	1	1.5E-04	0.005	3.0E-02	5.2E-05	na	---
Mercury	0.2	1	1.2E-07	0.0003	3.9E-04	4.0E-08	na	---
Thallium	0.36	1	2.1E-07	0.00007	3.0E-03	7.2E-08	na	---
Vanadium	27.2	1	1.6E-05	0.007	2.3E-03	5.5E-06	na	---
			Total Hazard Index =		4.6E-02	Total Risk =		2.9E-06

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration			Weight		Time		Factor
DOSE	Conc.	100		150	24		R.A.F	70		(f)	365	x 1E+06
		mg/day		days/yr	years			kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer risk = lifetime exposure dose x slope factor

(d) The reference dose for chromium VI was used.

(e) The reference dose for manganese in water was used.

(f) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = not detected

--- = not calculated due to absence of data

TABLE 6 - 23
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	4.8	1	2.8E-06	0.1	2.8E-05	9.7E-07	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	1	3.3E-08	na	---	1.1E-08	7.3	8.4E-08
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	0.055	1	3.2E-08	na	---	1.1E-08	7.3	8.1E-08
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	6400	1	3.8E-03	na	---	1.3E-03	na	---
Arsenic	1.2	1	7.0E-07	0.0003	2.3E-03	2.4E-07	1.75	4.2E-07
Barium	34	1	2.0E-05	0.07	2.9E-04	6.8E-06	na	---
Beryllium	0.57	1	3.3E-07	0.005	6.7E-05	1.1E-07	4.3	4.9E-07
Chromium (d)	5.8	1	3.4E-06	0.005	6.8E-04	1.2E-06	na	---
Cobalt	6.0	1	3.5E-06	na	---	1.2E-06	na	---
Copper	3.3	1	1.9E-06	na	---	6.6E-07	na	---
Lead	29	1	1.7E-05	na	---	5.8E-06	na	---
Manganese (e)	1400	1	8.2E-04	0.005	1.6E-01	2.8E-04	na	---
Mercury	0.13	1	7.6E-08	0.0003	2.5E-04	2.6E-08	na	---
Thallium	nd	1	---	0.00007	---	---	na	---
Vanadium	12	1	7.0E-06	0.007	1.0E-03	2.4E-06	na	---
			Total Hazard Index =		1.7E-01	Total Risk =		1.1E-06

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration			Weight		Time		Factor
DOSE	Conc.	100		150	24		R.A.F	70		(f)	365 x 1E+06	
		mg/day		days/yr	years			kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD
(c) Cancer risk = lifetime exposure dose x slope factor
(d) The reference dose for chromium VI was used.
(e) The reference dose for manganese in water was used.
(f) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available
nd = not detected
--- = not calculated due to absence of data

TABLE 6 - 24

POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS

MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	23.7	1	1.4E-05	0.1	1.4E-04	4.8E-06	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	1	3.3E-08	na	---	1.1E-08	7.3	8.4E-08
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	0.055	1	3.2E-08	na	---	1.1E-08	7.3	8.1E-08
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	8940	1	5.2E-03	na	---	1.8E-03	na	---
Arsenic	1.3	1	7.6E-07	0.0003	2.5E-03	2.6E-07	1.75	4.6E-07
Barium	86.2	1	5.1E-05	0.07	7.2E-04	1.7E-05	na	---
Beryllium	0.88	1	5.2E-07	0.005	1.0E-04	1.8E-07	4.3	7.6E-07
Chromium (d)	9.8	1	5.8E-06	0.005	1.2E-03	2.0E-06	na	---
Cobalt	12.8	1	7.5E-06	na	---	2.6E-06	na	---
Copper	5.6	1	3.3E-06	na	---	1.1E-06	na	---
Lead	124	1	7.3E-05	na	---	2.5E-05	na	---
Manganese (e)	6120	1	3.6E-03	0.005	7.2E-01	1.2E-03	na	---
Mercury	0.41	1	2.4E-07	0.0003	8.0E-04	8.3E-08	na	---
Thallium	nd	1	---	0.00007	---	---	na	---
Vanadium	18.1	1	1.1E-05	0.007	1.5E-03	3.6E-06	na	---
			Total Hazard Index =		7.3E-01	Total Risk =		1.4E-06

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration			Weight		Time		Factor
DOSE	Conc.	100		150	24		R.A.F	70		(f)	365	x 1E+06
		mg/day		days/yr	years			kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer risk = lifetime exposure dose x slope factor

(d) The reference dose for chromium VI was used.

(e) The reference dose for manganese in water was used.

(f) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = not detected

--- = not calculated due to absence of data

TABLE 6 - 25
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.014	1	8.2E-09	0.1	8.2E-08	2.8E-09	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	1	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	nd	1	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	5500	1	3.2E-03	na	---	1.1E-03	na	---
Arsenic	0.79	1	4.6E-07	0.0003	1.5E-03	1.6E-07	1.75	2.8E-07
Barium	28	1	1.6E-05	0.07	2.3E-04	5.6E-06	na	---
Beryllium	0.35	1	2.1E-07	0.005	4.1E-05	7.0E-08	4.3	3.0E-07
Chromium (d)	6.4	1	3.8E-06	0.005	7.5E-04	1.3E-06	na	---
Cobalt	2.9	1	1.7E-06	na	---	5.8E-07	na	---
Copper	37	1	2.2E-05	na	---	7.4E-06	na	---
Lead	6.3	1	3.7E-06	na	---	1.3E-06	na	---
Manganese (e)	110	1	6.5E-05	0.005	1.3E-02	2.2E-05	na	---
Mercury	0.13	1	7.6E-08	0.0003	2.5E-04	2.6E-08	na	---
Thallium	0.15	1	8.8E-08	0.00007	1.3E-03	3.0E-08	na	---
Vanadium	9.2	1	5.4E-06	0.007	7.7E-04	1.9E-06	na	---
			Total Hazard Index =		1.8E-02	Total Risk =		5.8E-07

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration			Weight		Time		Factor
DOSE	Conc.	100		150	24		R.A.F	70		(f)	365	x 1E+06
		mg/day		days/yr	years			kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer risk = lifetime exposure dose x slope factor

(d) The reference dose for chromium VI was used.

(e) The reference dose for manganese in water was used.

(f) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = not detected

--- = not calculated due to absence of data

TABLE 6 - 26

POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS

MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.023	1	1.4E-08	0.1	1.4E-07	4.6E-09	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	1	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	nd	1	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	6740	1	4.0E-03	na	---	1.4E-03	na	---
Arsenic	0.86	1	5.0E-07	0.0003	1.7E-03	1.7E-07	1.75	3.0E-07
Barium	58.9	1	3.5E-05	0.07	4.9E-04	1.2E-05	na	---
Beryllium	0.4	1	2.3E-07	0.005	4.7E-05	8.1E-08	4.3	3.5E-07
Chromium (d)	9.8	1	5.8E-06	0.005	1.2E-03	2.0E-06	na	---
Cobalt	3.6	1	2.1E-06	na	---	7.2E-07	na	---
Copper	99.3	1	5.8E-05	na	---	2.0E-05	na	---
Lead	11.8	1	6.9E-06	na	---	2.4E-06	na	---
Manganese (e)	135	1	7.9E-05	0.005	1.6E-02	2.7E-05	na	---
Mercury	0.28	1	1.6E-07	0.0003	5.5E-04	5.6E-08	na	---
Thallium	0.25	1	1.5E-07	0.00007	2.1E-03	5.0E-08	na	---
Vanadium	12.1	1	7.1E-06	0.007	1.0E-03	2.4E-06	na	---
			Total Hazard Index =		2.3E-02	Total Risk =		6.5E-07

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration			Weight		Time		Factor
DOSE	Conc.	100		150	24		R.A.F	70		(f)	365	x 1E+06
		mg/day		days/yr	years			kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer risk = lifetime exposure dose x slope factor

(d) The reference dose for chromium VI was used.

(e) The reference dose for manganese in water was used.

(f) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = not detected

--- = not calculated due to absence of data

TABLE 6 - 27

POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS

AVERAGE CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	14	1	7.7E-05	0.1	7.7E-04	6.6E-06	na	---
Vinyl Chloride	0.025	1	1.4E-07	na	---	1.2E-08	1.9	2.2E-08
Benzo(a)anthracene	0.078	1	4.3E-07	na	---	3.7E-08	7.3	2.7E-07
Benzo(a)pyrene	0.068	1	3.7E-07	na	---	3.2E-08	7.3	2.3E-07
Benzo(b)fluoranthene	0.076	1	4.2E-07	na	---	3.6E-08	7.3	2.6E-07
Benzo(k)fluoranthene	0.064	1	3.5E-07	na	---	3.0E-08	7.3	2.2E-07
Chrysene	0.095	1	5.2E-07	na	---	4.5E-08	7.3	3.3E-07
Indeno(1,2,3-cd)pyrene	0.052	1	2.8E-07	na	---	2.4E-08	7.3	1.8E-07
Aluminum	8000	1	4.4E-02	na	---	3.8E-03	na	---
Arsenic	1.5	1	8.2E-06	0.0003	2.7E-02	7.0E-07	1.75	1.2E-06
Barium	16	1	8.8E-05	0.07	1.3E-03	7.5E-06	na	---
Beryllium	0.41	1	2.2E-06	0.005	4.5E-04	1.9E-07	4.3	8.3E-07
Chromium (d)	7.5	1	4.1E-05	0.005	8.2E-03	3.5E-06	na	---
Cobalt	2.9	1	1.6E-05	na	---	1.4E-06	na	---
Copper	27	1	1.5E-04	na	---	1.3E-05	na	---
Lead	12	1	6.6E-05	na	---	5.6E-06	na	---
Manganese (e)	110	1	6.0E-04	0.005	1.2E-01	5.2E-05	na	---
Mercury	0.067	1	3.7E-07	0.0003	1.2E-03	3.1E-08	na	---
Thallium	0.15	1	8.2E-07	0.00007	1.2E-02	7.0E-08	na	---
Vanadium	14	1	7.7E-05	0.007	1.1E-02	6.6E-06	na	---
			Total Hazard Index =		1.8E-01	Total Risk =		3.6E-06

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	/	Body	x	Averaging	x Conversion
EXPOSURE		Rate		Frequency	Duration				Weight		Time	Factor
DOSE	Conc.	200		150	6		R.A.F		15		(f)	365 x 1E+06
		mg/day		days/yr	years				kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer risk = lifetime exposure dose x slope factor

(d) The reference dose for chromium VI was used.

(e) The reference dose for manganese in water was used.

(f) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = not detected

--- = not calculated due to absence of data

TABLE 6 - 28
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	160	1	8.8E-04	0.1	8.8E-03	7.5E-05	na	---
Vinyl Chloride	0.25	1	1.4E-06	na	---	1.2E-07	1.9	2.2E-07
Benzo(a)anthracene	0.078	1	4.3E-07	na	---	3.7E-08	7.3	2.7E-07
Benzo(a)pyrene	0.068	1	3.7E-07	na	---	3.2E-08	7.3	2.3E-07
Benzo(b)fluoranthene	0.076	1	4.2E-07	na	---	3.6E-08	7.3	2.6E-07
Benzo(k)fluoranthene	0.064	1	3.5E-07	na	---	3.0E-08	7.3	2.2E-07
Chrysene	0.095	1	5.2E-07	na	---	4.5E-08	7.3	3.3E-07
Indeno(1,2,3-cd)pyrene	0.052	1	2.8E-07	na	---	2.4E-08	7.3	1.8E-07
Aluminum	14400	1	7.9E-02	na	---	6.8E-03	na	---
Arsenic	3.5	1	1.9E-05	0.0003	6.4E-02	1.6E-06	1.75	2.9E-06
Barium	20.5	1	1.1E-04	0.07	1.6E-03	9.6E-06	na	---
Beryllium	1.1	1	6.0E-06	0.005	1.2E-03	5.2E-07	4.3	2.2E-06
Chromium (d)	13.9	1	7.6E-05	0.005	1.5E-02	6.5E-06	na	---
Cobalt	6.2	1	3.4E-05	na	---	2.9E-06	na	---
Copper	253	1	1.4E-03	na	---	1.2E-04	na	---
Lead	31.1	1	1.7E-04	na	---	1.5E-05	na	---
Manganese (e)	257	1	1.4E-03	0.005	2.8E-01	1.2E-04	na	---
Mercury	0.2	1	1.1E-06	0.0003	3.7E-03	9.4E-08	na	---
Thallium	0.36	1	2.0E-06	0.00007	2.8E-02	1.7E-07	na	---
Vanadium	27.2	1	1.5E-04	0.007	2.1E-02	1.3E-05	na	---
			Total Hazard Index =		4.3E-01	Total Risk =		6.8E-06

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	/	Body	x	Averaging	x Conversion
EXPOSURE		Rate		Frequency	Duration				Weight		Time	Factor
DOSE	Conc.	200		150	6		R.A.F		15		(f)	365 x 1E+06
		mg/day		days/yr	years				kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD
(c) Cancer risk = lifetime exposure dose x slope factor
(d) The reference dose for chromium VI was used.
(e) The reference dose for manganese in water was used.
(f) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available
nd = not detected
--- = not calculated due to absence of data

TABLE 6 - 29
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	4.8	1	2.6E-05	0.1	2.6E-04	2.3E-06	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	1	3.1E-07	na	---	2.7E-08	7.3	2.0E-07
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	0.055	1	3.0E-07	na	---	2.6E-08	7.3	1.9E-07
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	6400	1	3.5E-02	na	---	3.0E-03	na	---
Arsenic	1.2	1	6.6E-06	0.0003	2.2E-02	5.6E-07	1.75	9.9E-07
Barium	34	1	1.9E-04	0.07	2.7E-03	1.6E-05	na	---
Beryllium	0.57	1	3.1E-06	0.005	6.2E-04	2.7E-07	4.3	1.2E-06
Chromium (d)	5.8	1	3.2E-05	0.005	6.4E-03	2.7E-06	na	---
Cobalt	6	1	3.3E-05	na	---	2.8E-06	na	---
Copper	3.3	1	1.8E-05	na	---	1.5E-06	na	---
Lead	29	1	1.6E-04	na	---	1.4E-05	na	---
Manganese (e)	1400	1	7.7E-03	0.005	1.5E+00	6.6E-04	na	---
Mercury	0.13	1	7.1E-07	0.0003	2.4E-03	6.1E-08	na	---
Thallium	nd	1	---	0.00007	---	---	na	---
Vanadium	12	1	6.6E-05	0.007	9.4E-03	5.6E-06	na	---
			Total Hazard Index =		1.6E+00	Total Risk =		2.5E-06
			Hazard Index (liver toxins) =		2.6E-04			
			Hazard Index (nervous system toxins) =		1.5E+00			
			Hazard Index (kidney toxins) =		2.6E-03			

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	/	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration				Weight		Time		Factor
DOSE	Conc.	200		150	6		R.A.F		15		(f)	365 x	1E+06
		mg/day		days/yr	years				kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD
(c) Cancer risk = lifetime exposure dose x slope factor
(d) The reference dose for chromium VI was used.
(e) The reference dose for manganese in water was used.
(f) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available
nd = not detected
--- = not calculated due to absence of data

TABLE 6 - 30
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	23.7	1	1.3E-04	0.1	1.3E-03	1.1E-05	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	1	3.1E-07	na	---	2.7E-08	7.3	2.0E-07
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	0.055	1	3.0E-07	na	---	2.6E-08	7.3	1.9E-07
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	8940	1	4.9E-02	na	---	4.2E-03	na	---
Arsenic	1.3	1	7.1E-06	0.0003	2.4E-02	6.1E-07	1.75	1.1E-06
Barium	86.2	1	4.7E-04	0.07	6.7E-03	4.0E-05	na	---
Beryllium	0.88	1	4.8E-06	0.005	9.6E-04	4.1E-07	4.3	1.8E-06
Chromium (d)	9.8	1	5.4E-05	0.005	1.1E-02	4.6E-06	na	---
Cobalt	12.8	1	7.0E-05	na	---	6.0E-06	na	---
Copper	5.6	1	3.1E-05	na	---	2.6E-06	na	---
Lead	124	1	6.8E-04	na	---	5.8E-05	na	---
Manganese (e)	6120	1	3.4E-02	0.005	6.7E+00	2.9E-03	na	---
Mercury	0.41	1	2.2E-06	0.0003	7.5E-03	1.9E-07	na	---
Thallium	nd	1	---	0.00007	---	---	na	---
Vanadium	18.1	1	9.9E-05	0.007	1.4E-02	8.5E-06	na	---
			Total Hazard Index =		6.8E+00	Total Risk =		3.2E-06
			Hazard Index (liver toxins) =		1.3E-03			
			Hazard Index (nervous system toxins) =		6.7E+00			
			Hazard Index (kidney toxins) =		8.8E-03			

NOTES:

(a) Calculation for exposure dose :

INGESTION = EXPOSURE DOSE	Conc.	x Ingestion Rate	x Exposure Frequency	x Exposure Duration	x R.A.F /	Body Weight	x Averaging Time	x Conversion Factor
	Conc.	200	150	6	R.A.F	15	(f)	365 x 1E+06
		mg/day	days/yr	years		kg	years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD
(c) Cancer risk = lifetime exposure dose x slope factor
(d) The reference dose for chromium VI was used.
(e) The reference dose for manganese in water was used.
(f) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available
nd = not detected
--- = not calculated due to absence of data

TABLE 6 - 31

POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS

AVERAGE CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.014	1	7.7E-08	0.1	7.7E-07	6.6E-09	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	1	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	nd	1	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	5500	1	3.0E-02	na	---	2.6E-03	na	---
Arsenic	0.79	1	4.3E-06	0.0003	1.4E-02	3.7E-07	1.75	6.5E-07
Barium	28	1	1.5E-04	0.07	2.2E-03	1.3E-05	na	---
Beryllium	0.35	1	1.9E-06	0.005	3.8E-04	1.6E-07	4.3	7.1E-07
Chromium (d)	6.4	1	3.5E-05	0.005	7.0E-03	3.0E-06	na	---
Cobalt	2.9	1	1.6E-05	na	---	1.4E-06	na	---
Copper	37	1	2.0E-04	na	---	1.7E-05	na	---
Lead	6.3	1	3.5E-05	na	---	3.0E-06	na	---
Manganese (e)	110	1	6.0E-04	0.005	1.2E-01	5.2E-05	na	---
Mercury	0.13	1	7.1E-07	0.0003	2.4E-03	6.1E-08	na	---
Thallium	0.15	1	8.2E-07	0.00007	1.2E-02	7.0E-08	na	---
Vanadium	9.2	1	5.0E-05	0.007	7.2E-03	4.3E-06	na	---
			Total Hazard Index =		1.7E-01	Total Risk =		1.4E-06

NOTES:

(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F	/	Body	x	Averaging	x Conversion
EXPOSURE		Rate		Frequency	Duration				Weight		Time	Factor
DOSE	Conc.	200		150	6		R.A.F		15		(f)	365 x 1E+06
		mg/day		days/yr	years				kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer risk = lifetime exposure dose x slope factor

(d) The reference dose for chromium VI was used.

(e) The reference dose for manganese in water was used.

(f) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = not detected

--- = not calculated due to absence of data

TABLE 6 - 32
POTENTIAL RISK FROM INGESTION OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.023	1	1.3E-07	0.1	1.3E-06	1.1E-08	na	---
Vinyl Chloride	nd	1	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	1	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	1	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	1	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	1	---	na	---	---	7.3	---
Chrysene	nd	1	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	1	---	na	---	---	7.3	---
Aluminum	6740	1	3.7E-02	na	---	3.2E-03	na	---
Arsenic	0.86	1	4.7E-06	0.0003	1.6E-02	4.0E-07	1.75	7.1E-07
Barium	58.9	1	3.2E-04	0.07	4.6E-03	2.8E-05	na	---
Beryllium	0.4	1	2.2E-06	0.005	4.4E-04	1.9E-07	4.3	8.1E-07
Chromium (d)	9.8	1	5.4E-05	0.005	1.1E-02	4.6E-06	na	---
Cobalt	3.6	1	2.0E-05	na	---	1.7E-06	na	---
Copper	99.3	1	5.4E-04	na	---	4.7E-05	na	---
Lead	11.8	1	6.5E-05	na	---	5.5E-06	na	---
Manganese (e)	135	1	7.4E-04	0.005	1.5E-01	6.3E-05	na	---
Mercury	0.28	1	1.5E-06	0.0003	5.1E-03	1.3E-07	na	---
Thallium	0.25	1	1.4E-06	0.00007	2.0E-02	1.2E-07	na	---
Vanadium	12.1	1	6.6E-05	0.007	9.5E-03	5.7E-06	na	---
			Total Hazard Index =		2.1E-01	Total Risk =		1.5E-06

NOTES:
(a) Calculation for exposure dose :

INGESTION =	Conc.	x Ingestion	x	Exposure	x Exposure	x	R.A.F /	Body	x	Averaging	x	Conversion
EXPOSURE		Rate		Frequency	Duration			Weight		Time		Factor
DOSE	Conc.	200		150	6		R.A.F	15		(f)	365 x	1E+06
		mg/day		days/yr	years			kg		years	days/year	mg/kg

(b) Hazard quotient = chronic exposure dose / RfD
(c) Cancer risk = lifetime exposure dose x slope factor
(d) The reference dose for chromium VI was used.
(e) The reference dose for manganese in water was used.
(f) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available
nd = not detected
--- = not calculated due to absence of data

TABLE 6 - 33
POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	14	0.5	2.1E-05	0.1	2.1E-04	7.0E-06	na	---
Vinyl Chloride	0.025	0.5	3.7E-08	na	---	1.3E-08	1.9	2.4E-08
Benzo(a)anthracene	0.078	0.05	1.1E-08	na	---	3.9E-09	7.3	2.9E-08
Benzo(a)pyrene	0.068	0.05	1.0E-08	na	---	3.4E-09	7.3	2.5E-08
Benzo(b)fluoranthene	0.076	0.05	1.1E-08	na	---	3.8E-09	7.3	2.8E-08
Benzo(k)fluoranthene	0.064	0.05	9.4E-09	na	---	3.2E-09	7.3	2.4E-08
Chrysene	0.095	0.05	1.4E-08	na	---	4.8E-09	7.3	3.5E-08
Indeno(1,2,3-cd)pyrene	0.052	0.05	7.6E-09	na	---	2.6E-09	7.3	1.9E-08
Aluminum	8000	(d)	---	na	---	---	na	---
Arsenic	1.5	(d)	---	0.0003	---	---	1.75	---
Barium	16	(d)	---	0.07	---	---	na	---
Beryllium	0.41	(d)	---	0.005	---	---	4.3	---
Chromium (e)	7.5	(d)	---	0.005	---	---	na	---
Cobalt	2.9	(d)	---	na	---	---	na	---
Copper	27	(d)	---	na	---	---	na	---
Lead	12	(d)	---	na	---	---	na	---
Manganese (f)	110	(d)	---	0.005	---	---	na	---
Mercury	0.067	(d)	---	0.0003	---	---	na	---
Thallium	0.15	(d)	---	0.00007	---	---	na	---
Vanadium	14	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		2.1E-04	Total Risk =		1.8E-07

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	x	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		24		RAF	70		(g)	365 x 1E+06
			mg/day		days/yr		years			kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA, 1989, "Supplemental Risk Assessment Guidance ", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detected

--- = not calculated due to an absence of data

TABLE 6 - 34

POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	160	0.5	2.3E-04	0.1	2.3E-03	8.1E-05	na	---
Vinyl Chloride	0.25	0.5	3.7E-07	na	---	1.3E-07	1.9	2.4E-07
Benzo(a)anthracene	0.078	0.05	1.1E-08	na	---	3.9E-09	7.3	2.9E-08
Benzo(a)pyrene	0.068	0.05	1.0E-08	na	---	3.4E-09	7.3	2.5E-08
Benzo(b)fluoranthene	0.076	0.05	1.1E-08	na	---	3.8E-09	7.3	2.8E-08
Benzo(k)fluoranthene	0.064	0.05	9.4E-09	na	---	3.2E-09	7.3	2.4E-08
Chrysene	0.095	0.05	1.4E-08	na	---	4.8E-09	7.3	3.5E-08
Indeno(1,2,3-cd)pyrene	0.052	0.05	7.6E-09	na	---	2.6E-09	7.3	1.9E-08
Aluminum	14400	(d)	---	na	---	---	na	---
Arsenic	3.5	(d)	---	0.0003	---	---	1.75	---
Barium	20.5	(d)	---	0.07	---	---	na	---
Beryllium	1.1	(d)	---	0.005	---	---	4.3	---
Chromium (e)	13.9	(d)	---	0.005	---	---	na	---
Cobalt	6.2	(d)	---	na	---	---	na	---
Copper	253	(d)	---	na	---	---	na	---
Lead	31.1	(d)	---	na	---	---	na	---
Manganese (f)	257	(d)	---	0.005	---	---	na	---
Mercury	0.2	(d)	---	0.0003	---	---	na	---
Thallium	0.36	(d)	---	0.00007	---	---	na	---
Vanadium	27.2	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		2.3E-03	Total Risk =		4.0E-07

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	x	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		24		RAF	70		(g)	365 x 1E+06
			mg/day		days/yr		years			kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA, 1989, "Supplemental Risk Assessment Guidance ", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detected

--- = not calculated due to an absence of data

TABLE 6 - 35

POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	4.8	0.5	7.0E-06	0.1	7.0E-05	2.4E-06	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	0.05	8.4E-09	na	---	2.9E-09	7.3	2.1E-08
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	0.055	0.05	8.1E-09	na	---	2.8E-09	7.3	2.0E-08
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	6400	(d)	---	na	---	---	na	---
Arsenic	1.2	(d)	---	0.0003	---	---	1.75	---
Barium	34	(d)	---	0.07	---	---	na	---
Beryllium	0.57	(d)	---	0.005	---	---	4.3	---
Chromium (e)	5.8	(d)	---	0.005	---	---	na	---
Cobalt	6	(d)	---	na	---	---	na	---
Copper	3.3	(d)	---	na	---	---	na	---
Lead	29	(d)	---	na	---	---	na	---
Manganese (f)	1400	(d)	---	0.005	---	---	na	---
Mercury	0.13	(d)	---	0.0003	---	---	na	---
Thallium	nd	(d)	---	0.00007	---	---	na	---
Vanadium	12	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		7.0E-05	Total Risk =		4.1E-08

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	x	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		24		RAF	70		(g)	365 x 1E+06
			mg/day		days/yr		years			kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA, 1989, "Supplemental Risk Assessment Guidance ", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detected

--- = not calculated due to an absence of data

TABLE 6 - 36
POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	23.7	0.5	3.5E-05	0.1	3.5E-04	1.2E-05	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	0.05	8.4E-09	na	---	2.9E-09	7.3	2.1E-08
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	0.055	0.05	8.1E-09	na	---	2.8E-09	7.3	2.0E-08
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	8940	(d)	---	na	---	---	na	---
Arsenic	1.3	(d)	---	0.0003	---	---	1.75	---
Barium	86.2	(d)	---	0.07	---	---	na	---
Beryllium	0.88	(d)	---	0.005	---	---	4.3	---
Chromium (e)	9.8	(d)	---	0.005	---	---	na	---
Cobalt	12.8	(d)	---	na	---	---	na	---
Copper	5.6	(d)	---	na	---	---	na	---
Lead	124	(d)	---	na	---	---	na	---
Manganese (f)	6120	(d)	---	0.005	---	---	na	---
Mercury	0.41	(d)	---	0.0003	---	---	na	---
Thallium	nd	(d)	---	0.00007	---	---	na	---
Vanadium	18.1	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		3.5E-04	Total Risk =		4.1E-08

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	x	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		24		RAF	70		(g)	365 x 1E+06
			mg/day		days/yr		years			kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD
(c) Cancer Risk = lifetime exposure dose x slope factor
(d) R.A.F. for metals is neglible; (USEPA, 1989, "Supplemental Risk Assessment Guidance ", EPA/901/5-89-001)
(e) The reference dose for chromium VI was used.
(f) The reference dose for manganese in water was used.
(g) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available
nd = chemical not detected
--- = not calculated due to an absence of data

TABLE 6 - 37

POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.014	0.5	2.1E-08	0.1	2.1E-07	7.0E-09	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	nd	0.05	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	5500	(d)	---	na	---	---	na	---
Arsenic	0.79	(d)	---	0.0003	---	---	1.75	---
Barium	28	(d)	---	0.07	---	---	na	---
Beryllium	0.35	(d)	---	0.005	---	---	4.3	---
Chromium (e)	6.4	(d)	---	0.005	---	---	na	---
Cobalt	2.9	(d)	---	na	---	---	na	---
Copper	37	(d)	---	na	---	---	na	---
Lead	6.3	(d)	---	na	---	---	na	---
Manganese (f)	110	(d)	---	0.005	---	---	na	---
Mercury	0.13	(d)	---	0.0003	---	---	na	---
Thallium	0.15	(d)	---	0.00007	---	---	na	---
Vanadium	9.2	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		2.1E-07	Total Risk =		---

NOTES:

(a) Calculation for exposure dose :

DERMAL	=	Conc.	x Soil Contact	x Exposure	x Exposure	x R.A.F.	Body	x Averaging	Conversion
EXPOSURE			Rate	Frequency	Duration		Weight	Time	Factor
DOSE		Conc.	500	150	24	RAF	70	(g)	365 x 1E+06
			mg/day	days/yr	years		kg	years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA, 1989, "Supplemental Risk Assessment Guidance ", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detected

--- = not calculated due to an absence of data

TABLE 6 - 38

POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.023	0.5	3.4E-08	0.1	3.4E-07	1.2E-08	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	nd	0.05	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	6740	(d)	---	na	---	---	na	---
Arsenic	0.86	(d)	---	0.0003	---	---	1.75	---
Barium	58.9	(d)	---	0.07	---	---	na	---
Beryllium	0.4	(d)	---	0.005	---	---	4.3	---
Chromium (e)	9.8	(d)	---	0.005	---	---	na	---
Cobalt	3.6	(d)	---	na	---	---	na	---
Copper	99.3	(d)	---	na	---	---	na	---
Lead	11.8	(d)	---	na	---	---	na	---
Manganese (f)	135	(d)	---	0.005	---	---	na	---
Mercury	0.28	(d)	---	0.0003	---	---	na	---
Thallium	0.25	(d)	---	0.00007	---	---	na	---
Vanadium	12.1	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		3.4E-07	Total Risk =		---

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	x	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		24		RAF	70		(g)	365 x 1E+06
			mg/day		days/yr		years			kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA, 1989, "Supplemental Risk Assessment Guidance ", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 24 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detected

--- = not calculated due to an absence of data

TABLE 6 - 39

POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	14	0.5	9.6E-05	0.1	9.6E-04	8.2E-06	na	---
Vinyl Chloride	0.025	0.5	1.7E-07	na	---	1.5E-08	1.9	2.8E-08
Benzo(a)anthracene	0.078	0.05	5.3E-08	na	---	4.6E-09	7.3	3.3E-08
Benzo(a)pyrene	0.068	0.05	4.7E-08	na	---	4.0E-09	7.3	2.9E-08
Benzo(b)fluoranthene	0.076	0.05	5.2E-08	na	---	4.5E-09	7.3	3.3E-08
Benzo(k)fluoranthene	0.064	0.05	4.4E-08	na	---	3.8E-09	7.3	2.7E-08
Chrysene	0.095	0.05	6.5E-08	na	---	5.6E-09	7.3	4.1E-08
Indeno(1,2,3-cd)pyrene	0.052	0.05	3.6E-08	na	---	3.1E-09	7.3	2.2E-08
Aluminum	8000	(d)	---	na	---	---	na	---
Arsenic	1.5	(d)	---	0.0003	---	---	1.75	---
Barium	16	(d)	---	0.07	---	---	na	---
Beryllium	0.41	(d)	---	0.005	---	---	4.3	---
Chromium (e)	7.5	(d)	---	0.005	---	---	na	---
Cobalt	2.9	(d)	---	na	---	---	na	---
Copper	27	(d)	---	na	---	---	na	---
Lead	12	(d)	---	na	---	---	na	---
Manganese (f)	110	(d)	---	0.005	---	---	na	---
Mercury	0.067	(d)	---	0.0003	---	---	na	---
Thallium	0.15	(d)	---	0.00007	---	---	na	---
Vanadium	14	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		9.6E-04	Total Risk =		2.1E-07

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc.	x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.		500		150		6	RAF	15		(g)	365 x 1E+06
				mg/day		days/yr		years		kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposere dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA,1989,"Supplemental Risk Assessment Guidance", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detested

--- = not calculated due to an absence of data

TABLE 6 - 40
POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SOLID WASTE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	160	0.5	1.1E-03	0.1	1.1E-02	9.4E-05	na	---
Vinyl Chloride	0.25	0.5	1.7E-06	na	---	1.5E-07	1.9	2.8E-07
Benzo(a)anthracene	0.078	0.05	5.3E-08	na	---	4.6E-09	7.3	3.3E-08
Benzo(a)pyrene	0.068	0.05	4.7E-08	na	---	4.0E-09	7.3	2.9E-08
Benzo(b)fluoranthene	0.076	0.05	5.2E-08	na	---	4.5E-09	7.3	3.3E-08
Benzo(k)fluoranthene	0.064	0.05	4.4E-08	na	---	3.8E-09	7.3	2.7E-08
Chrysene	0.095	0.05	6.5E-08	na	---	5.6E-09	7.3	4.1E-08
Indeno(1,2,3-cd)pyrene	0.052	0.05	3.6E-08	na	---	3.1E-09	7.3	2.2E-08
Aluminum	14400	(d)	---	na	---	---	na	---
Arsenic	3.5	(d)	---	0.0003	---	---	1.75	---
Barium	20.5	(d)	---	0.07	---	---	na	---
Beryllium	1.1	(d)	---	0.005	---	---	4.3	---
Chromium (e)	13.9	(d)	---	0.005	---	---	na	---
Cobalt	6.2	(d)	---	na	---	---	na	---
Copper	253	(d)	---	na	---	---	na	---
Lead	31.1	(d)	---	na	---	---	na	---
Manganese (f)	257	(d)	---	0.005	---	---	na	---
Mercury	0.2	(d)	---	0.0003	---	---	na	---
Thallium	0.36	(d)	---	0.00007	---	---	na	---
Vanadium	27.2	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		1.1E-02	Total Risk =		4.6E-07

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		6	RAF	15		(g)	365 x 1E+06
			mg/day		days/yr		years		kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposere dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA,1989,"Supplemental Risk Assessment Guidance", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detested

--- = not calculated due to an absence of data

TABLE 6 - 41
POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	4.8	0.5	3.3E-05	0.1	3.3E-04	2.8E-06	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	0.05	3.9E-08	na	---	3.3E-09	7.3	2.4E-08
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	0.055	0.05	3.8E-08	na	---	3.2E-09	7.3	2.4E-08
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	6400	(d)	---	na	---	---	na	---
Arsenic	1.2	(d)	---	0.0003	---	---	1.75	---
Barium	34	(d)	---	0.07	---	---	na	---
Beryllium	0.57	(d)	---	0.005	---	---	4.3	---
Chromium (e)	5.8	(d)	---	0.005	---	---	na	---
Cobalt	6	(d)	---	na	---	---	na	---
Copper	3.3	(d)	---	na	---	---	na	---
Lead	29	(d)	---	na	---	---	na	---
Manganese (f)	1400	(d)	---	0.005	---	---	na	---
Mercury	0.13	(d)	---	0.0003	---	---	na	---
Thallium	nd	(d)	---	0.00007	---	---	na	---
Vanadium	12	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		3.3E-04	Total Risk =		4.8E-08

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		6	RAF	15		(g)	365 x 1E+06
			mg/day		days/yr		years		kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposere dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA,1989,"Supplemental Risk Assessment Guidance", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detested

--- = not calculated due to an absence of data

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POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE BULKY WASTE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	23.7	0.5	1.6E-04	0.1	1.6E-03	1.4E-05	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	0.057	0.05	3.9E-08	na	---	3.3E-09	7.3	2.4E-08
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	0.055	0.05	3.8E-08	na	---	3.2E-09	7.3	2.4E-08
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	8940	(d)	---	na	---	---	na	---
Arsenic	1.3	(d)	---	0.0003	---	---	1.75	---
Barium	86.2	(d)	---	0.07	---	---	na	---
Beryllium	0.88	(d)	---	0.005	---	---	4.3	---
Chromium (e)	9.8	(d)	---	0.005	---	---	na	---
Cobalt	12.8	(d)	---	na	---	---	na	---
Copper	5.6	(d)	---	na	---	---	na	---
Lead	124	(d)	---	na	---	---	na	---
Manganese (f)	6120	(d)	---	0.005	---	---	na	---
Mercury	0.41	(d)	---	0.0003	---	---	na	---
Thallium	nd	(d)	---	0.00007	---	---	na	---
Vanadium	18.1	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		1.6E-03	Total Risk =		4.8E-08

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		6	RAF	15		(g)	365 x 1E+06
			mg/day		days/yr		years		kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposere dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA,1989,"Supplemental Risk Assessment Guidance", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detested

--- = not calculated due to an absence of data

TABLE 6 - 43

POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Average Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.014	0.5	9.6E-08	0.1	9.6E-07	8.2E-09	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	nd	0.05	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	5500	(d)	---	na	---	---	na	---
Arsenic	0.79	(d)	---	0.0003	---	---	1.75	---
Barium	28	(d)	---	0.07	---	---	na	---
Beryllium	0.35	(d)	---	0.005	---	---	4.3	---
Chromium (e)	6.4	(d)	---	0.005	---	---	na	---
Cobalt	2.9	(d)	---	na	---	---	na	---
Copper	37	(d)	---	na	---	---	na	---
Lead	6.3	(d)	---	na	---	---	na	---
Manganese (f)	110	(d)	---	0.005	---	---	na	---
Mercury	0.13	(d)	---	0.0003	---	---	na	---
Thallium	0.15	(d)	---	0.00007	---	---	na	---
Vanadium	9.2	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		9.6E-07	Total Risk =		---

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc. x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.	500		150		6	RAF	15		(g)	365 x 1E+06
			mg/day		days/yr		years		kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposere dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA,1989,"Supplemental Risk Assessment Guidance", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detested

--- = not calculated due to an absence of data

TABLE 6 - 44

POTENTIAL RISK FROM DERMAL CONTACT OF SURFACE SOILS WITHIN THE SEWAGE SLUDGE AREA BY SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR A CHILD EXPOSURE

ANALYTE	Maximum Concentration (mg/kg)	Relative Absorption Factor (RAF)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Acetone	0.023	0.5	1.6E-07	0.1	1.6E-06	1.4E-08	na	---
Vinyl Chloride	nd	0.5	---	na	---	---	1.9	---
Benzo(a)anthracene	nd	0.05	---	na	---	---	7.3	---
Benzo(a)pyrene	nd	0.05	---	na	---	---	7.3	---
Benzo(b)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Benzo(k)fluoranthene	nd	0.05	---	na	---	---	7.3	---
Chrysene	nd	0.05	---	na	---	---	7.3	---
Indeno(1,2,3-cd)pyrene	nd	0.05	---	na	---	---	7.3	---
Aluminum	6740	(d)	---	na	---	---	na	---
Arsenic	0.86	(d)	---	0.0003	---	---	1.75	---
Barium	58.9	(d)	---	0.07	---	---	na	---
Beryllium	0.4	(d)	---	0.005	---	---	4.3	---
Chromium (e)	9.8	(d)	---	0.005	---	---	na	---
Cobalt	3.6	(d)	---	na	---	---	na	---
Copper	99.3	(d)	---	na	---	---	na	---
Lead	11.8	(d)	---	na	---	---	na	---
Manganese (f)	135	(d)	---	0.005	---	---	na	---
Mercury	0.28	(d)	---	0.0003	---	---	na	---
Thallium	0.25	(d)	---	0.00007	---	---	na	---
Vanadium	12.1	(d)	---	0.007	---	---	na	---
			Total Hazard Index =		1.6E-06	Total Risk =		---

NOTES:

(a) Calculation for exposure dose :

DERMAL EXPOSURE DOSE	=	Conc.	x	Soil Contact Rate	x	Exposure Frequency	x	Exposure Duration	R.A.F.	Body Weight	x	Averaging Time	Conversion Factor
		Conc.		500		150		6	RAF	15		(g)	365 x 1E+06
				mg/day		days/yr		years		kg		years	days/year mg/kg

(b) Hazard quotient = chronic exposere dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) R.A.F. for metals is neglible; (USEPA,1989,"Supplemental Risk Assessment Guidance", EPA/901/5-89-001)

(e) The reference dose for chromium VI was used.

(f) The reference dose for manganese in water was used.

(g) Averaging times of 6 years for chronic doses and 70 years for lifetime doses were used.

na = toxicity value not available

nd = chemical not detested

--- = not calculated due to an absence of data

TABLE 6 - 45
POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE SOLID WASTE AREA FOR SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (b)	Exposure Dose Chronic (c) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (d)		Exposure Dose Lifetime (c) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (e)
Chloroethane	nd	8.0E-03	---	na	---		---	na	---
1,2-Dichloroethene (f)	44	1.0E-02	3.2E-06	0.01	3.2E-04		1.38E-06	na	---
bis(2-Ethylhexyl)phthalate	nd	3.3E-02	---	0.02	---		---	0.014	---
Aluminum	60500	1.0E-03	4.4E-04	na	---		1.90E-04	na	---
Arsenic	3.7	1.0E-03	2.7E-08	0.0003	9.0E-05		1.16E-08	1.75	2.0E-08
Barium	328	1.0E-03	2.4E-06	0.07	3.4E-05		1.03E-06	na	---
Beryllium	11.2	1.0E-03	8.2E-08	0.005	1.6E-05		3.52E-08	4.3	1.5E-07
Chromium (g)	23.9	1.0E-03	1.8E-07	0.005	3.5E-05		7.50E-08	na	---
Cobalt	nd	1.0E-03	---	na	---		---	na	---
Copper	37.8	1.0E-03	2.8E-07	na	---		1.19E-07	na	---
Lead	150	1.0E-03	1.1E-06	na	---		4.71E-07	na	---
Manganese (h)	814	1.0E-03	6.0E-06	0.005	1.2E-03		2.56E-06	na	---
Vanadium	49.8	1.0E-03	3.6E-07	0.007	5.2E-05		1.56E-07	na	---
Ammonia	nd	1.0E-03	---	na	---		---	na	---
			Total Hazard Index =		1.7E-03			Total Risk =	1.7E-07

NOTES:
(a) Tables 6-45 and 6-46 are the same because there is only one leachate sample at this location.
(b) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(c) Calculation for exposure dose:

DERMAL =	Conc.	x Dermal	x Skin Surface	x Exposure	x Exposure	x Exposure	/	Body	x Averaging			Conversion	
EXPOSURE	Perm.	Const.	Area	Time	Frequency	Duration		Weight	Time			x	Factor
DOSE	Conc.	Kp	1,800	1	104	30		70	(i)		x 365	x	1E+06
		cm/hour	sq. cm	hr/day	days/yr	years		kg	years		days/year		cu.cm-ug/mg-L

(d) Hazard quotient = chronic exposure dose / RfD
(e) Cancer risk = lifetime exposure dose x slope factor
(f) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE were used.
(g) Reference Dose for chromium VI used.
(h) Reference Dose for manganese in water used.
(i) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 46

POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE SOLID WASTE AREA FOR SITE VISITORS

MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (b)	Exposure Dose Chronic (c) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (d)	Exposure Dose Lifetime (c) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (e)
Chloroethane	nd	8.0E-03	---	na	---	---	na	---
1,2-Dichloroethene (f)	44	1.0E-02	3.2E-06	0.01	3.2E-04	1.38E-06	na	---
bis(2-Ethylhexyl)phthalate	nd	3.3E-02	---	0.02	---	---	0.014	---
Aluminum	60500	1.0E-03	4.4E-04	na	---	1.90E-04	na	---
Arsenic	3.7	1.0E-03	2.7E-08	0.0003	9.0E-05	1.16E-08	1.75	2.0E-08
Barium	328	1.0E-03	2.4E-06	0.07	3.4E-05	1.03E-06	na	---
Beryllium	11.2	1.0E-03	8.2E-08	0.005	1.6E-05	3.52E-08	4.3	1.5E-07
Chromium (g)	23.9	1.0E-03	1.8E-07	0.005	3.5E-05	7.50E-08	na	---
Cobalt	nd	1.0E-03	---	na	---	---	na	---
Copper	37.8	1.0E-03	2.8E-07	na	---	1.19E-07	na	---
Lead	150	1.0E-03	1.1E-06	na	---	4.71E-07	na	---
Manganese (h)	814	1.0E-03	6.0E-06	0.005	1.2E-03	2.56E-06	na	---
Vanadium	49.8	1.0E-03	3.6E-07	0.007	5.2E-05	1.56E-07	na	---
Ammonia	nd	1.0E-03	---	na	---	---	na	---
			Total Hazard Index =		1.7E-03		Total Risk =	1.7E-07

NOTES:

(a) Tables 6-45 and 6-46 are the same because there is only one leachate sample at this location.

(b) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B

(c) Calculation for exposure dose:

DERMAL =	Conc.	x Dermal	x Skin Surface	x Exposure	x Exposure	x Exposure	/	Body	x Averaging			Conversion	
EXPOSURE	Perm.	Const.	Area	Time	Frequency	Duration		Weight	Time			x Factor	
DOSE	Conc.	Kp	1,800	1	104	30		70	(i)	x	365	x	1E+06
		cm/hour	sq. cm	hr/day	days/yr	years		kg	years		days/year		cu.cm-ug/mg-L

(d) Hazard quotient = chronic exposure dose / RfD

(e) Cancer risk = lifetime exposure dose x slope factor

(f) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE were used.

(g) Reference Dose for chromium VI used.

(h) Reference Dose for manganese in water used.

(i) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 47

POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE BULKY WASTE AREA FOR SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Chloroethane	5.7	8.0E-03	---	na	---		---	na	---
1,2-Dichloroethene (e)	1	1.0E-02	7.3E-08	0.01	7.3E-06		3.14E-08	na	---
bis(2-Ethylhexyl)phthalate	50	3.3E-02	---	0.02	---		---	0.014	---
Aluminum	2100	1.0E-03	1.5E-05	na	---		6.59E-06	na	---
Arsenic	nd	1.0E-03	---	0.0003	---		---	1.75	---
Barium	510	1.0E-03	3.7E-06	0.07	5.3E-05		1.60E-06	na	---
Beryllium	2.2	1.0E-03	1.6E-08	0.005	3.2E-06		6.91E-09	4.3	3.0E-08
Chromium (f)	2.4	1.0E-03	1.8E-08	0.005	3.5E-06		7.54E-09	na	---
Cobalt	63	1.0E-03	---	na	---		---	na	---
Copper	nd	1.0E-03	---	na	---		---	na	---
Lead	37	1.0E-03	2.7E-07	na	---		1.16E-07	na	---
Manganese (g)	8200	1.0E-03	6.0E-05	0.005	1.2E-02		2.57E-05	na	---
Vanadium	15	1.0E-03	1.1E-07	0.007	1.6E-05		4.71E-08	na	---
Ammonia	13000	1.0E-03	---	na	---		---	na	---
			Total Hazard Index =		1.2E-02			Total Risk =	3.0E-08

NOTES:

(a) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B

(b) Calculation for exposure dose:

DERMAL EXPOSURE DOSE =	Conc. x Perm. Conc.	Dermal Const. Kp cm/hour	x Skin Surface Area 1,800 sq. cm	x Exposure Time 1 hr/day	x Exposure Frequency 104 days/yr	x Exposure Duration 30 years	/ Body Weight 70 kg	x Averaging Time (h) years	x 365 days/year	Conversion Factor x 1E+06 cu.cm-ug/mg-L

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE were used.

(f) Reference Dose for chromium VI used.

(g) Reference Dose for manganese in water used.

(h) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 48

POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE BULKY WASTE AREA FOR SITE VISITORS

MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Chloroethane	8	8.0E-03	---	na	---		---	na	---
1,2-Dichloroethene (e)	1	1.0E-02	7.3E-08	0.01	7.3E-06		3.14E-08	na	---
bis(2-Ethylhexyl)phthalate	230	3.3E-02	---	0.02	---		---	0.014	---
Aluminum	9220	1.0E-03	6.8E-05	na	---		2.90E-05	na	---
Arsenic	nd	1.0E-03	---	0.0003	---		---	1.75	---
Barium	2120	1.0E-03	1.6E-05	0.07	2.2E-04		6.66E-06	na	---
Beryllium	8.7	1.0E-03	6.4E-08	0.005	1.3E-05		2.73E-08	4.3	1.2E-07
Chromium (f)	5	1.0E-03	3.7E-08	0.005	7.3E-06		1.57E-08	na	---
Cobalt	295	1.0E-03	---	na	---		---	na	---
Copper	nd	1.0E-03	---	na	---		---	na	---
Lead	174	1.0E-03	1.3E-06	na	---		5.46E-07	na	---
Manganese (g)	14700	1.0E-03	1.1E-04	0.005	2.2E-02		4.62E-05	na	---
Vanadium	65.2	1.0E-03	4.8E-07	0.007	6.8E-05		2.05E-07	na	---
Ammonia	21800	1.0E-03	---	na	---		---	na	---
			Total Hazard Index =		2.2E-02			Total Risk =	1.2E-07

NOTES:

(a) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B

(b) Calculation for exposure dose:

DERMAL =	Conc.	x	Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x	Averaging
EXPOSURE	Perm.		Const.		Area		Time		Frequency		Duration		Weight		Time
DOSE	Conc.		Kp		1,800		1		104		30		70		(h)
			cm/hour		sq. cm		hr/day		days/yr		years		kg		years

				Conversion	
			x	Factor	
x	365		x	1E+06	
	days/year			cu.cm-ug/mg-L	

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE were used.

(f) Reference Dose for chromium VI used.

(g) Reference Dose for manganese in water used.

(h) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 49
POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE SOLID WASTE AREA FOR SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE (a)

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (b)	Exposure Dose Chronic (c) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (d)	Exposure Dose Lifetime (c) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (e)
Chloroethane	nd	8.0E-03	---	na	---	---	na	---
1,2-Dichloroethene (f)	44	1.0E-02	3.9E-06	0.01	3.9E-04	3.89E-07	na	---
bis(2-Ethylhexyl)phthalate	nd	3.3E-02	---	0.02	---	---	0.014	---
Aluminum	60500	1.0E-03	5.3E-04	na	---	5.35E-05	na	---
Arsenic	3.7	1.0E-03	3.3E-08	0.0003	1.1E-04	3.27E-09	1.75	5.7E-09
Barium	328	1.0E-03	2.9E-06	0.07	4.1E-05	2.90E-07	na	---
Beryllium	11.2	1.0E-03	9.9E-08	0.005	2.0E-05	9.90E-09	4.3	4.3E-08
Chromium (g)	23.9	1.0E-03	2.1E-07	0.005	4.2E-05	2.11E-08	na	---
Cobalt	nd	1.0E-03	---	na	---	---	na	---
Copper	37.8	1.0E-03	3.3E-07	na	---	3.34E-08	na	---
Lead	150	1.0E-03	1.3E-06	na	---	1.33E-07	na	---
Manganese (h)	814	1.0E-03	7.2E-06	0.005	1.4E-03	7.20E-07	na	---
Vanadium	49.8	1.0E-03	4.4E-07	0.007	6.3E-05	4.40E-08	na	---
Ammonia	nd	1.0E-03	---	na	---	---	na	---
			Total Hazard Index =		2.1E-03		Total Risk =	4.8E-08

NOTES:
(a) Tables 6-49 and 6-50 are the same because there is only one leachate sample at this location.
(b) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(c) Calculation for exposure dose:

DERMAL EXPOSURE DOSE	=	Conc. Conc.	x	Dermal Perm. Const. Kp (b) cm/hour	x	Skin Surface Area 1,800 sq. cm	x	Exposure Time 1 hr/day	x	Exposure Frequency 104 days/yr	x	Exposure Duration 7 years	/	Body Weight 58 kg	x	Averaging Time (i) years	x	Conversion Factor x 365 days/year	x	1E+06 cu.cm-ug/mg-L

(d) Hazard quotient = chronic exposure dose / RfD
(e) Cancer risk = lifetime exposure dose x slope factor
(f) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE was used.
(g) Reference Dose for chromium VI used.
(h) Reference Dose for manganese in water used.
(i) Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 50
POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE SOLID WASTE AREA FOR SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE (a)

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (b)	Exposure Dose Chronic (c) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (d)	Exposure Dose Lifetime (c) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (e)
Chloroethane	nd	8.0E-03	---	na	---	---	na	---
1,2-Dichloroethene (f)	44	1.0E-02	3.9E-06	0.01	3.9E-04	3.89E-07	na	---
bis(2-Ethylhexyl)phthalate	nd	3.3E-02	---	0.02	---	---	0.014	---
Aluminum	60500	1.0E-03	5.3E-04	na	---	5.35E-05	na	---
Arsenic	3.7	1.0E-03	3.3E-08	0.0003	1.1E-04	3.27E-09	1.75	5.7E-09
Barium	328	1.0E-03	2.9E-06	0.07	4.1E-05	2.90E-07	na	---
Beryllium	11.2	1.0E-03	9.9E-08	0.005	2.0E-05	9.90E-09	4.3	4.3E-08
Chromium (g)	23.9	1.0E-03	2.1E-07	0.005	4.2E-05	2.11E-08	na	---
Cobalt	nd	1.0E-03	---	na	---	---	na	---
Copper	37.8	1.0E-03	3.3E-07	na	---	3.34E-08	na	---
Lead	150	1.0E-03	1.3E-06	na	---	1.33E-07	na	---
Manganese (h)	814	1.0E-03	7.2E-06	0.005	1.4E-03	7.20E-07	na	---
Vanadium	49.8	1.0E-03	4.4E-07	0.007	6.3E-05	4.40E-08	na	---
Ammonia	nd	1.0E-03	---	na	---	---	na	---
			Total Hazard Index =		2.1E-03		Total Risk =	4.8E-08

NOTES:
(a) Tables 6-49 and 6-50 are the same because there is only one leachate sample at this location.
(b) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(c) Calculation for exposure dose:

DERMAL	=	Conc.	x Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x Averaging	Conversion
EXPOSURE			Perm. Const.		Area		Time		Frequency		Duration		Weight	Time	x Factor
DOSE		Conc.	Kp (b)		1,800		1		104		7		58	(i)	x 365 x 1E+06
			cm/hour		sq. cm		hr/day		days/yr		years		kg	years	days/year cu.cm-ug/mg-L

(d) Hazard quotient = chronic exposure dose / RfD
(e) Cancer risk = lifetime exposure dose x slope factor
(f) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE was used.
(g) Reference Dose for chromium VI used.
(h) Reference Dose for manganese in water used.
(i) Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 51
POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE BULKY WASTE AREA FOR SITE VISITORS
AVERAGE CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Chloroethane	5.7	8.0E-03	---	na	---	---	na	---
1,2-Dichloroethene (e)	1	1.0E-02	8.8E-08	0.01	8.8E-06	8.84E-09	na	---
bis(2-Ethylhexyl)phthalate	50	3.3E-02	---	0.02	---	---	0.014	---
Aluminum	2100	1.0E-03	1.9E-05	na	---	1.86E-06	na	---
Arsenic	nd	1.0E-03	---	0.0003	---	---	1.75	---
Barium	510	1.0E-03	4.5E-06	0.07	6.4E-05	4.51E-07	na	---
Beryllium	2.2	1.0E-03	1.9E-08	0.005	3.9E-06	1.95E-09	4.3	8.4E-09
Chromium (f)	2.4	1.0E-03	2.1E-08	0.005	4.2E-06	2.12E-09	na	---
Cobalt	63	1.0E-03	---	na	---	---	na	---
Copper	nd	1.0E-03	---	na	---	---	na	---
Lead	37	1.0E-03	3.3E-07	na	---	3.27E-08	na	---
Manganese (g)	8200	1.0E-03	7.3E-05	0.005	1.5E-02	7.25E-06	na	---
Vanadium	15	1.0E-03	1.3E-07	0.007	1.9E-05	1.33E-08	na	---
Ammonia	13000	1.0E-03	---	na	---	---	na	---
			Total Hazard Index =		1.5E-02		Total Risk =	8.4E-09

NOTES:
(a) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) Calculation for exposure dose:

DERMAL EXPOSURE DOSE =	Conc. Conc.	x Dermal Perm. Const. Kp cm/hour	x	Skin Surface Area 1,800 sq. cm	x	Exposure Time 1 hr/day	x	Exposure Frequency 104 days/yr	x	Exposure Duration 7 years	/	Body Weight 58 kg	x Averaging Time (h) years	x 365 days/year	Conversion Factor x 1E+06 cu.cm-ug/mg-L

(c) Hazard quotient = chronic exposure dose / RfD
(d) Cancer risk = lifetime exposure dose x slope factor
(e) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE was used.
(f) Reference Dose for chromium VI used.
(g) Reference Dose for manganese in water used.
(h) Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 52
POTENTIAL RISK FROM DERMAL ABSORPTION OF LEACHATE WITHIN THE BULKY WASTE AREA FOR SITE VISITORS
MAXIMUM CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Chloroethane	8	8.0E-03	---	na	---	---	na	---
1,2-Dichloroethene (e)	1	1.0E-02	8.8E-08	0.01	8.8E-06	8.84E-09	na	---
bis(2-Ethylhexyl)phthalate	230	3.3E-02	---	0.02	---	---	0.014	---
Aluminum	9220	1.0E-03	8.2E-05	na	---	8.15E-06	na	---
Arsenic	nd	1.0E-03	---	0.0003	---	---	1.75	---
Barium	2120	1.0E-03	1.9E-05	0.07	2.7E-04	1.87E-06	na	---
Beryllium	8.7	1.0E-03	7.7E-08	0.005	1.5E-05	7.69E-09	4.3	3.3E-08
Chromium (f)	5	1.0E-03	4.4E-08	0.005	8.8E-06	4.42E-09	na	---
Cobalt	295	1.0E-03	---	na	---	---	na	---
Copper	nd	1.0E-03	---	na	---	---	na	---
Lead	174	1.0E-03	1.5E-06	na	---	1.54E-07	na	---
Manganese (g)	14700	1.0E-03	1.3E-04	0.005	2.6E-02	1.30E-05	na	---
Vanadium	65.2	1.0E-03	5.8E-07	0.007	8.2E-05	5.77E-08	na	---
Ammonia	21800	1.0E-03	---	na	---	---	na	---
			Total Hazard Index =		2.6E-02		Total Risk =	3.3E-08

NOTES:
(a) Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) Calculation for exposure dose:

DERMAL	=	Conc.	x Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x Averaging		Conversion
EXPOSURE			Perm. Const.		Area		Time		Frequency		Duration		Weight	Time	x	Factor
DOSE		Conc.	Kp		1,800		1		104		7		58	(h)	x 365	x 1E+06
			cm/hour		sq. cm		hr/day		days/yr		years		kg	years	days/year	cu.cm-ug/mg-L

(c) Hazard quotient = chronic exposure dose / RfD
(d) Cancer risk = lifetime exposure dose x slope factor
(e) Dose-response data for cis-1,2-DCE and DPC for trans-1,2-DCE was used.
(f) Reference Dose for chromium VI used.
(g) Reference Dose for manganese in water used.
(h) Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 53

POTENTIAL RISK FROM INGESTION OF SITE GROUNDWATER WITHIN THE SOLID WASTE AREA (AS DRINKING WATER)

AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

Analyte	Average Concentration (ug/L)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Benzene	11	3.0E-04	na	---		1.3E-04	0.029	3.7E-06
1,1-Dichloroethane	14	3.8E-04	0.1	3.8E-03		1.6E-04	na	---
1,2-Dichloroethene (e)	34	9.3E-04	0.01	9.3E-02		4.0E-04	na	---
Vinyl Chloride	34	9.3E-04	na	---		4.0E-04	1.9	7.6E-04
Pentachlorophenol	3	8.2E-05	0.03	2.7E-03		3.5E-05	0.12	4.2E-06
bis(2-Ethylhexyl)phthalate	5.6	1.5E-04	0.02	7.7E-03		6.6E-05	0.014	9.2E-07
Acrylamide	160	4.4E-03	0.0002	2.2E+01		1.9E-03	4.5	8.5E-03
N,N-DMF	200	5.5E-03	0.1	5.5E-02		2.3E-03	na	---
Antimony	nd	---	0.0004	---		---	na	---
Arsenic	2.7	7.4E-05	0.0003	2.5E-01		3.2E-05	1.75	5.5E-05
Barium	170	4.7E-03	0.07	6.7E-02		2.0E-03	na	---
Beryllium	1.7	4.7E-05	0.005	9.3E-03		2.0E-05	4.3	8.6E-05
Cadmium (f)	4.4	1.2E-04	0.0005	2.4E-01		5.2E-05	na	---
Chromium (e)	24	6.6E-04	0.005	1.3E-01		2.8E-04	na	---
Manganese (f)	1900	5.2E-02	0.005	1.0E+01		2.2E-02	na	---
Nickel	26	7.1E-04	0.02	3.6E-02		3.1E-04	na	---
Vanadium	21	5.8E-04	0.007	8.2E-02		2.5E-04	na	---
Zinc	680	1.9E-02	0.3	6.2E-02		8.0E-03	na	---
		Total Hazard Index =		3.3E+01		Total Risk =		9.4E-03
		Hazard Index (liver toxins) =		0.07				
		Hazard Index (nervous system toxins) =		32.33				
		Hazard Index (kidney toxins) =		0.24				
		Hazard Index (red blood cell effects) =		0.16				

NOTES:

(a) This table does not include groundwater chemicals of concern for which no reference dose or slope factor exists. (chloroethane,2-methylnapthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, sulfide and ammonia)

(b) Calculation for exposure dose :

INGESTION EXPOSURE	=	Conc.	Ingestion Rate	x Exposure Frequency	x Exposure Duration	/ Body Weight	Averaging Time	x	Conversion Factor
DOSE		Conc.	2	350	30	70	(g)		365 x 1E+03
			L/day	days/yr	years	kg	years		days/year ug/mg

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer Risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-dichloroethene and chromium VI were used.

(f) Reference Dose for cadmium and manganese in water were used.

(g) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 54

POTENTIAL RISK FROM INGESTION OF SITE GROUNDWATER WITHIN THE SOLID WASTE AREA (AS DRINKING WATER)

MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

Analyte	Maximum Concentration (ug/L)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Benzene	31	8.5E-04	na	---		3.6E-04	0.029	1.1E-05
1,1-Dichloroethane	220	6.0E-03	0.1	---		2.6E-03	na	---
1,2-Dichloroethene (e)	730	2.0E-02	0.01	2.0E+00		8.6E-03	na	---
Vinyl Chloride	690	1.9E-02	na	---		8.1E-03	1.9	1.5E-02
Pentachlorophenol	3	8.2E-05	0.03	2.7E-03		3.5E-05	0.12	4.2E-06
bis(2-Ethylhexyl)phthalate	36	9.9E-04	0.02	4.9E-02		4.2E-04	0.014	5.9E-06
Acrylamide	229	6.3E-03	0.0002	3.1E+01		2.7E-03	4.5	1.2E-02
N,N-DMF	1440	3.9E-02	0.1	3.9E-01		1.7E-02	na	---
Antimony	nd	---	0.0004	---		---	na	---
Arsenic	9.7	2.7E-04	0.0003	8.9E-01		1.1E-04	1.75	2.0E-04
Barium	508	1.4E-02	0.07	2.0E-01		6.0E-03	na	---
Beryllium	13.7	3.8E-04	0.005	7.5E-02		1.6E-04	4.3	6.9E-04
Cadmium (f)	40	1.1E-03	0.0005	2.2E+00		4.7E-04	na	---
Chromium (e)	154	4.2E-03	0.005	8.4E-01		1.8E-03	na	---
Manganese (f)	9790	2.7E-01	0.005	5.4E+01		1.1E-01	na	---
Nickel	125	3.4E-03	0.02	1.7E-01		1.5E-03	na	---
Vanadium	142	3.9E-03	0.007	5.6E-01		1.7E-03	na	---
Zinc	7360	2.0E-01	0.3	6.7E-01		8.6E-02	na	---
		Total Hazard Index =		9.3E+01		Total Risk =		2.8E-02
		Hazard Index (liver toxins) =		0.45				
		Hazard Index (nervous system toxins) =		85.01				
		Hazard Index (kidney toxins) =		2.19				
		Hazard Index (red blood cell effects) =		2.67				

NOTES:

(a) This table does not include groundwater chemicals of concern for which no reference dose or slope factor exists.
(chloroethane,2-methylnapthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, sulfide and ammonia)

(b) Calculation for exposure dose :

INGESTION EXPOSURE DOSE	= Conc.	Ingestion Rate	x Exposure Frequency	x Exposure Duration	/ Body Weight	Averaging Time	x	Conversion Factor
	Conc.	2	350	30	70	(g)		365 x 1E+03
		L/day	days/yr	years	kg	years		days/year ug/mg

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer Risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-dichloroethene and chromium VI were used.

(f) Reference Dose for cadmium and manganese in water were used.

(g) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 55

POTENTIAL RISK OF INGESTION OF SITE GROUNDWATER WITHIN THE BULKY WASTE AREA (AS DRINKING WATER)

AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

Analyte	Average Concentration (ug/L)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Benzene	1	2.7E-05	na	---		1.2E-05	0.029	3.4E-07
1,1-Dichloroethane	5	1.4E-04	0.1	1.4E-03		5.9E-05	na	---
1,2-Dichloroethene (e)	5	1.4E-04	0.01	1.4E-02		5.9E-05	na	---
Vinyl Chloride	nd	---	na	---		---	1.9	---
Pentachlorophenol	nd	---	0.03	---		---	0.12	---
bis(2-Ethylhexyl)phthalate	nd	---	0.02	---		---	0.014	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N,N-DMF	33	9.0E-04	0.1	9.0E-03		3.9E-04	na	---
Antimony	19	5.2E-04	0.0004	1.3E+00		2.2E-04	na	---
Arsenic	0.84	2.3E-05	0.0003	7.7E-02		9.9E-06	1.75	1.7E-05
Barium	81	2.2E-03	0.07	---		9.5E-04	na	---
Beryllium	2	5.5E-05	0.005	1.1E-02		2.3E-05	4.3	1.0E-04
Cadmium (f)	nd	---	0.0005	---		---	na	---
Chromium (e)	9.9	2.7E-04	0.005	5.4E-02		1.2E-04	na	---
Manganese (f)	1600	4.4E-02	0.005	8.8E+00		1.9E-02	na	---
Nickel	13	3.6E-04	0.02	1.8E-02		1.5E-04	na	---
Vanadium	15	4.1E-04	0.007	5.9E-02		1.8E-04	na	---
Zinc	61	1.7E-03	0.3	5.6E-03		7.2E-04	na	---
		Total Hazard Index =		1.0E+01		Total Risk =		1.2E-04
		Hazard Index (liver toxins) =		0.01				
		Hazard Index (nervous system toxins) =		8.77				
		Hazard Index (kidney toxins) =		0.00				
		Hazard Index (red blood cell effects) =		0.02				

NOTES:

(a) This table does not include groundwater chemicals of concern for which no reference dose or slope factor exists. (chloroethane,2-methylnapthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, sulfide and ammonia)

(b) Calculation for exposure dose :

INGESTION EXPOSURE DOSE	= Conc. Conc.	Ingestion Rate	x Exposure Frequency	x Exposure Duration	/	Body Weight	Averaging Time	x	Conversion Factor
		2	350	30		70	(g)		365 x 1E+03
		L/day	days/yr	years		kg	years		days/year ug/mg

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer Risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-dichloroethene and chromium VI were used.

(f) Reference Dose for cadmium and manganese in water were used.

(g) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 56

POTENTIAL RISK OF INGESTION OF SITE GROUNDWATER WITHIN THE BULKY WASTE AREA (AS DRINKING WATER)

MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

Analyte	Maximum Concentration (ug/L)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Benzene	1	2.7E-05	na	---		1.2E-05	0.029	3.4E-07
1,1-Dichloroethane	5	1.4E-04	0.1	1.4E-03		5.9E-05	na	---
1,2-Dichloroethene (e)	5	1.4E-04	0.01	1.4E-02		5.9E-05	na	---
Vinyl Chloride	nd	---	na	---		---	1.9	---
Pentachlorophenol	nd	---	0.03	---		---	0.12	---
bis(2-Ethylhexyl)phthalate	nd	---	0.02	---		---	0.014	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N,N-DMF	183	5.0E-03	0.1	5.0E-02		2.1E-03	na	---
Antimony	104.9	2.9E-03	0.0004	7.2E+00		1.2E-03	na	---
Arsenic	2.3	6.3E-05	0.0003	2.1E-01		2.7E-05	1.75	4.7E-05
Barium	430	1.2E-02	0.07	---		5.0E-03	na	---
Beryllium	10.5	2.9E-04	0.005	5.8E-02		1.2E-04	4.3	5.3E-04
Cadmium (f)	nd	---	0.0005	---		---	na	---
Chromium (e)	66.6	1.8E-03	0.005	3.6E-01		7.8E-04	na	---
Manganese (f)	9995	2.7E-01	0.005	5.5E+01		1.2E-01	na	---
Nickel	71.3	2.0E-03	0.02	9.8E-02		8.4E-04	na	---
Vanadium	91	2.5E-03	0.007	3.6E-01		1.1E-03	na	---
Zinc	215	5.9E-03	0.3	2.0E-02		2.5E-03	na	---
		Total Hazard Index =		6.3E+01		Total Risk =		5.8E-04
		Hazard Index (liver toxins) =		0.05				
		Hazard Index (nervous system toxins) =		54.77				
		Hazard Index (kidney toxins) =		0.00				
		Hazard Index (red blood cell effects) =		0.03				

NOTES:

(a) This table does not include groundwater chemicals of concern for which no reference dose or slope factor exists. (chloroethane,2-methylnapthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, sulfide and ammonia)

(b) Calculation for exposure dose :

INGESTION	= Conc.	Ingestion	x Exposure	x Exposure	/ Body	Averaging	x	Conversion
EXPOSURE		Rate	Frequency	Duration	Weight	Time		Factor
DOSE	Conc.	2	350	30	70	(g)	365	x 1E+03
		L/day	days/yr	years	kg	years	days/year	ug/mg

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer Risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-dichloroethene and chromium VI were used.

(f) Reference Dose for cadmium and manganese in water were used.

(g) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 57

POTENTIAL RISK FROM INGESTION OF SITE GROUNDWATER WITHIN THE SEWAGE SLUDGE AREA (AS DRINKING WATER)

AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

Analyte	Average Concentration (ug/L)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Benzene	nd	---	na	---		---	0.029	---
1,1-Dichloroethane	nd	---	0.1	---		---	na	---
1,2-Dichloroethene (e)	nd	---	0.01	---		---	na	---
Vinyl Chloride	nd	---	na	---		---	1.9	---
Pentachlorophenol	nd	---	0.03	---		---	0.12	---
bis(2-Ethylhexyl)phthalate	nd	---	0.02	---		---	0.014	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N,N-DMF	nd	---	0.1	---		---	na	---
Antimony	17	4.7E-04	0.0004	1.2E+00		2.0E-04	na	---
Arsenic	1.8	4.9E-05	0.0003	1.6E-01		2.1E-05	1.75	3.7E-05
Barium	97	2.7E-03	0.07	---		1.1E-03	na	---
Beryllium	1.7	4.7E-05	0.005	9.3E-03		2.0E-05	4.3	8.6E-05
Cadmium (f)	3.3	9.0E-05	0.0005	1.8E-01		3.9E-05	na	---
Chromium (e)	14	3.8E-04	0.005	7.7E-02		1.6E-04	na	---
Manganese (f)	2500	6.8E-02	0.005	1.4E+01		2.9E-02	na	---
Nickel	33	9.0E-04	0.02	4.5E-02		3.9E-04	na	---
Vanadium	22	6.0E-04	0.007	8.6E-02		2.6E-04	na	---
Zinc	140	3.8E-03	0.3	1.3E-02		1.6E-03	na	---
		Total Hazard Index =		1.5E+01		Total Risk =		1.2E-04
		Hazard Index (liver toxins) =		0.00				
		Hazard Index (nervous system toxins) =		13.70				
		Hazard Index (kidney toxins) =		0.18				
		Hazard Index (red blood cell effects) =		0.01				

NOTES:

(a) This table does not include groundwater chemicals of concern for which no reference dose or slope factor exists. (chloroethane,2-methylnapthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, sulfide and aminonia)

(b) Calculation for exposure dose :

INGESTION EXPOSURE DOSE	= Conc. Conc.	Ingestion Rate 2 L/day	x Exposure Frequency 350 days/yr	x Exposure Duration 30 years	/ Body Weight 70 kg	Averaging Time (g) years	x Conversion Factor 365 days/year x 1E+03 ug/mg

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer Risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-dichloroethene and chromium VI were used.

(f) Reference Dose for cadmium and manganese in water were used.

(g) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 58

POTENTIAL RISK FROM INGESTION OF SITE GROUNDWATER WITHIN THE SEWAGE SLUDGE AREA (AS DRINKING WATER)

MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE (a)

Analyte	Maximum Concentration (ug/L)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Benzene	nd	---	na	---		---	0.029	---
1,1-Dichloroethane	nd	---	0.1	---		---	na	---
1,2-Dichloroethene (e)	nd	---	0.01	---		---	na	---
Vinyl Chloride	nd	---	na	---		---	1.9	---
Pentachlorophenol	nd	---	0.03	---		---	0.12	---
bis(2-Ethylhexyl)phthalate	nd	---	0.02	---		---	0.014	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N,N-DMF	nd	---	0.1	---		---	na	---
Antimony	74.2	2.0E-03	0.0004	5.1E+00		8.7E-04	na	---
Arsenic	5.5	1.5E-04	0.0003	5.0E-01		6.5E-05	1.75	1.1E-04
Barium	284	7.8E-03	0.07	1.1E-01		3.3E-03	na	---
Beryllium	3.4	9.3E-05	0.005	1.9E-02		4.0E-05	4.3	1.7E-04
Cadmium (f)	19.4	5.3E-04	0.0005	1.1E+00		2.3E-04	na	---
Chromium (e)	54.5	1.5E-03	0.005	3.0E-01		6.4E-04	na	---
Manganese (f)	6230	1.7E-01	0.005	3.4E+01		7.3E-02	na	---
Nickel	76.6	2.1E-03	0.02	1.0E-01		9.0E-04	na	---
Vanadium	101	2.8E-03	0.007	4.0E-01		1.2E-03	na	---
Zinc	362	9.9E-03	0.3	3.3E-02		4.3E-03	na	---
		Total Hazard Index =		4.2E+01		Total Risk =		2.8E-04
		Hazard Index (liver toxins) =		0.00				
		Hazard Index (nervous system toxins) =		34.14				
		Hazard Index (kidney toxins) =		1.06				
		Hazard Index (red blood cell effects) =		0.03				

NOTES:

(a) This table does not include groundwater chemicals of concern for which no reference dose or slope factor exists.
(chloroethane,2-methylnapthalene, 4-chloro-3-methylphenol, aluminum, cobalt, copper, lead, sulfide and ammonia)

(b) Calculation for exposure dose :

INGESTION	= Conc.	Ingestion	x Exposure	x Exposure	/	Body	Averaging	x	Conversion
EXPOSURE		Rate	Frequency	Duration		Weight	Time		Factor
DOSE	Conc.	2	350	30		70	(g)		365 x 1E+03
		L/day	days/yr	years		kg	years		days/year ug/mg

(c) Hazard quotient = chronic exposure dose / RfD

(d) Cancer Risk = lifetime exposure dose x slope factor

(e) Dose-response data for cis-1,2-dichloroethene and chromium VI were used.

(f) Reference Dose for cadmium and manganese in water were used.

(g) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 59

POTENTIAL RISK FROM INGESTION OF GROUNDWATER FROM RESIDENTIAL WELLS

AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

Analyte	Average Concentration (ug/L)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)		Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Benzene	0.52	1.4E-05	na	---		6.1E-06	0.029	1.8E-07
Chloroethane	0.53	1.5E-05	na	---		6.2E-06	na	---
Trichloroethene	0.56	1.5E-05	na	---		6.6E-06	0.011	7.2E-08
4-Methylphenol	7.9	2.2E-04	0.005	4.3E-02		9.3E-05	na	---
N,N-DMF	14	3.8E-04	0.1	3.8E-03		1.6E-04	na	---
Dieldrin	0.0024	6.6E-08	0.00005	1.3E-03		2.8E-08	16	4.5E-07
Aluminum	90	2.5E-03	na	---		1.1E-03	na	---
Barium	8.3	2.3E-04	0.07	3.2E-03		9.7E-05	na	---
Copper	14	3.8E-04	na	---		1.6E-04	na	---
Manganese (d)	890	2.4E-02	0.005	4.9E+00		1.0E-02	na	---
Mercury	0.14	3.8E-06	0.0003	1.3E-02		1.6E-06	na	---
Zinc	24	6.6E-04	0.3	2.2E-03		2.8E-04	na	---
Sulfide	1600	4.4E-02	na	---		1.9E-02	na	---
		Total Hazard Index =		4.9E+00		Total Risk =		7.0E-07
		Hazard Index (liver toxins) =		5.2E-03				
		Hazard Index (nervous system toxins) =		4.9E+00				

NOTES:

(a) Calculation for exposure dose :

INGESTION EXPOSURE DOSE	=	Conc. x	Ingestion Rate	x Exposure Frequency	x Exposure Duration	/ Body Weight	Averaging Time	x	Conversion Factor
		Conc.	2	350	30	70	(e)		365 x 1E+03
			L/day	days/yr	years	kg	years		days/year ug/mg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) Reference Dose for manganese in water was used.

(e) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 60
POTENTIAL RISK FROM INGESTION OF GROUNDWATER FROM RESIDENTIAL WELLS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

Analyte	Maximum Concentration (ug/L)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)	Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Benzene	0.8	2.2E-05	na	---	9.4E-06	0.029	2.7E-07
Chloroethane	1	2.7E-05	na	---	1.2E-05	na	---
Trichloroethene	2	5.5E-05	na	---	2.3E-05	0.011	2.6E-07
4-Methylphenol	63	1.7E-03	0.005	3.5E-01	7.4E-04	na	---
N,N-DMF	14	3.8E-04	0.1	3.8E-03	1.6E-04	na	---
Dieldrin	0.0024	6.6E-08	0.00005	1.3E-03	2.8E-08	16	4.5E-07
Aluminum	552	1.5E-02	na	---	6.5E-03	na	---
Barium	44.3	1.2E-03	0.07	1.7E-02	5.2E-04	na	---
Copper	58.6	1.6E-03	na	---	6.9E-04	na	---
Manganese (d)	3100	8.5E-02	0.005	1.7E+01	3.6E-02	na	---
Mercury	0.46	1.3E-05	0.0003	4.2E-02	5.4E-06	na	---
Zinc	165	4.5E-03	0.3	1.5E-02	1.9E-03	na	---
Sulfide	3700	1.0E-01	na	---	4.3E-02	na	---
		Total Hazard Index =		1.7E+01	Total Risk =		9.8E-07
		Hazard Index (liver toxins) =		5.2E-03			
		Hazard Index (nervous system toxins) =		1.7E+01			

NOTES:

(a) Calculation for exposure dose :

INGESTION	=	Conc.	x	Ingestion Rate	x Exposure Frequency	x Exposure Duration	/ Body Weight	Averaging Time	x	Conversion Factor
EXPOSURE DOSE		Conc.		2	350	30	70	(e)	365	x 1E+03
				L/day	days/yr	years	kg	years	days/year	ug/mg

(b) Hazard quotient = chronic exposure dose / RfD

(c) Cancer Risk = lifetime exposure dose x slope factor

(d) Reference Dose for manganese in water was used.

(e) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to absence of data

TABLE 6 - 61
POTENTIAL RISK FROM INGESTION OF SAUGATUCKET RIVER WATER BY SWIMMERS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)		Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Aluminum	200	3.9E-06	na	---		1.7E-06	na	---
Antimony	11	2.2E-07	0.0004	5.4E-04		9.2E-08	na	---
Barium	15	2.9E-07	0.07	4.2E-06		1.3E-07	na	---
Manganese (d)	240	4.7E-06	0.005	9.4E-04		2.0E-06	na	---
Ammonia	210	4.1E-06	na	---		1.8E-06	na	---
Sulfide	790	1.5E-05	na	---		6.6E-06	na	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N N dimethylformamide	nd	---	0.1	---		---	na	---
		Total Hazard Index =		1.5E-03		Total Risk =		---

NOTES:
(a) Calculation for exposure dose :

INGESTION EXPOSURE DOSE	= Conc.	x Ingestion Rate	x Exposure Time	x Exposure Frequency	x Exposure / Duration	Body Weight	x Averaging Time	x Conversion Factor
	Conc.	0.05	1	10	30	70	(e)	365 x 1E+03
		L/hr	hr/day	days/yr	years	kg	years	days/year ug/mg

(b) Hazard quotient = chronic exposere dose / RfD
(c) Cancer Risk = lifetime exposure dose x slope factor
(d) Reference Dose for manganese in water was used.
(e) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 62
POTENTIAL RISK FROM INGESTION OF SAUGATUCKET RIVER WATER BY SWIMMERS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)		Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Aluminum	424	8.3E-06	na	---		3.6E-06	na	---
Antimony	25	4.9E-07	0.0004	1.2E-03		2.1E-07	na	---
Barium	279	5.5E-06	0.07	7.8E-05		2.3E-06	na	---
Manganese (d)	2030	4.0E-05	0.005	7.9E-03		1.7E-05	na	---
Ammonia	670	1.3E-05	na	---		5.6E-06	na	---
Sulfide	1900	3.7E-05	na	---		1.6E-05	na	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N N dimethylformamide	nd	---	0.1	---		---	na	---
		Total Hazard Index =		9.2E-03		Total Risk =		---

NOTES:
(a) Calculation for exposure dose :

INGESTION EXPOSURE DOSE	= Conc. x	Ingestion Rate	x Exposure Time	x Exposure Frequency	x Exposure / Duration	Body Weight	x Averaging Time	x Conversion Factor
	Conc.	0.05	1	10	30	70	(e)	365 x 1E+03
		L/hr	hr/day	days/yr	years	kg	years	days/year ug/mg

(b) Hazard quotient = chronic exposere dose / RfD
(c) Cancer Risk = lifetime exposure dose x slope factor
(d) Reference Dose for manganese in water was used.
(e) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 63
POTENTIAL RISK FROM DERMAL CONTACT WITH SAUGATUCKET RIVER WATER BY SWIMMERS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	200	1.0E-03	1.4E-06	na	---	6.04E-07	na	---
Antimony	11	1.0E-03	7.7E-08	0.0004	1.9E-04	3.32E-08	na	---
Barium	15	1.0E-03	1.1E-07	0.07	1.5E-06	4.53E-08	na	---
Manganese (e)	240	1.0E-03	1.7E-06	0.005	3.4E-04	7.25E-07	na	---
Ammonia	210	1.0E-03	1.5E-06	na	---	6.34E-07	na	---
Sulfide	790	1.0E-03	5.6E-06	na	---	2.39E-06	na	---
Acrylamide	nd	2.4E-04	---	0.0002	---	---	4.5	---
N N dimethylformamid	nd	na	---	0.1	---	---	na	---
			Hazard Index =		5.3E-04	Total Risk =		---

NOTES:
(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) calculation for exposure dose:

DERMAL	=	Conc.	x	Dermal Perm. Const.	x	Skin Surface Area	x	Exposure Time	x	Exposure Frequency	x	Exposure Duration	/	Body Weight	x	Averaging Time	x	Conversion Factor
EXPOSURE DOSE		Conc.		Kp		18,000		1		10		30		70		(f)		365 X 1E+06
				cm/hour		sq. cm		hr/day		days/yr		years		kg		years		days/yr cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD
(d) - cancer risk = lifetime exposure dose x slope factor
(e) - Reference Dose for manganese in water was used.
(f) - Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to the absence of data

TABLE 6 - 64
POTENTIAL RISK FROM DERMAL CONTACT WITH SAUGATUCKET RIVER WATER BY SWIMMERS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	424	1.0E-03	3.0E-06	na	---	1.28E-06	na	---
Antimony	25	1.0E-03	1.8E-07	0.0004	4.4E-04	7.55E-08	na	---
Barium	279	1.0E-03	2.0E-06	0.07	2.8E-05	8.42E-07	na	---
Manganese (e)	2030	1.0E-03	1.4E-05	0.005	2.9E-03	6.13E-06	na	---
Ammonia	670	1.0E-03	4.7E-06	na	---	2.02E-06	na	---
Sulfide	1900	1.0E-03	1.3E-05	na	---	5.74E-06	na	---
Acrylamide	nd	2.4E-04	---	0.0002	---	---	4.5	---
N N dimethylformamid	nd	na	---	0.1	---	---	na	---
			Hazard Index =		3.3E-03	Total Risk =		---

NOTES:
(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) calculation for exposure dose:

DERMAL	=	Conc.	x	Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x Averaging	x Conversion
EXPOSURE				Perm. Const.		Area		Time		Frequency		Duration		Weight	Time	Factor
DOSE		Conc.		Kp		18,000		1		10		30		70	(f)	365 X 1E+06
				cm/hour		sq. cm		hr/day		days/yr		years		kg	years	days/yr cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD
(d) - cancer risk = lifetime exposure dose x slope factor
(e) - Reference Dose for manganese in water was used.
(f) - Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to the absence of data

TABLE 6 - 65
POTENTIAL RISK FROM INGESTION OF SAUGATUCKET RIVER WATER BY SWIMMERS
AVERAGE CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)		Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Aluminum	200	4.7E-06	na	---		4.7E-07	na	---
Antimony	11	2.6E-07	0.0004	6.5E-04		2.6E-08	na	---
Barium	15	3.5E-07	0.07	5.1E-06		3.5E-08	na	---
Manganese (d)	240	5.7E-06	0.005	1.1E-03		5.7E-07	na	---
Ammonia	210	5.0E-06	na	---		5.0E-07	na	---
Sulfide	790	1.9E-05	na	---		1.9E-06	na	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N N dimethylformamide	nd	---	0.1	---		---	na	---
		Total Hazard Index =		1.8E-03		Total Risk =		---

NOTES:
(a) Calculation for exposure dose :

INGESTION =	Conc. x	Ingestion	x	Exposure	x	Exposure	x	Exposure /	Body	x	Averaging	x Conversion
EXPOSURE		Rate		Time		Frequency		Duration	Weight		Time	Factor
DOSE	Conc.	0.05		1		10		7	58		(e)	365 X 1E+03
		L/hr		hr/day		days/yr		years	kg		years	days/year ug/mg

(b) Hazard quotient = chronic exposere dose / RfD
(c) Cancer Risk = lifetime exposure dose x slope factor
(d) Reference Dose for manganese in water was used.
(e) Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 66
POTENTIAL RISK FROM INGESTION OF SAUGATUCKET RIVER WATER BY SWIMMERS
MAXIMUM CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Exposure Dose Chronic (a) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (b)		Exposure Dose Lifetime (a) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (c)
Aluminum	424	1.0E-05	na	---		1.0E-06	na	---
Antimony	25	5.9E-07	0.0004	1.5E-03		5.9E-08	na	---
Barium	279	6.6E-06	0.07	9.4E-05		6.6E-07	na	---
Manganese (d)	2030	4.8E-05	0.005	9.6E-03		4.8E-06	na	---
Ammonia	670	1.6E-05	na	---		1.6E-06	na	---
Sulfide	1900	4.5E-05	na	---		4.5E-06	na	---
Acrylamide	nd	---	0.0002	---		---	4.5	---
N N dimethylformamide	nd	---	0.1	---		---	na	---
		Total Hazard Index =		1.1E-02		Total Risk =		---

NOTES:
(a) Calculation for exposure dose :

INGESTION =	Conc. x	Ingestion	x Exposure	x Exposure	x Exposure /	Body	x	Averaging	x	Conversion
EXPOSURE		Rate	Time	Frequency	Duration	Weight		Time		Factor
DOSE	Conc.	0.05	1	10	7	58		(e)	365	X 1E+03
		L/hr	hr/day	days/yr	years	kg		years	days/year	ug/mg

(b) Hazard quotient = chronic exposere dose / RfD
(c) Cancer Risk = lifetime exposure dose x slope factor
(d) Reference Dose for manganese in water was used.
(e) Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to absence of data

TABLE 6 - 67
POTENTIAL RISK FROM DERMAL CONTACT WITH SAUGATUCKET RIVER WATER BY SWIMMERS
AVERAGE CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	200	1.0E-03	1.5E-06	na	---		1.51E-07	na	---
Antimony	11	1.0E-03	8.3E-08	0.0004	2.1E-04		8.31E-09	na	---
Barium	15	1.0E-03	1.1E-07	0.07	1.6E-06		1.13E-08	na	---
Manganese (e)	240	1.0E-03	1.8E-06	0.005	3.6E-04		1.81E-07	na	---
Ammonia	210	1.0E-03	1.6E-06	na	---		1.59E-07	na	---
Sulfide	790	1.0E-03	6.0E-06	na	---		5.97E-07	na	---
Acrylamide	nd	2.4E-04	---	0.0002	---		---	4.5	---
N N dimethylformamide	nd	na	---	0.1	---		---	na	---
			Hazard Index =		5.7E-04		Total Risk =		---

NOTES:
(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) calculation for exposure dose:

DERMAL =	Conc.	x	Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x	Averaging	x Conversion
EXPOSURE			Perm. Const.		Area		Time		Frequency		Duration		Weight		Time	Factor
DOSE	Conc.		Kp		16,000		1		10		7		58		(f)	365 X 1E+06
			cm/hour		sq. cm		hr/day		days/yr		years		kg		years	days/yr cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD
(d) - cancer risk = lifetime exposure dose x slope factor
(e) - Reference Dose for manganese in water was used.
(f) - Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to the absence of data

TABLE 6 - 68
POTENTIAL RISK FROM DERMAL CONTACT WITH SAUGATUCKET RIVER WATER BY SWIMMERS
MAXIMUM CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	424	1.0E-03	3.2E-06	na	---	3.20E-07	na	---
Antimony	25	1.0E-03	1.9E-07	0.0004	4.7E-04	1.89E-08	na	---
Barium	279	1.0E-03	2.1E-06	0.07	3.0E-05	2.11E-07	na	---
Manganese (e)	2030	1.0E-03	1.5E-05	0.005	3.1E-03	1.53E-06	na	---
Ammonia	670	1.0E-03	5.1E-06	na	---	5.06E-07	na	---
Sulfide	1900	1.0E-03	1.4E-05	na	---	1.44E-06	na	---
Acrylamide	nd	2.4E-04	---	0.0002	---	---	4.5	---
N N dimethylformamide	nd	na	---	0.1	---	---	na	---
			Hazard Index =		3.6E-03	Total Risk =		---

NOTES:
(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) calculation for exposure dose:

DERMAL =	Conc.	x	Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x Averaging	x Conversion
EXPOSURE			Perm. Const.		Area		Time		Frequency		Duration		Weight	Time	Factor
DOSE	Conc.		Kp		16,000		1		10		7		58	(f)	365 X 1E+06
			cm/hour		sq. cm		hr/day		days/yr		years		kg	years	days/yr cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD
(d) - cancer risk = lifetime exposure dose x slope factor
(e) - Reference Dose for manganese in water was used.
(f) - Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to the absence of data

TABLE 6 - 69
POTENTIAL RISK FROM DERMAL CONTACT WITH MITCHELL BROOK WATER
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	400	1.0E-03	7.3E-07	na	---	3.14E-07	na	---
Antimony	12	1.0E-03	2.2E-08	0.0004	5.5E-05	9.42E-09	na	---
Barium	17	1.0E-03	3.1E-08	0.07	4.4E-07	1.33E-08	na	---
Manganese (e)	280	1.0E-03	5.1E-07	0.005	1.0E-04	2.20E-07	na	---
Ammonia	670	1.0E-03	1.2E-06	na	---	5.26E-07	na	---
Sulfide	760	1.0E-03	1.4E-06	na	---	5.97E-07	na	---
Acrylamide	130	2.4E-04	5.7E-08	0.0002	2.9E-04	2.45E-08	4.5	1.1E-07
N N dimethylformamid	nd	na	---	0.1	---	---	na	---
			Hazard Index =		4.4E-04	Total Risk =		1.1E-07

NOTES:
(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) calculation for exposure dose:

DERMAL	=	Conc.	x	Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x Averaging	x Conversion
EXPOSURE				Perm. Const.		Area		Time		Frequency		Duration		Weight	Time	Factor
DOSE		Conc.		Kp		1,800		1		26		30		70	(f)	365 X 1E+06
				cm/hour		sq. cm		hr/day		days/yr		years		kg	years	days/yr cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD
(d) - cancer risk = lifetime exposure dose x slope factor
(e) - Reference Dose for manganese in water was used.
(f) - Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to the absence of data

TABLE 6 - 70
POTENTIAL RISK FROM DERMAL CONTACT WITH MITCHELL BROOK WATER
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	1140	1.0E-03	2.1E-06	na	---	8.95E-07	na	---
Antimony	28.8	1.0E-03	5.3E-08	0.0004	1.3E-04	2.26E-08	na	---
Barium	173	1.0E-03	3.2E-07	0.07	4.5E-06	1.36E-07	na	---
Manganese (e)	1610	1.0E-03	2.9E-06	0.005	5.9E-04	1.26E-06	na	---
Ammonia	3530	1.0E-03	6.5E-06	na	---	2.77E-06	na	---
Sulfide	1900	1.0E-03	3.5E-06	na	---	1.49E-06	na	---
Acrylamide	272	2.4E-04	1.2E-07	0.0002	6.0E-04	5.12E-08	4.5	2.3E-07
N N dimethylformamid	nd	na	---	0.1	---	---	na	---
			Hazard Index =		1.3E-03	Total Risk =		2.3E-07

NOTES:

(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B

(b) calculation for exposure dose:

DERMAL	=	Conc.	x	Dermal Perm. Const.	x	Skin Surface Area	x	Exposure Time	x	Exposure Frequency	x	Exposure Duration	/	Body Weight	x	Averaging Time	x	Conversion Factor
EXPOSURE DOSE		Conc.		Kp		1,800		1		26		30		70		(f)		365 X 1E+06
				cm/hour		sq. cm		hr/day		days/yr		years		kg		years		days/yr cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD

(d) - cancer risk = lifetime exposure dose x slope factor

(e) - Reference Dose for manganese in water was used.

(f) - Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to the absence of data

TABLE 6 - 71
POTENTIAL RISK FROM DERMAL CONTACT WITH MITCHELL BROOK WATER
AVERAGE CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Average Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	400	1.0E-03	8.8E-07	na	---		8.84E-08	na	---
Antimony	12	1.0E-03	2.7E-08	0.0004	6.6E-05		2.65E-09	na	---
Barium	17	1.0E-03	3.8E-08	0.07	5.4E-07		3.76E-09	na	---
Manganese (e)	280	1.0E-03	6.2E-07	0.005	1.2E-04		6.19E-08	na	---
Ammonia	670	1.0E-03	1.5E-06	na	---		1.48E-07	na	---
Sulfide	760	1.0E-03	1.7E-06	na	---		1.68E-07	na	---
Acrylamide	130	2.4E-04	6.9E-08	0.0002	3.4E-04		6.90E-09	4.5	3.1E-08
N N dimethylformamide	nd	na	0.0E+00	0.1	---		---	na	---
			Hazard Index =		5.4E-04		Total Risk =		3.1E-08

NOTES:
(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B
(b) calculation for exposure dose:

DERMAL	=	Conc.	x	Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x	Averaging	x	Conversion
EXPOSURE				Perm. Const.		Area		Time		Frequency		Duration		Weight		Time		Factor
DOSE		Conc.		Kp		1,800		1		26		7		58		(f)	365 X	1E+06
				cm/hour		sq. cm		hr/day		days/yr		years		kg		years	days/yr	cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD
(d) - cancer risk = lifetime exposure dose x slope factor
(e) - Reference Dose for manganese in water was used.
(f) - Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected
na = toxicity value not available
--- = not calculated due to the absence of data

TABLE 6 - 72
POTENTIAL RISK FROM DERMAL CONTACT WITH MITCHELL BROOK WATER
MAXIMUM CONCENTRATIONS USED FOR AN ADOLESCENT EXPOSURE

ANALYTE	Maximum Concentration (ug/L)	Dermal Permeability Constant (a)	Exposure Dose Chronic (b) (mg/kg/day)	Oral Reference Dose (RfD) (mg/kg/day)	Hazard Quotient (c)	Exposure Dose Lifetime (b) (mg/kg/day)	Oral Slope Factor /(mg/kg/day)	Cancer Risk (d)
Aluminum	1140	1.0E-03	2.5E-06	na	---	2.52E-07	na	---
Antimony	28.8	1.0E-03	6.4E-08	0.0004	1.6E-04	6.37E-09	na	---
Barium	173	1.0E-03	3.8E-07	0.07	5.5E-06	3.82E-08	na	---
Manganese (e)	1610	1.0E-03	3.6E-06	0.005	7.1E-04	3.56E-07	na	---
Ammonia	3530	1.0E-03	7.8E-06	na	---	7.80E-07	na	---
Sulfide	1900	1.0E-03	4.2E-06	na	---	4.20E-07	na	---
Acrylamide	272	2.4E-04	1.4E-07	0.0002	7.2E-04	1.44E-08	4.5	6.5E-08
N N dimethylformamide	nd	na	---	0.1	---	---	na	---
			Hazard Index =		1.6E-03	Total Risk =		6.5E-08

NOTES:

(a) - Source: EPA, 1992, "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B

(b) calculation for exposure dose:

DERMAL	=	Conc.	x	Dermal	x	Skin Surface	x	Exposure	x	Exposure	x	Exposure	/	Body	x	Averaging	x	Conversion
EXPOSURE				Perm. Const.		Area		Time		Frequency		Duration		Weight		Time		Factor
DOSE		Conc.		Kp		1,800		1		26		7		58		(f)	365	X 1E+06
				cm/hour		sq. cm		hr/day		days/yr		years		kg		years	days/yr	cu.cm-ug/L-mg

(c) - Hazard quotient = chronic exposure dose / RfD

(d) - cancer risk = lifetime exposure dose x slope factor

(e) - Reference Dose for manganese in water was used.

(f) - Averaging times of 7 years for chronic doses and 70 years for lifetime doses were used

nd = chemical not detected

na = toxicity value not available

--- = not calculated due to the absence of data

TABLE 6-73
POTENTIAL RISK FROM INHALATION OF OUTDOOR AIR BY ADULTS IN THE SOLID WASTE AREA
AVERAGE CONCENTRATIONS USED BASED ON SOIL GAS CONTAMINATION COLLECTED BY SUMMA CANISTERS

ANALYTE	Avg. Soil Gas Conc. (mg/m^3)	Estimated Emission Rate (mg/sec)(a)	Modeled Air Concentration (mg/m^3)(b)	Annualized Avg. Conc. (mg/m^3)(c)	RfC (mg/m^3)(d)	Inhalation Unit Risk /(ug/m^3)(e)	Hazard Quotient (f)	Cancer Risk (g)
Acetone	0	0	0	0	na	na	na	---
Benzene	8.0	0.68	1.4E-03	9.4E-05	na	8.3E-06	na	3.4E-07
Carbon Disulfide	0.87	0.07	1.5E-04	1.0E-05	0.01	nd	1.0E-03	---
1,1-Dichloroethane	61	5.19	1.1E-02	7.2E-04	0.5	nd	1.4E-03	---
1,1-Dichloroethene	17	1.45	2.9E-03	2.0E-04	na	5.0E-05	na	4.3E-06
cis-1,2-Dichloroethene	9800	833.33	1.7E+00	1.2E-01	na	na	na	---
trans-1,2-Dichloroethene	11	0.94	1.9E-03	1.3E-04	na	nd	na	---
Dichlorodifluoromethane	51	4.34	8.8E-03	6.0E-04	0.2	nd	3.0E-03	---
Ethylbenzene	25	2.13	4.3E-03	3.0E-04	1	na	3.0E-04	---
4-Methyl-2-pentanone	6.5	0.55	1.1E-03	7.7E-05	0.08	nd	9.6E-04	---
Methylene Chloride	26	2.21	4.5E-03	3.1E-04	3	4.7E-07	1.0E-04	6.2E-08
Toluene	100	8.50	1.7E-02	1.2E-03	0.4	na	3.0E-03	---
1,2,4-Trichlorobenzene	0	0	0	0	0.009	na	---	---
1,2,4-Trimethylbenzene	2	0.17	3.4E-04	2.4E-05	na	na	na	---
1,3,5-Trimethylbenzene	4.3	0.37	7.4E-04	5.1E-05	na	na	na	---
Trichloroethene	31	2.64	5.3E-03	3.7E-04	na	1.7E-06	na	2.7E-07
Vinyl Chloride	1400	119.05	2.4E-01	1.7E-02	na	8.4E-05	na	6.0E-04
m,p-Xylene	41	3.49	7.1E-03	4.8E-04	0.3	nd	1.6E-03	---
					Total Hazard Index =		1.1E-02	
						Total Cancer Risk =		6.0E-04

NOTES:

(a) Soil gas concentration x gas generation rate (180 cfm, or 0.085 m^3/sec, calculated in Appendix E)

(b) Emission rate x Disposal area length in prevailing wind direction (NW)/ Surface area x Breathing zone height x Windspeed.
[(Emission rate x 450 m) / (110950 m^2 x 2 m x 1 m/sec)]

(c) Annualized Air Concentration = Modeled Air Concentration (mg/m^3) x 4 hrs/24 hrs x 150 days / 365 days

(d) Reference concentration from Table 6-2

(e) Unit risk from Table 6-2

(f) Hazard quotient = Annualized Air Concentration / RfC

(g) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs

na - not available

nd - not determined

-- - not calculated due to absence of data

TABLE 6-74
POTENTIAL RISK FROM INHALATION OF OUTDOOR AIR BY ADULTS IN THE SOLID WASTE AREA
MAXIMUM CONCENTRATIONS USED BASED ON SOIL GAS CONTAMINATION COLLECTED BY SUMMA CANISTERS

ANALYTE	Max. Soil Gas Conc. (mg/m^3)	Estimated Emission Rate (mg/sec)(a)	Modeled Air Concentration (mg/m^3)(b)	Annualized Avg. Conc. (mg/m^3)(c)	RfC (mg/m^3)(d)	Inhalation Unit Risk /(ug/m^3)(e)	Hazard Quotient (f)	Cancer Risk (g)
Acetone	0	0	0	0	na	na	na	---
Benzene	8.0	0.68	1.4E-03	9.4E-05	na	8.3E-06	na	3.4E-07
Carbon Disulfide	0.87	0.07	1.5E-04	1.0E-05	0.01	nd	1.0E-03	---
1,1-Dichloroethane	140	11.90	2.4E-02	1.7E-03	0.5	nd	3.3E-03	---
1,1-Dichloroethene	32	2.72	5.5E-03	3.8E-04	na	5.0E-05	na	8.1E-06
cis-1,2-Dichloroethene	23000	1955.78	4.0E+00	2.7E-01	na	na	na	---
trans-1,2-Dichloroethene	27	2.30	4.7E-03	3.2E-04	na	nd	na	---
Dichlorodifluoromethane	100	8.50	1.7E-02	1.2E-03	0.2	nd	5.9E-03	---
Ethylbenzene	25	2.13	4.3E-03	3.0E-04	1	na	3.0E-04	---
4-Methyl-2-pentanone	6.5	0.55	1.1E-03	7.7E-05	0.08	nd	9.6E-04	---
Methylene Chloride	66	5.61	1.1E-02	7.8E-04	3	4.7E-07	2.6E-04	1.6E-07
Toluene	230	19.56	4.0E-02	2.7E-03	0.4	na	6.8E-03	---
1,2,4-Trichlorobenzene	0	0	0	0	0.009	na	---	---
1,2,4-Trimethylbenzene	2	0.17	3.4E-04	2.4E-05	na	na	na	---
1,3,5-Trimethylbenzene	4.3	0.37	7.4E-04	5.1E-05	na	na	na	---
Trichloroethene	31	2.64	5.3E-03	3.7E-04	na	1.7E-06	na	2.7E-07
Vinyl Chloride	3100	263.61	5.3E-01	3.7E-02	na	8.4E-05	na	1.3E-03
m,p-Xylene	41	3.49	7.1E-03	4.8E-04	0.3	nd	1.6E-03	---
					Total Hazard Index =		2.0E-02	
						Total Cancer Risk =		1.3E-03

NOTES:

(a) Soil gas concentration x gas generation rate (180 cfm, or 0.085 m^3/sec, calculated in Appendix E)

(b) Emission rate x Disposal area length in prevailing wind direction (NW)/ Surface area x Breathing zone height x Windspeed.
[(Emission rate x 450 m) / (110950 m^2 x 2 m x 1 m/sec)]

(c) Annualized Air Concentration = Modeled Air Concentration (mg/m^3) x 4 hrs/24 hrs x 150 days / 365 days

(d) Reference concentration from Table 6-2

(e) Unit risk from Table 6-2

(f) Hazard quotient = Annualized Air Concentration / RfC

(g) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs

na - not available

nd - not determined

-- - not calculated due to absence of data

TABLE 6-75
POTENTIAL RISK FROM INHALATION OF OUTDOOR AIR BY ADULTS IN THE BULKY WASTE AREA
AVERAGE CONCENTRATIONS USED BASED ON SOIL GAS CONTAMINATION COLLECTED BY SUMMA CANISTERS

ANALYTE	Avg. Soil Gas Conc. (mg/m^3)	Estimated Emission Rate (mg/sec)(a)	Modeled Air Concentration (mg/m^3)(b)	Annualized Avg. Conc. (mg/m^3)(c)	RfC (mg/m^3)(d)	Inhalation Unit Risk /(ug/m^3)(e)	Hazard Quotient (f)	Cancer Risk (g)
Acetone	1	0.016	3.8E-05	2.6E-06	na	na	na	---
Benzene	1.6	0.025	6.2E-05	4.2E-06	na	8.3E-06	na	1.5E-08
Carbon Disulfide	0	0	0	0	0.01	nd	---	---
1,1-Dichloroethane	4.5	0.070	1.7E-04	1.2E-05	0.5	nd	2.4E-05	---
1,1-Dichloroethene	0.2	0.003	7.7E-06	5.3E-07	na	5.0E-05	na	1.1E-08
cis-1,2-Dichloroethene	11	0.171	4.2E-04	2.9E-05	na	na	na	---
trans-1,2-Dichloroethene	0.21	0.003	8.1E-06	5.5E-07	na	nd	na	---
Dichlorodifluoromethane	14	0.218	5.4E-04	3.7E-05	0.2	nd	1.8E-04	---
Ethylbenzene	8.8	0.137	3.4E-04	2.3E-05	1	na	2.3E-05	---
4-Methyl-2-pentanone	0	0	0	0	0.08	nd	---	---
Methylene Chloride	1.7	0.027	6.5E-05	4.5E-06	3	4.7E-07	1.5E-06	9.0E-10
Toluene	28	0.437	1.1E-03	7.4E-05	0.4	na	1.8E-04	---
1,2,4-Trichlorobenzene	0.27	0.004	1.0E-05	7.1E-07	0.009	na	7.9E-05	---
1,2,4-Trimethylbenzene	1.5	0.023	5.8E-05	4.0E-06	na	na	na	---
1,3,5-Trimethylbenzene	0.9	0.014	3.5E-05	2.4E-06	na	na	na	---
Trichloroethene	3.5	0.055	1.3E-04	9.2E-06	na	1.7E-06	na	6.7E-09
Vinyl Chloride	7.6	0.118	2.9E-04	2.0E-05	na	8.4E-05	na	7.2E-07
m,p-Xylene	14	0.218	5.4E-04	3.7E-05	0.3	nd	1.2E-04	---
					Total Hazard Index =		6.2E-04	
						Total Cancer Risk =		7.5E-07

NOTES:

(a) Soil gas concentration x gas generation rate (33 cfm, or 0.016 m^3/sec, calculated in Appendix E)

(b) Emission rate x Disposal area length in prevailing wind direction (NW)/ Surface area x Breathing zone height x Windspeed.
[(Emission rate x 190 m) / (38511 m^2 x 2 m x 1 m/sec)]

(c) Annualized Air Concentration = Modeled Air Concentration (mg/m^3) x 4 hrs/24 hrs x 150 days / 365 days

(d) Reference concentration from Table 6-2

(e) Unit risk from Table 6-2

(f) Hazard quotient = Annualized Air Concentration / RfC

(g) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs

na - not available

nd - not determined

-- - not calculated due to absence of data

TABLE 6-76
POTENTIAL RISK FROM INHALATION OF OUTDOOR AIR BY ADULTS IN THE BULKY WASTE AREA
MAXIMUM CONCENTRATIONS USED BASED ON SOIL GAS CONTAMINATION COLLECTED BY SUMMA CANISTERS

ANALYTE	Max. Soil Gas Conc. (mg/m^3)	Estimated Emission Rate (mg/sec)(a)	Modeled Air Concentration (mg/m^3)(b)	Annualized Avg. Conc. (mg/m^3)(c)	RfC (mg/m^3)(d)	Inhalation Unit Risk /(ug/m^3)(e)	Hazard Quotient (f)	Cancer Risk (g)
Acetone	1.3	0.020	5.0E-05	3.4E-06	na	na	na	---
Benzene	2.9	0.045	1.1E-04	7.6E-06	na	8.3E-06	na	2.7E-08
Carbon Disulfide	0	0	0	0	0.01	nd	---	---
1,1-Dichloroethane	6.9	0.108	2.7E-04	1.8E-05	0.5	nd	3.6E-05	---
1,1-Dichloroethene	0.31	0.005	1.2E-05	8.2E-07	na	5.0E-05	na	1.7E-08
cis-1,2-Dichloroethene	17	0.265	6.5E-04	4.5E-05	na	na	na	---
trans-1,2-Dichloroethene	0.3	0.005	1.2E-05	7.9E-07	na	nd	na	---
Dichlorodifluoromethane	26	0.405	1.0E-03	6.8E-05	0.2	nd	3.4E-04	---
Ethylbenzene	12	0.187	4.6E-04	3.2E-05	1	na	3.2E-05	---
4-Methyl-2-pentanone	0	0	0	0	0.08	nd	---	---
Methylene Chloride	2.4	0.037	9.2E-05	6.3E-06	3	4.7E-07	2.1E-06	1.3E-09
Toluene	34	0.530	1.3E-03	9.0E-05	0.4	na	2.2E-04	---
1,2,4-Trichlorobenzene	0.27	0.004	1.0E-05	7.1E-07	0.009	na	7.9E-05	---
1,2,4-Trimethylbenzene	2.3	0.036	8.8E-05	6.1E-06	na	na	na	---
1,3,5-Trimethylbenzene	1.5	0.023	5.8E-05	4.0E-06	na	na	na	---
Trichloroethene	3.8	0.059	1.5E-04	1.0E-05	na	1.7E-06	na	7.3E-09
Vinyl Chloride	14	0.218	5.4E-04	3.7E-05	na	8.4E-05	na	1.3E-06
m,p-Xylene	24	0.374	9.2E-04	6.3E-05	0.3	nd	2.1E-04	---
					Total Hazard Index =		9.3E-04	
						Total Cancer Risk =		1.4E-06

NOTES:

(a) Soil gas concentration x gas generation rate (33 cfm, or 0.016 m^3/sec, calculated in Appendix E)

(b) Emission rate x Disposal area length in prevailing wind direction (NW)/ Surface area x Breathing zone height x Windspeed.
[(Emission rate x 190 m) / (38511 m^2 x 2 m x 1 m/sec)]

(c) Annualized Air Concentration = Modeled Air Concentration (mg/m^3) x 4 hrs/24 hrs x 150 days / 365 days

(d) Reference concentration from Table 6-2

(e) Unit risk from Table 6-2

(f) Hazard quotient = Annualized Air Concentration / RfC

(g) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs

na - not available

nd - not determined

-- - not calculated due to absence of data

TABLE 6-77
POTENTIAL RISK FROM INHALATION OF OUTDOOR AIR BY ADULTS IN THE SEWAGE SLUDGE AREA
AVERAGE CONCENTRATIONS USED BASED ON SOIL GAS CONTAMINATION COLLECTED BY SUMMA CANISTERS

ANALYTE	Avg. Soil Gas Conc. (mg/m^3)	Estimated Emission Rate (mg/sec)(a)	Modeled Air Concentration (mg/m^3)(b)	Annualized Avg. Conc. (mg/m^3)(c)	RfC (mg/m^3)(d)	Inhalation Unit Risk /(ug/m^3)(e)	Hazard Quotient (f)	Cancer Risk (g)
Acetone	0.081	0.04543	7.5E-05	5.2E-06	na	na	na	---
Benzene	0	0	0	0	na	8.3E-06	na	---
Carbon Disulfide	0	0	0	0	0.01	nd	---	---
1,1-Dichloroethane	0	0	0	0	0.5	nd	---	---
1,1-Dichloroethene	0	0	0	0	na	5.0E-05	na	---
cis-1,2-Dichloroethene	0	0	0	0	na	na	na	---
trans-1,2-Dichloroethene	0	0	0	0	na	nd	na	---
Dichlorodifluoromethane	0	0	0	0	0.2	nd	---	---
Ethylbenzene	0.01	0.00514	8.5E-06	5.8E-07	1	na	5.8E-07	---
4-Methyl-2-pentanone	0	0	0	0	0.08	nd	---	---
Methylene Chloride	0.002	0.00114	1.9E-06	1.3E-07	3	4.7E-07	4.3E-08	2.6E-11
Toluene	0	0	0	0	0.4	na	---	---
1,2,4-Trichlorobenzene	0	0	0	0	0.009	na	---	---
1,2,4-Trimethylbenzene	0.005	0.00269	4.5E-06	3.1E-07	na	na	na	---
1,3,5-Trimethylbenzene	0.003	0.00161	2.7E-06	1.8E-07	na	na	na	---
Trichloroethene	0	0	0	0	na	1.7E-06	na	---
Vinyl Chloride	0	0	0	0	na	8.4E-05	na	---
m,p-Xylene	0.02	0.01041	1.7E-05	1.2E-06	0.3	nd	3.9E-06	---
					Total Hazard Index =		4.6E-06	
						Total Cancer Risk =		2.6E-11

NOTES:
(a) See Appendix E
(b) Emission rate x Disposal area length in prevailing wind direction (NW)/ Surface area x Breathing zone height x Windspeed.
[(Emission rate x 120 m) / (36118 m^2 x 2 m x 1 m/sec)]
(c) Annualized Air Concentration = Modeled Air Concentration (mg/m^3) x 4 hrs/24 hrs x 150 days / 365 days
(d) Reference concentration from Table 6-2
(e) Unit risk from Table 6-2
(f) Hazard quotient = Annualized Air Concentration / RfC
(g) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs
na - not available
nd - not determined
-- - not calculated due to absence of data

TABLE 6-78
POTENTIAL RISK FROM INHALATION OF OUTDOOR AIR BY ADULTS IN THE SEWAGE SLUDGE AREA
MAXIMUM CONCENTRATIONS USED BASED ON SOIL GAS CONTAMINATION COLLECTED BY SUMMA CANISTERS

ANALYTE	Max. Soil Gas Conc. (mg/m^3)	Estimated Emission Rate (mg/sec)(a)	Modeled Air Concentration (mg/m^3)(b)	Annualized Avg. Conc. (mg/m^3)(c)	RfC (mg/m^3)(d)	Inhalation Unit Risk /(ug/m^3)(e)	Hazard Quotient (f)	Cancer Risk (g)
Acetone	0.081	0.0453	7.5E-05	5.2E-06	na	na	na	---
Benzene	0	0	0	0	na	8.3E-06	na	---
Carbon Disulfide	0	0	0	0	0.01	nd	---	---
1,1-Dichloroethane	0	0	0	0	0.5	nd	---	---
1,1-Dichloroethene	0	0	0	0	na	5.0E-05	na	---
cis-1,2-Dichloroethene	0	0	0	0	na	na	na	---
trans-1,2-Dichloroethene	0	0	0	0	na	nd	na	---
Dichlorodifluoromethane	0	0	0	0	0.2	nd	---	---
Ethylbenzene	0.01	0.005	8.3E-06	5.7E-07	1	na	5.7E-07	---
4-Methyl-2-pentanone	0	0	0	0	0.08	nd	---	---
Methylene Chloride	0.002	0.01	1.7E-05	1.1E-06	3	4.7E-07	3.8E-07	2.3E-10
Toluene	0	0	0	0	0.4	na	---	---
1,2,4-Trichlorobenzene	0	0	0	0	0.009	na	---	---
1,2,4-Trimethylbenzene	0.005	0.0026	4.3E-06	3.0E-07	na	na	na	---
1,3,5-Trimethylbenzene	0.003	0.0015	2.5E-06	1.7E-07	na	na	na	---
Trichloroethene	0	0	0	0	na	1.7E-06	na	---
Vinyl Chloride	0	0	0	0	na	8.4E-05	na	---
m,p-Xylene	0.02	0.0103	1.7E-05	1.2E-06	0.3	nd	3.9E-06	---
					Total Hazard Index =		4.9E-06	
						Total Cancer Risk =		2.3E-10

NOTES:
(a) See Appendix E
(b) Emission rate x Disposal area length in prevailing wind direction (NW)/ Surface area x Breathing zone height x Windspeed.
[(Emission rate x 120 m) / (36118 m^2 x 2 m x 1 m/sec)]
(c) Annualized Air Concentration = Modeled Air Concentration (mg/m^3) x 4 hrs/24 hrs x 150 days / 365 days
(d) Reference concentration from Table 6-2
(e) Unit risk from Table 6-2
(f) Hazard quotient = Annualized Air Concentration / RfC
(g) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs
na - not available
nd - not determined
-- - not calculated due to absence of data

TABLE 6-79
POTENTIAL RISK FROM INHALATION OF AMBIENT AIR BY NEARBY RESIDENTS
AVERAGE CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Ambient Air Concentration (mg/m^3)	Annualized Avg. Conc. (mg/m^3)(a)	RfC (mg/m^3)(b)	Inhalation Unit Risk /(ug/m^3)(c)	Hazard Quotient (d)	Cancer Risk (e)
Benzene	2.4E-02	2.3E-02	na	8.3E-06	na	8.2E-05
Ethylbenzene	2.0E-03	1.9E-03	1	na	1.9E-03	na
Methylene Chloride	1.0E-03	9.6E-04	3	4.7E-07	3.2E-04	1.9E-07
1,1,2,2-Tetrachloroethane	4.0E-03	3.8E-03	na	5.8E-05	na	9.5E-05
Toluene	1.0E-03	9.6E-04	0.4	na	2.4E-03	na
1,1,1-Trichloroethane	2.0E-03	1.9E-03	1	na	1.9E-03	na
Vinyl Chloride	1.0E-03	9.6E-04	na	8.4E-05	na	3.5E-05
m,p-Xylene	4.0E-03	3.8E-03	0.3	na	1.3E-02	na
o-Xylene	5.0E-03	4.8E-03	0.7	na	6.8E-03	na
			Total Hazard Index =		2.6E-02	
				Total Cancer Risk =		2.1E-04

NOTES:
(a) Annualized Air Concentration = Ambient Air Concentration (mg/m^3) x 350 days / 365 days
(b) Reference concentration from Table 6-2
(c) Unit risk from Table 6-2
(d) Hazard quotient = Annualized Air Concentration / RfC
(e) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs
na - not available
nd - not determined

TABLE 6-80
POTENTIAL RISK FROM INHALATION OF AMBIENT AIR BY NEARBY RESIDENTS
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Ambient Air Concentration (mg/m^3)	Annualized Avg. Conc. (mg/m^3)(a)	RfC (mg/m^3)(b)	Inhalation Unit Risk /(ug/m^3)(c)	Hazard Quotient (d)	Cancer Risk (e)
Benzene	7.5E-01	7.2E-01	na	8.3E-06	na	2.6E-03
Ethylbenzene	2.0E-03	1.9E-03	1	na	1.9E-03	na
Methylene Chloride	1.0E-03	9.6E-04	3	4.7E-07	3.2E-04	1.9E-07
1,1,2,2-Tetrachloroethane	4.0E-03	3.8E-03	na	5.8E-05	na	9.5E-05
Toluene	2.0E-03	1.9E-03	0.4	na	4.8E-03	na
1,1,1-Trichloroethane	2.0E-03	1.9E-03	1	na	1.9E-03	na
Vinyl Chloride	4.0E-03	3.8E-03	na	8.4E-05	na	1.4E-04
m,p-Xylene	7.0E-03	6.7E-03	0.3	na	2.2E-02	na
o-Xylene	7.0E-03	6.7E-03	0.7	na	9.6E-03	na
			Total Hazard Index =		4.1E-02	
				Total Cancer Risk =		2.8E-03

NOTES:

(a) Annualized Air Concentration = Ambient Air Concentration (mg/m^3) x 350 days / 365 days

(b) Reference concentration from Table 6-2

(c) Unit risk from Table 6-2

(d) Hazard quotient = Annualized Air Concentration / RfC

(e) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs

na - not available

nd - not determined

TABLE 6-81
POTENTIAL FUTURE RISK FROM INHALATION OF INDOOR AIR BY NEARBY RESIDENTS
AVERAGE CONCENTRATION OF VINYL CHLORIDE USED FOR AN ADULT EXPOSURE

ANALYTE	Indoor Air Concentration (mg/m^3)	Annualized Avg. Conc. (mg/m^3)(a)	RfC (mg/m^3)(b)	Inhalation Unit Risk /(ug/m^3)(c)	Hazard Quotient (d)	Cancer Risk (e)
Vinyl Chloride	2.3E-02	2.2E-02	na	8.4E-05	na	7.9E-04
			Total Hazard Index =		na	
				Total Cancer Risk =		7.9E-04

NOTES:
(a) Annualized Air Concentration = Indoor Air Concentration (mg/m^3) x 350 days / 365 days
(b) Reference concentration from Table 6-2
(c) Unit risk from Table 6-2
(d) Hazard quotient = Annualized Air Concentration / RfC
(e) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs
na - not available
nd - not determined

TABLE 6-82
POTENTIAL FUTURE RISK FROM INHALATION OF INDOOR AIR BY NEARBY RESIDENTS
MAXIMUM CONCENTRATION OF VINYL CHLORIDE USED FOR AN ADULT EXPOSURE

ANALYTE	Indoor Air Concentration (mg/m^3)	Annualized Avg. Conc. (mg/m^3)(a)	RfC (mg/m^3)(b)	Inhalation Unit Risk /(ug/m^3)(c)	Hazard Quotient (d)	Cancer Risk (e)
Vinyl Chloride	5.6E-02	5.4E-02	na	8.4E-05	na	1.9E-03
			Total Hazard Index =		na	
				Total Cancer Risk =		1.9E-03

NOTES:

(a) Annualized Air Concentration = Indoor Air Concentration (mg/m^3) x 350 days / 365 days

(b) Reference concentration from Table 6-2

(c) Unit risk from Table 6-2

(d) Hazard quotient = Annualized Air Concentration / RfC

(e) Cancer Risk = Annualized Air Concentration (mg/m^3) x Unit Risk (ug/m^3) x 1000 ug/mg x 30 yrs / 70 yrs

na - not available

nd - not determined

TABLE 6-83. SUMMARY OF CANCER RISK ESTIMATES

Exposure Point	Target	Route	Average	Maximum	Table Reference
Solid Waste Area Surface Soil	Adult	Ingestion	1.5E-06	2.9E-06	6-21, 6-22
		Dermal	1.8E-07	4.0E-07	6-33, 6-34
		Total Adult	1.7E-06	3.3E-06	*
	Child	Ingestion	3.6E-06	6.8E-06	6-27, 6-28
		Dermal	2.1E-07	4.6E-07	6-39, 6-40
		Total Child	3.8E-06	7.3E-06	*
		Total Lifetime	5.5E-06	1.1E-05	*, **
Bulky Waste Area Surface Soil	Adult	Ingestion	1.1E-06	1.4E-06	6-23, 6-24
		Dermal	4.1E-08	4.1E-08	6-35, 6-36
		Total Adult	1.1E-06	1.4E-06	*
	Child	Ingestion	2.5E-06	3.2E-06	6-29, 6-30
		Dermal	4.8E-08	4.8E-08	6-41, 6-42
		Total Child	2.5E-06	3.2E-06	*
		Total Lifetime	3.7E-06	4.7E-06	*, **
Sewage Sludge Area Surface Soil	Adult	Ingestion	5.8E-07	6.5E-07	6-25, 6-26
		Dermal	--	--	6-37, 6-38
		Total Adult	5.8E-07	6.5E-07	*
	Child	Ingestion	1.4E-06	1.5E-06	6-31, 6-32
		Dermal	--	--	6-43, 6-44
		Total Child	1.4E-06	1.5E-06	*
		Total Lifetime	2.0E-06	2.2E-06	*, **
Solid Waste Area Leachate	Adult	Dermal	1.7E-07	1.7E-07	6-45, 6-46
	Adolescent	Dermal	4.8E-08	4.8E-08	6-49, 6-50
Bulky Waste Area Leachate	Adult	Dermal	3.0E-08	1.2E-07	6-47, 6-48
	Adolescent	Dermal	8.4E-09	3.3E-08	6-51, 6-52
Solid Waste Area Groundwater	Adult	Ingestion	9.4E-03	2.8E-02	6-53, 6-54
Bulky Waste Area Groundwater	Adult	Ingestion	1.2E-04	5.8E-04	6-55, 6-56

TABLE 6-83. SUMMARY OF CANCER RISK ESTIMATES

Exposure Point	Target	Route	Average	Maximum	Table Reference
Sewage Sludge Area Groundwater	Adult	Ingestion	1.2E-04	2.8E-04	6-57, 6-58
Residential Wells Groundwater	Adult	Ingestion	7.0E-07	9.8E-07	6-59, 6-60
Saugatucket River Water	Adult	Ingestion	--	--	6-61, 6-62
		Dermal	--	--	6-63, 6-64
	Adolescent	Ingestion	--	--	6-65, 6-66
		Dermal	--	--	6-67, 6-68
Mitchell Brook Water	Adult	Dermal	1.1E-07	2.3E-07	6-69, 6-70
	Adolescent	Dermal	3.1E-08	6.5E-08	6-71, 6-72
Solid Waste Soil Gas	Visitor	Inhalation	6.0E-04	1.3E-03	6-73, 6-74
Bulky Waste Soil Gas	Visitor	Inhalation	7.5E-07	1.4E-06	6-75, 6-76
Sewage Sludge Soil Gas	Visitor	Inhalation	2.6E-11	2.3E-10	6-77, 6-78
Residential Ambient/Indoor Air	Resident	Inhalation	2.1E-04	2.8E-03	6-79, 6-80
Future Residential Indoor Air	Resident	Inhalation	7.9E-04	1.9E-03	6-81, 6-82

NOTES

-- No carcinogens detected or no carcinogens significantly absorbed.

* Ingestion plus dermal risks

** Adult plus child risks

TABLE 6-84. SUMMARY OF HAZARD INDEX ESTIMATES

Exposure Point	Target	Route	Average	Maximum	Table Reference
Solid Waste Area Surface Soil	Adult	Ingestion	2.0E-02	4.6E-02	6-21, 6-22
		Dermal	2.1E-04	2.3E-03	6-33, 6-34
		Total Adult	2.0E-02	4.8E-02	*
	Child	Ingestion	1.8E-01	4.3E-01	6-27, 6-28
		Dermal	9.6E-04	1.1E-02	6-39, 6-40
		Total Child	1.8E-01	4.4E-01	*
Bulky Waste Area Surface Soil	Adult	Ingestion	1.7E-01	7.3E-01	6-23, 6-24
		Dermal	7.0E-05	3.5E-04	6-35, 6-36
		Total Adult	1.7E-01	7.3E-01	*
	Child	Ingestion	1.6E+00	6.8E+00	6-29, 6-30
		Dermal	3.3E-04	1.6E-03	6-41, 6-42
		Total Child	1.6E+00	6.8E+00	*
Sewage Sludge Area Surface Soil	Adult	Ingestion	1.8E-02	2.3E-02	6-25, 6-26
		Dermal	2.1E-07	3.4E-07	6-37, 6-38
		Total Adult	1.8E-02	2.3E-02	*
	Child	Ingestion	1.7E-01	2.1E-01	6-31, 6-32
		Dermal	9.6E-07	1.6E-06	6-43, 6-44
		Total Child	1.7E-01	2.1E-01	*
Solid Waste Area Leachate	Adult	Dermal	1.7E-03	1.7E-03	6-45, 6-46
	Adolescent	Dermal	2.1E-03	2.1E-03	6-49, 6-50
Bulky Waste Area Leachate	Adult	Dermal	1.2E-02	2.2E-02	6-47, 6-48
	Adolescent	Dermal	1.5E-02	2.6E-02	6-51, 6-52
Solid Waste Area Groundwater	Adult	Ingestion	3.3E+01	9.3E+01	6-53, 6-54
Bulky Waste Area Groundwater	Adult	Ingestion	1.0E+01	6.3E+01	6-55, 6-56
Sewage Sludge Area Groundwater	Adult	Ingestion	1.5E+01	4.2E+01	6-57, 6-58
Residential Wells Groundwater	Adult	Ingestion	4.9E+00	1.7E+01	6-59, 6-60

TABLE 6-84. SUMMARY OF HAZARD INDEX ESTIMATES

Exposure Point	Target	Route	Average	Maximum	Table Reference
Saugatucket River Water	Adult	Ingestion	1.5E-03	9.2E-03	6-61, 6-62
		Dermal	5.3E-04	3.3E-03	6-63, 6-64
	Adolescent	Ingestion	1.8E-03	1.1E-02	6-65, 6-66
		Dermal	5.7E-04	3.6E-03	6-67, 6-68
Mitchell Brook Water	Adult	Dermal	4.4E-04	1.3E-03	6-69, 6-70
	Adolescent	Dermal	5.4E-04	1.6E-03	6-71, 6-72
Solid Waste Soil Gas	Visitor	Inhalation	1.1E-02	2.0E-02	6-73, 6-74
Bulky Waste Soil Gas	Visitor	Inhalation	6.2E-04	9.3E-04	6-75, 6-76
Sewage Sludge Soil Gas	Visitor	Inhalation	4.6E-06	4.9E-06	6-77, 6-78
Residential Ambient/Indoor Air	Resident	Inhalation	2.6E-02	4.1E-02	6-79, 6-80
Future Residential Indoor Air	Resident	Inhalation	--	--	6-81, 6-82

NOTES:

* Ingestion plus dermal risks

Table 7-1. ROSE HILL REGIONAL LANDFILL ECOLOGICAL RISK ASSESSMENT - SURFACE WATER CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration Maximum	Mean 6/91	9/91	1/92	4/92	5/92	AWQC Chronic Criteria	AWQC Acute Criteria	Background Range
Volatile organics										
Benzene	1/56	3	2.5	—	—	—	—	5.9	265	U
Toluene	1/56	2	—	***	—	—	—	14	635	U
Total Xylenes	2/56	9	3.4	—	—	—	—	ND	ND	U
Chlorobenzene	1/56	2	***	—	—	—	—	18	795	U
1,2-Dichloroethene(total)	1/56	4	2.6	—	—	—	—	ND	ND	U
Chloroethane	1/56	6	5.1	—	—	—	—	ND	ND	U
Carbon Disulfide	15/56	14	3.2	5.2	4.8	***	—	ND	ND	4
Water soluble organics										
Acrylamide	1/15	272	NA	110	NA	—	NA	ND	ND	U
N,N-DMF	1/31	5	NA	***	—	—	NA	ND	ND	U
Semivolatile organics										
bis(2-ethylhexyl)phthalate	1/56	8	5.2	—	—	—	—	12	555	U
Diethylphthalate	2/56	2	—	***	***	—	—	58	2,605	U
Dimethylphthalate	1/56	1	—	—	***	—	—	37	1,650	U
Di-n-butylphthalate	1/56	3	—	—	***	—	—	ND	ND	U
Pesticides										
gamma-BHC(Lindane)	1/56	0.002	—	***	—	—	—	ND	ND	U
4,4'-DDD	1/56	0.0047	—	—	***	—	—	ND	ND	U
Methoxychlor	1/56	0.014	—	—	***	—	—	0.03	ND	U
Inorganics										
Aluminum	30/56	1,140	250	130	120	—	310	87	750	88.5 - 194
Antimony	4/56	28.8	—	15	—	12	—	10	450	U
Arsenic	2/56	4.1	1.7	0.57	—	—	—	1.2	52	U
Barium	33/56	279	40	10	7.8	7.7	9.5	ND	ND	U - 8.6
Calcium	56/56	27,100	7,700	5,300	4,000	3,700	4,300	ND	ND	3,240 - 4,070
Chromium	1/56	3.2	—	—	—	1.7	—	11	16	U
Copper	6/56	11.6	—	5.8	—	—	1.6	13.9 *	21.2 *	U - 2.1
Iron	48/56	65,000	9,500	1,600	1,400	660	1,900	1,000	ND	U - 250
Lead	1/56	3.7	—	—	—	—	1.2	4.0 *	104 *	U
Magnesium	56/56	12,900	2,700	1,700	1,400	1,300	1,500	ND	ND	1,210 - 1,460
Manganese	54/56	2,030	610	320	230	140	240	ND	ND	20.6 - 68.2
Nickel	1/56	5.0	2.7	—	—	—	—	185 *	1,664 *	U
Potassium	31/56	45,000	5,200	870	980	880	—	ND	ND	U - 777
Sodium	56/56	59,900	14,000	11,000	9,000	9,000	9,000	ND	ND	7,900 - 9,720
Zinc	15/56	22.8	8.3	9.4	7.0	—	5.2	124 *	137 *	U - 3.9
Ammonia	17/19	3.53	NA	NA	NA	0.29	0.65	2.2	24	U - 0.15
Cyanide	3/56	210	—	5.3	—	—	25	5.2	22	U
Sulfide	14/37	2.20	1.4	—	—	NA	NA	ND	ND	U - 2.20

NOTES

All concentrations in μg/L except ammonia and sulfide, which are in mg/L.
— Analyte was not detected in this round.
*** The calculated mean is greater than the maximum detect.
NA Analyte was not analyzed for in this round or all values were rejected.
ND Data not available.
* Criterion was calculated using the maximum value of unfiltered hardness (120.8 mg/L).
U This analyte was not detected in any of the background samples, or the non-detected value is the lowest concentration.

TABLE 7-2. ROSE HILL REGIONAL LANDFILL ECOLOGICAL RISK ASSESSMENT - LEACHATE CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration Maximum	Site Concentration Mean 6/91	Site Concentration Mean 4/92	AWQC Chronic Criteria	AWQC Acute Criteria
Volatile organics						
Toluene	3/9	50	19	---	14	635
Ethylbenzene	3/8	2	---	1.7	36	1,600
Total Xylenes	2/8	3	---	***	ND	ND
Chlorobenzene	3/9	2	***	---	18	795
Trichloroethene	1/8	4	2.8	---	43	1,950
1,2-Dichloroethene(total)	2/8	44	10.8	***	ND	ND
1,1-Dichloroethane	3/9	2	***	---	ND	ND
Chloroethane	4/9	8	5.7	***	ND	ND
Vinyl Chloride	1/8	1	***	---	ND	ND
Carbon Disulfide	2/8	12	4.5	---	ND	ND
Semivolatile organics						
Naphthalene	3/9	0.9	---	0.77	2.6	115
Diethylphthalate	3/9	11	---	6.3	58	2,605
bis(2-Ethylhexyl)phthalate	1/9	230	42.5	---	12	555
Inorganics						
Aluminum	7/9	60,500	12,000	310	87	750
Arsenic	1/8	3.7	1.9	---	1.2	52
Barium	9/9	2,120	510	180	ND	ND
Beryllium	2/9	11.2	3.8	---	0.17	7.5
Calcium	9/9	59,000	25,000	20,000	ND	ND
Chromium	2/9	23.9	6.1	2.6	11	16
Cobalt	4/9	295	53	---	ND	ND
Copper	1/9	37.8	9.6	---	22.6 *	36.2 *
Iron	9/9	1,370,000	330,000	140,000	1,000	ND
Lead	3/9	174	56	5.0	8.4 *	214 *
Manganese	9/9	14,700	7,100	1,900	ND	ND
Magnesium	9/9	16,100	7,200	6,600	ND	ND
Mercury	1/9	0.2	---	0.13	0.012	2.4
Nickel	3/8	15.8	7.0	---	300 *	2,700 *
Potassium	9/9	44,800	14,000	14,000	ND	ND
Sodium	9/9	55,400	21,000	23,000	ND	ND
Vanadium	3/9	65.2	23	---	ND	ND
Zinc	4/7	209	***	6.8	202 *	223 *
Ammonia	3/3	21.75	NA	13	2.2	24
Cyanide	2/9	41.7	16	---	5.2	22

NOTES

All concentrations in μg/L except ammonia, which is in mg/L.

--- Analyte was not detected in this round.

*** The calculated mean is greater than the maximum detect.

NA Analyte was not analyzed for in this round or all values were rejected.

ND Data not available.

* The criterion is calculated using the maximum value of the unfiltered hardness (213.6 mg/L).

TABLE 7-3. ROSE HILL REGIONAL LANDFILL ECOLOGICAL RISK ASSESSMENT
LEACHATE SCREENING - DEER INGESTION

Compound	Maximum Leachate Concentration (μg/L)	Deer Dose (mg/kg/day) (1)		Subchronic Reference Dose (mg/kg/day) (2)	Hazard Ratio (3)	
		Maximum Exposure	25 Percent Exposure		Maximum Exposure	25 Percent Exposure
Toluene	50.0	0.00174	0.00043	2.0000	0.0009	0.0002
Aluminum	60,500.0	2.10435	0.52609	2.9000	0.7256	0.1814
Arsenic	3.7	0.00013	0.00003	0.0003	0.4290	0.1072
Barium	2,120.0	0.07374	0.01843	0.0700	1.0534	0.2634
Beryllium	11.2	0.00039	0.00010	0.0050	0.0779	0.0195
Chromium	23.9	0.00083	0.00021	0.0200	0.0416	0.0104
Cobalt	295.0	0.01026	0.00257	ND	ND	ND
Copper	37.8	0.00131	0.00033	0.0370	0.0355	0.0089
Iron	1,370,000.0	47.65217	11.91304	ND	ND	ND
Lead	174.0	0.00605	0.00151	0.0014	**4.3230**	**1.0807**
Manganese	14,700.0	0.51130	0.12783	0.0050	**102.2609**	**25.5652**
Mercury	0.2	0.00001	0.00000	0.0003	0.0232	0.0058
Vanadium	65.2	0.00227	0.00057	0.0070	0.3240	0.0810
Zinc	209.0	0.00727	0.00182	0.3000	0.0242	0.0061
Cyanide	41.7	0.00145	0.00036	0.0200	0.0725	0.0181

NOTES

(1) Maximum exposure: Dose = (max. leachate conc.) * (4 L water/day) / (deer body wt [115 kg]) * 1000
25 percent exposure: Dose = (max. leachate conc.) * (1 L water/day) / (deer body wt [115 kg]) * 1000
M&E (1989).

(2) From USEPA (1993b) and M&E (1989).

(3) Hazard Ratio = Dose / Reference Dose.

TABLE 7-4. ROSE HILL REGIONAL LANDFILL ECOLOGICAL RISK ASSESSMENT - SEDIMENT CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration Maximum	Site Concentration Mean 6/91	Site Concentration Mean 9/91	Site Concentration Mean 5/92	Sediment Criteria ERL-L	Sediment Criteria ERL-M	Sediment Criteria EPA	Sediment Criteria NYSDEC	Background Range		
Volatile organics (µg/kg)												
Benzene	1/39	1	—	***	—	ND	ND	ND	ND		U	
Ethylbenzene	2/40	8	4.1	***	—	ND	ND	ND	ND		U	
Total Xylenes	5/40	67	9.3	***	—	ND	ND	ND	ND		U	
Acetone	5/40	215	—	97	—	ND	ND	ND	ND	U	-	42
2-Butanone	2/40	46	—	13	—	ND	ND	ND	ND		U	
4-Methyl-2-pentanone	1/40	3	—	***	—	ND	ND	ND	ND		U	
Tetrachloroethene	3/40	4	—	***	—	ND	ND	ND	ND		U	
Trichloroethene	6/39	150	16	—	—	ND	ND	ND	ND		U	
1,2-Dichloroethene(total)	1/40	5	3.9	—	—	ND	ND	ND	ND		U	
Chloroform	1/40	5	—	***	—	ND	ND	ND	ND		U	
Carbon Disulfide	2/40	22	4.2	9.5	—	ND	ND	ND	ND		U	
Semivolatile organics (µg/kg)												
Phenanthrene	2/39	220	***	—	***	225	1,380	ND	ND		U	
Anthracene	1/39	64	—	—	***	85	960	ND	ND		U	
Flouranthene	5/39	330	***	***	***	600	3,600	ND	ND		U	
Pyrene	6/39	280	***	***	***	350	2,200	ND	ND		U	
Chrysene	1/39	180	***	—	—	400	2,800	ND	ND		U	
Benzo(b)fluoranthene	1/39	130	***	—	—	ND	ND	ND	ND		U	
Benzo(k)fluoranthene	1/39	130	***	—	—	ND	ND	ND	ND		U	
Benzo(a)pyrene	1/39	140	***	—	—	400	2,500	ND	ND		U	
Di-n-butylphthalate	1/39	650	—	310	—	ND	ND	ND	ND		U	
Butylbenzylphthalate	1/39	440	***	—	—	ND	ND	ND	ND		U	
Pesticides (µg/kg)												
delta-BHC	11/37	1.3	—	***	0.73	ND	ND	ND	ND		U	
4,4'-DDE	5/37	4.9	—	2.6	2.1	2.0	15	ND	ND		U	
4,4'-DDD	2/37	8.2	—	3.1	2.6	2.0	20	ND	ND		U	
4,4'-DDT	1/37	0.90	—	***	—	1.0	7	ND	ND		U	
Methoxychlor	1/37	2.6	—	***	—	ND	ND	ND	ND		U	
Endosulfan II	1/37	0.31	—	***	—	ND	ND	ND	ND		U	
Dieldrin	1/37	1.3	—	***	—	0.02	8	ND	ND		U	
gamma-Chlordane	1/37	0.23	—	***	—	0.5	6	ND	ND		U	
Inorganics (mg/kg)												
Aluminum	40/40	8,650	3,500	4,400	1,700	ND	ND	ND	ND	749	-	1,260
Antimony	1/40	62.1	—	8.1	—	2	25	ND	ND		U	
Arsenic	21/40	6.1	0.85	0.78	1.1	33	85	3	5		U	
Barium	40/40	64.6	16	17	7.9	ND	ND	20	ND	2.7	-	3.1
Beryllium	18/40	2.3	0.71	0.54	0.22	ND	ND	ND	ND		U	
Cadmium	1/40	1.3	—	0.56	—	5	9	ND	0.8		U	
Calcium	33/40	1,760	530	780	260	ND	ND	ND	ND	U	-	350
Chromium	23/40	18.1	3.0	5.7	1.7	80	145	25	26	U	-	1.6
Cobalt	21/40	6.5	1.5	3.0	0.90	ND	ND	ND	ND		U	
Copper	3/39	56.1	2.4	6.3	—	70	390	25	19		U	
Iron	40/40	113,000	13,000	12,000	8,100	ND	ND	17,000	24,000	780	-	1,020
Lead	32/40	243.4	7.2	27	5.2	35	110	40	27	U	-	7.2
Magnesium	35/40	2,560	530	890	340	ND	ND	ND	ND	U	-	373

TABLE 7-4 (Continued). ROSE HILL REGIONAL LANDFILL ECOLOGICAL RISK ASSESSMENT - SEDIMENT CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration				Sediment Criteria				Background Range		
		Maximum	Mean 6/91	Mean 9/91	Mean 5/92	ERL-L	ERL-M	EPA	NYSDEC			
Manganese	40/40	1,150	160	120	110	ND	ND	300	428	13.5	-	22.6
Nickel	19/40	20.5	2.9	5.0	1.8	30	50	20	22	U	-	1.4
Potassium	18/40	775	180	320	—	ND	ND	ND	ND		U	
Selenium	6/40	2.1	0.68	0.34	0.20	ND	ND	ND	ND	U	-	0.52
Sodium	13/39	115	45	44	—	ND	ND	ND	ND		U	
Thallium	2/40	0.37	—	0.20	—	ND	ND	ND	ND		U	
Vanadium	28/40	17.7	7.2	8.9	2.3	ND	ND	ND	ND	U	-	2.0
Zinc	13/40	236	31	35	6.0	120	270	90	85		U	
Ammonia	5/11	25.6	NA	NA	3.7	ND	ND	75	ND		U	
Sulfide	15/29	850	31	63	—	ND	ND	ND	ND	U	-	22.0

NOTES
— Analyte was not detected in this round.
*** The calculated mean is greater than the maximum detect.
NA Analyte was not analyzed for in this round.
ND Data is not available.
U This analyte was not detected in any of the background samples, or the non-detected value is the lowest concentration.
ER-L/ER-M Values presented by Long and Morgan (1990)
EPA Values presented by USEPA (1977)
NYSDEC Draft sediment criteria (NYSDEC 1989)

TABLE 7-5. ECOLOGICAL RISK ASSESSMENT - SURFACE SOIL CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration			Effect Level	Screening Status Code[2]
		Maximum	Mean[1]			
			9/91	4/92		
Volatile Organics - μg/kg						
1,1,1-Trichloroethane	1/24	8	6.8	---	100,000	SE
1,1-Dichloroethene	1/24	4	***	---	Unknown	SM
1,1-Dichloroethane	2/24	25	7.7	---	100,000	SE
1,2-Dichloroethene	4/24	2,400	266.7	---	100,000	SE
2-Butanone	7/24	830	130.8	8.5	10,000	SE
2-Hexanone	1/24	6	***	---	Unknown	SM
4-Methyl-2-Pentanone	1/24	3	***	---	Unknown	SM
Acetone	15/24	160,000	15,917	428.8	10,000,000	SE
Benzene	2/24	6	***	---	300	SE
Chloroform	4/24	3	***	---	100,000	SE
Ethylbenzene	5/24	21	8.5	7.6	1,000	SE
Tetrachloroethene	7/24	13	5.5	---	10,000	SE
Toluene	6/24	110	24.3	6.3	300	SE
Trichloroethene	1/24	2	***	---	Unknown	SM
Vinyl Chloride	2/24	250	25.0	---	10,000	SE
Total Xylenes	5/24	84	16.7	7.8	1,000	SE
Semivolatile Organics - μg/kg						
4-Chloroanaline	1/24	490	229.6	---	Unknown	SM

TABLE 7-5 (Continued). ECOLOGICAL RISK ASSESSMENT - SURFACE SOIL CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration			Effect Level	Screening Status Code[2]
		Maximum	Mean[1]			
			9/91	4/92		
Benzo(a)anthracene	4/24	78	***	***	1,000	SE
Benzo(a)pyrene	4/24	68	***	***	20	SM
Benzo(b)fluoranthene	5/24	76	***	***	19,000	SE
Benzo(k)fluoranthene	4/24	64	***	***	19,000	SE
Benzo(g,h,i)perylene	4/24	57	***	***	1,000	SE
Butylbenzylphthalate	3/24	120	***	---	10,000	SE
Chrysene	5/24	95	***	***	5,000	SE
Diethylphthalate	5/24	46	***	***	60	SE
Fluoranthene	7/24	160	149.2	***	10,000	SE
Indeno(1,2,3-cd)pyrene	3/24	52	***	---	1,000	SE
Naphthalene	1/24	35	---	***	5,000	SE
Phenanthrene	5/24	110	***	***	5,000	SE
Pyrene	9/24	170	126.5	***	10,000	SE
Pesticides - µg/kg						
Aldrin	1/24	0.6	***	---	Unknown	SM
alpha-Chlordane	1/24	3.7	1.3	---	Unknown	SM
Dieldrin	1/24	4.5	2.3	---	Unknown	SM
Endrin ketone	2/24	2.3	---	2.3	100	SE

TABLE 7-5 (Continued). ECOLOGICAL RISK ASSESSMENT - SURFACE SOIL CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration			Effect Level	Screening Status Code[2]
		Maximum	Mean[1]			
			9/91	4/92		
4,4-DDE	7/24	11.0	3.6	2.4	100	SE
4,4-DDD	2/24	5.2	2.9	***	100	SE
4,4-DDT	8/24	5.2	3.1	1.8	100	SE
Inorganics - mg/kg						
Aluminum	24/24	16,600	9,219	6,592	Unknown	SB
Antimony	1/24	79	9	---	8	SM
Arsenic	13/24	3.5	1.6	1.1	3.4	SM
Barium	24/24	86	20	24	400	SE
Beryllium	11/24	1.1	---	0.6	2.2	SE
Cadmium	1/24	0.6	0.4	---	3	SE
Calcium	24/24	1,870	626	502	Unknown	SB
Chromium	14/24	18	10	4	120	SE
Cobalt	14/24	12.8	3.9	3.3	25	SE
Copper	15/22	253	32	5	20	CC
Iron	24/24	149,000	11,285	26,124	Unknown	SM
Lead	24/24	124	11	21	20	CC
Magnesium	24/24	1,990	1,241	802	8,660	SB/SE

TABLE 7-5 (Continued). ECOLOGICAL RISK ASSESSMENT - SURFACE SOIL CONTAMINANT SCREENING

Compound	Frequency of Detection	Site Concentration			Effect Level	Screening Status Code[2]
		Maximum	Mean[1]			
			9/91	4/92		
Manganese	24/24	6,120	130	666	300	CC
Mercury	4/24	0.41	0.10	0.11	0.5	SE
Nickel	12/23	10.6	5.8	2.5	32	SE
Potassium	23/24	944	680	394	4,320	SB/SE
Selenium	1/24	5.9	---	1.1	2	SM
Silver	3/24	1.6	0.5	---	10	SE
Thallium	2/24	0.4	0.2	0.2	Unknown	SB
Vanadium	23/24	27	16	11	150	SE
Zinc	22/22	57	32	19	100	SE

1 Only calculated for compounds with at least one detection. Half of the detection limit was used at locations where a compound was below the detection limit when calculating means. The symbol *** indicates that the calculated mean exceeded the maximum value.

2 SB - Screened Out: Background Concentrations Only; SE - Screened Out: Media Concentration Below Effect/Criteria Level; SM - Screened Out: Miscellaneous (see text); CC - Chemical of Concern.

References for effect levels: USEPA (1985a), Eisler (1985; 1986; 1987a; 1987b; 1988a; 1988b), Bysshe (1988), Fitchko (1989), Beyer (1990), M&E (1992c), and Kappleman (1993).

TABLE 7-6. ECOLOGICAL RISK ASSESSMENT - UNITED STATES SURFACE SOIL BACKGROUND LEVEL FOR METALS (MG/KG)

Compound	Mean	Typical Range	Minimum	Maximum
Aluminum	66,000	30,000-100,000	700	>100,000
Antimony	ND	ND	ND	ND
Arsenic	6	1-12	0.1	50
Barium	554	200-1,000	15	5,000
Beryllium	1	1-3	<1	7
Cadmium	3.5	0.2-8.9	0.01	9
Calcium	24,000	8,000-18,000	<150	400,000
Chromium	53	4-1,000	1	3,000
Cobalt	10	3-10	<3	70
Copper	25	2-100	<1	300
Iron	25,000	20,000-50,000	100	550,000
Lead	20	2-100	2	700
Magnesium	9,200	3,000-10,000	50	100,000
Manganese	560	500-700	<1	7,000
Mercury	0.15	0.01-0.61	0.01	15
Nickel	20	1.5-28	<5	5,000
Potassium	23,000	9,500-25,000	50	70,000
Selenium	0.5	0.1-2.0	0.1	38
Silver	ND	0.1-1.0	0.1	1.0

TABLE 7-6 (Continued). ECOLOGICAL RISK ASSESSMENT - UNITED STATES SURFACE SOIL BACKGROUND LEVEL FOR METALS (MG/KG)

Compound	Mean	Typical Range	Minimum	Maximum
Thallium	ND	0.5-2.0	0.5	2.0
Vanadium	76	30-70	<7	500
Zinc	54	10-300	<5	2,000

From: Bysshe (1988), Fitchko (1989), Beyer (1990), and M&E (1992c).
ND = No data.

TABLE 7-7. ECOLOGICAL RISK ASSESSMENT - LANDFILL GAS CONTAMINANT SCREENING

COMPOUND	MODELED AIR CONCENTRATION (MG/M^3)[a]	EFFECT LEVEL (MG/M^3)[b]	
		CHRONIC	ACUTE
Benzene	0.006	160	32,000
1,1-Dichloroethane	0.096	2,025[c]	------
cis-1,2-Dichloroethene	15.600	550[c]	------
Methylene Chloride	0.046	87	------
Toluene	0.156	320	15,000
Trichloroethene	0.022	300	------
Vinyl Chloride	2.160	125[c]	------
m,p-Xylene	0.028	50	13,000

[a] Emission Rate * Disposal Area Length in Prevailing Wind Direction / Cross-sectional area * 0.3 m height * Windspeed [1 m/sec]. See Table 6-74.

[b] From USEPA (1984b; 1984c; 1984d; 1984e; 1984f) and Kappleman (1993).

[c] No Observed Effect Level (NOEL) value.

TABLE 7-8. SUMMARY OF THE ECOLOGICAL CHEMICALS OF CONCERN

Compound	Surface Soil	Surface Water	Leachate	Surface Sediment
Aluminum		X	X	X
Copper	X			
Iron		X	X	X
Lead	X		X	
Manganese	X	X	X	

TABLE 7-9. ASSESSMENT AND MEASUREMENT ENDPOINTS FOR SELECTED SPECIES GROUPS

Species Group	Assessment Endpoint	Measurement Endpoint
Benthic Organisms	Abundance/Diversity	Comparison With Upstream Location, Toxicity Tests
Fish	Presence	Observed Use of Site, Water Quality Criteria, Toxicity Tests

TABLE 7-10. CORRELATION OF BENTHIC GRAB SAMPLE SPECIES DENSITIES WITH VARIOUS SEDIMENT PARAMETERS IN THE SAUGATUCKET RIVER AND MITCHELL BROOK

Parameter	Correlation Coefficient	P-Level	Sample Size
Saugatucket River:			
Iron Concentration	0.1272	NS	5
Percent Gravel	0.5591	NS	5
Percent Sand	-0.5836	NS	5
Percent Silt	-0.1033	NS	5
Mitchell Brook:			
Iron Concentration	-0.5040	NS	3
Percent Gravel	0.8934	NS	3
Percent Sand	-0.9508	NS	3
Percent Silt	0.8220	NS	3

NS = No significant correlation; P-level = 0.05

TABLE 7-11. CORRELATION OF ARTIFICIAL SUBSTRATE SAMPLE SPECIES DENSITIES WITH IRON CONCENTRATION IN SAUGATUCKET RIVER AND MITCHELL BROOK SURFACE WATERS

Parameter	Correlation Coefficient	P-Level	Sample Size
Saugatucket River:			
Total Iron	-0.9494	0.014	5
Total Aluminum	0.1132	NS	5
Mitchell Brook:			
Total Iron	-0.4995	NS	3

NS = No significant correlation; P-level = 0.05

TABLE 7-12. CORRELATION OF *CONCHAPELOPIA* WITH SEDIMENT IRON CONCENTRATION IN THE SAUGATUCKET RIVER

Parameter	Correlation Coefficient	P-Level	Sample Size
Total Density:			
Iron Concentration	0.8577	NS	5
Percent Occurrence:			
Iron Concentration	0.7785	NS	5

NS = No significant correlation; P-level = 0.05

TABLE 7-13. CORRELATION OF ARTIFICIAL SUBSTRATE SAMPLE DOMINANT SPECIES WITH ALUMINUM AND IRON IN SAUGATUCKET RIVER SURFACE WATER

Parameter	Correlation Coefficient	P-Level	Sample Size
Conchapelopia Density:			
Total Aluminum	-0.1408	NS	5
Total Iron	-0.9492	0.014	5
Leutra Density:			
Total Aluminum	0.3320	NS	5
Total Iron	-0.7259	NS	5
Percent *Conchapelopia*:			
Total Aluminum	-0.4730	NS	5
Total Iron	-0.7545	NS	5
Percent *Leutra*:			
Total Aluminum	0.3592	NS	5
Total Iron	-0.6031	NS	5

NS = No significant correlation; P-level = 0.05

TABLE 7-14. CORRELATION OF ARTIFICIAL SUBSTRATE SAMPLE SPECIES DENSITIES WITH IRON IN MITCHELL BROOK SURFACE WATER

Parameter	Correlation Coefficient	P-Level	Sample Size
Polypedilum fallax Density:			
Total Iron	0.9451	NS	3
Percent *Conchapelopia*:			
Total Iron	0.3268	NS	3

NS = No significant correlation; P-level = 0.05

TABLE 7-15. SUMMARY OF CHEMICALS OF CONCERN CONCENTRATIONS IN SEDIMENT AND SURFACE WATER DURING MACROINVERTEBRATE SAMPLING - MAY 1992

	Sediment (mg/kg)		Surface Water (μg/l)		
Location	Iron	Aluminum	Iron	Aluminum	Manganese
Saugatucket River:					
SE-02	885	836	234	194	21.2
SE-04	4,240	1,440	322	170	136
SE-05	25,900	1,540	603	163	176
SE-06	12,500	1,800	1,640	208	303
SE-11	3,680	1,860	1,420	153	373
Mitchell Brook:					
SE-09	4,110	2,010	416	179	58
SE-07	12,400	2,640	6,760	320	443
SE-12	9,630	1,860	2,510	132	434

TABLE 7-16. SUMMARY OF THE WEIGHT OF SURVIVING ORGANISMS IN 10-DAY *HYALELLA AZTECA* SEDIMENT TOXICITY TESTS

Location	Mean Weight of Surviving Organisms (mg)
Lexington Pond Reference	0.107
Laboratory Control Water	0.078
Saugatucket River	
SE-02	0.129
SE-04	0.103
SE-05	0.086
SE-06	0.071
SE-11	0.130
Mitchell Brook	
SE-09	0.101
SE-07	0.074
SE-12	0.080

Note: No statistical difference in mean weight of surviving organisms was found between test samples and reference samples.

TABLE 7-17. SURVIVAL RATE OF *CERIODAPHNIA DUBIA* IN 7-DAY STATIC RENEWAL SEDIMENT TOXICITY TESTS

Location	Percent Survival	
	Day 2	Day 7
Lexington Pond Reference	100	70
Laboratory Control Water	100	100
Saugatucket River		
SE-02	100	80
SE-04	100	100
SE-05	90	90
SE-06	90	80
SE-11	90	90
Mitchell Brook		
SE-09	90	80
SE-07	100	90
SE-12	90	90

TABLE 7-18. SURVIVAL RATE OF *PIMEPHALES PROMELAS* IN 96-HOUR CHRONIC SEDIMENT TOXICITY TESTS

Location	Percent Survival	
	48 hours	96 hours
Lexington Reference Pond	87.5	85
Saugatucket River		
SE-02	80.0	65.0
SE-04	97.5	90.0
SE-05	97.5	92.5
SE-06	87.5	85.0
SE-11	100	100
Mitchell Brook		
SE-09	97.5	92.5
SE-07	90.0	85.0
SE-12	90.0	75.0

Note: No significant statistical difference was found between the reference sample and any 48-hour or 96-hour test samples.

TABLE 7-19. SUMMARY OF LEACHATE TOXICITY TESTS

Measurement Endpoint	*Ceriodaphnia dubia*	*Pimephales promelas*
Acute Test:		
48 hour LC_{50}	67.8%[a]	no samples with >50% observed mortality
NOAEL	25%	50%
Chronic Test:		
7-day LC_{50}	could not be determined	58.1% [b]
Survival NOEC	no effects observed	50%
Survival LOEC	no effects observed	100%
Reproductive NOEC	50%	--
Reproductive LOEC	100%	--
Growth NOEC	--	25%
Growth LOEC	--	50%
7-day IC_{25}-growth	--	33.8%
7-day IC_{50}-growth	--	56.8%

- indicates value not calculated for this test
(a) 95% confidence interval 101.0% to 45.5%
(b) 95% confidence interval 71.7% to 47.1%

TABLE 7-20. SUMMARY OF SURVIVAL RATES IN LEACHATE TOXICITY TESTS

	Percent Survival			
	Ceriodaphnia dubia		*Pimephales promelas*	
Concentration of Leachate	48-hour	7-day	48-hour	7-day
Control (0%)	100	100	100	82.5
3.125%	100	90	100	80
6.25%	80	80	100	85
12.5%	90	90	97	82.5
25%	80	80	100	80
50%	70	60	100	72.5
100%	0	0	83	2.5

3.6.1C
#9057

EPA Contract No. 68-W9-0036
EPA Work Assignment No. 18-1LA5

EPA Project Officer: Diane Kelley
EPA Remedial Project Manager: David Newton

SDMS DocID 9057

REMEDIAL INVESTIGATION FINAL REPORT

Volume III
Figures

Rose Hill Regional Landfill Superfund Site
South Kingstown, Rhode Island

May 1994

Prepared by:

Metcalf & Eddy
An Air & Water Technologies Company

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Plate 2 Shallow Overburden Groundwater Elevation
Plate 3 Deep Overburden Groundwater Elevation
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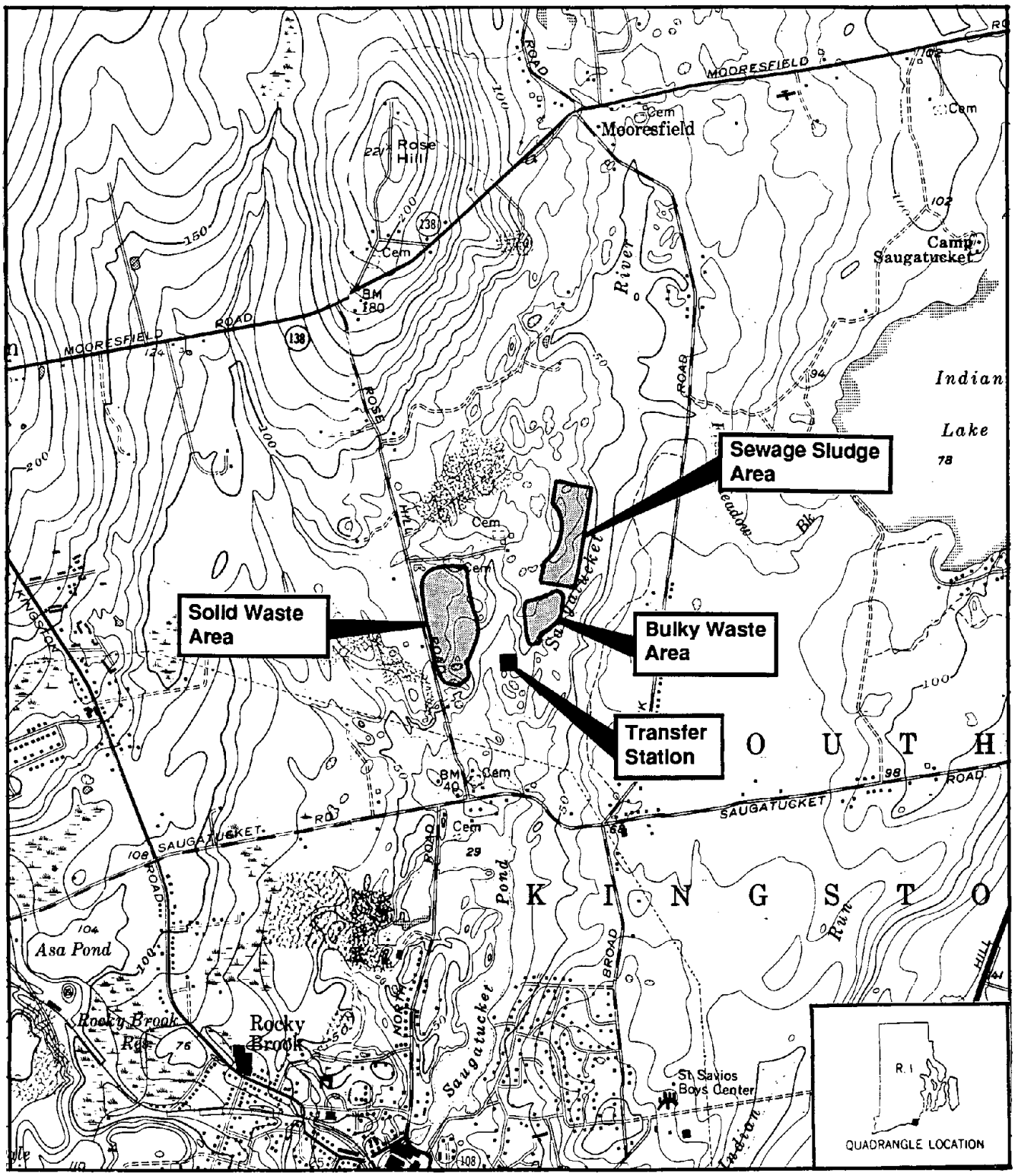
Section One



SOURCE: USGS TOPOGRAPHIC MAPS
KINGSTON, RI, 1970
NARRGANSETT PIER, RI, 1975

2000 0 2000
SCALE IN FEET

FIGURE 1-1. LOCATION OF THE ROSE HILL REGIONAL LANDFILL SITE

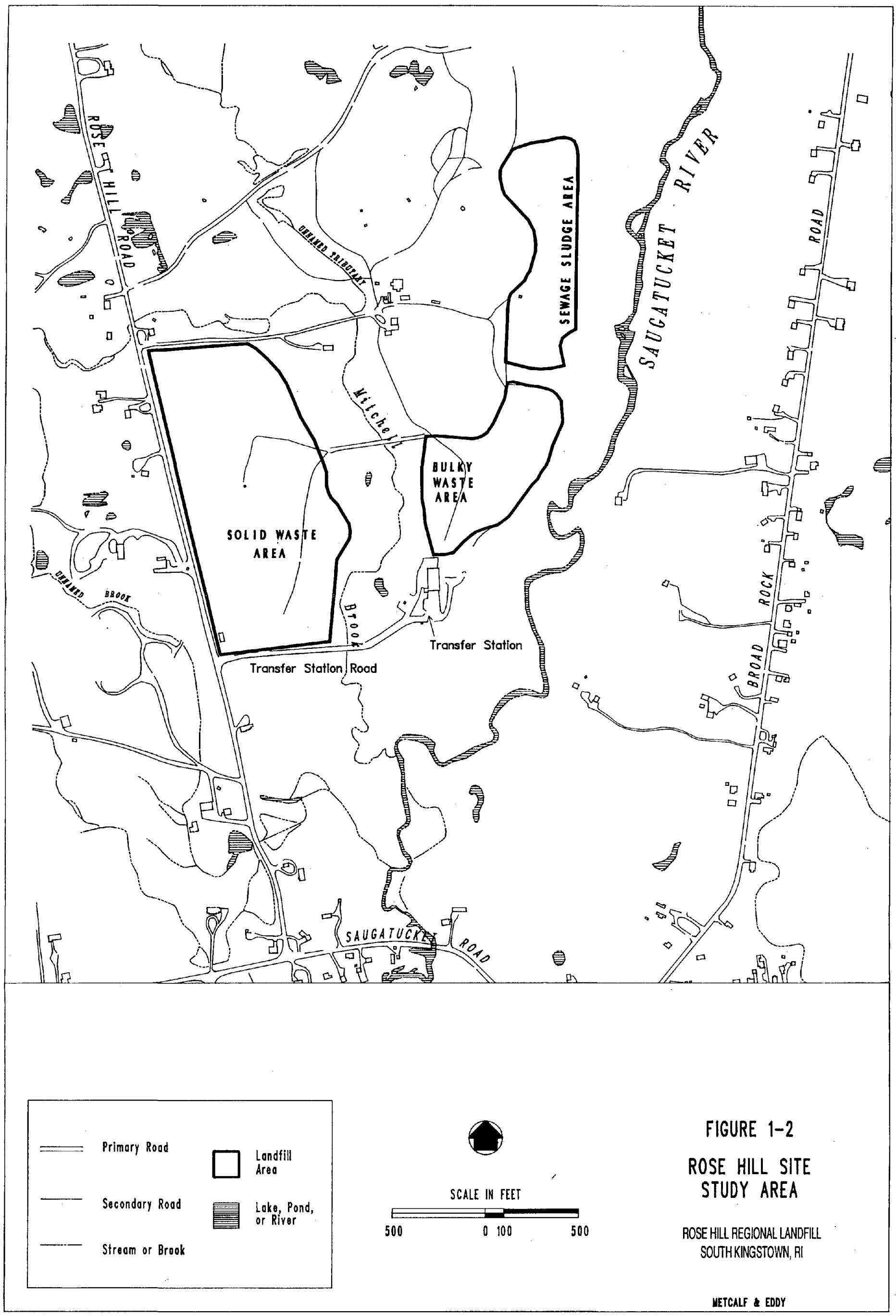


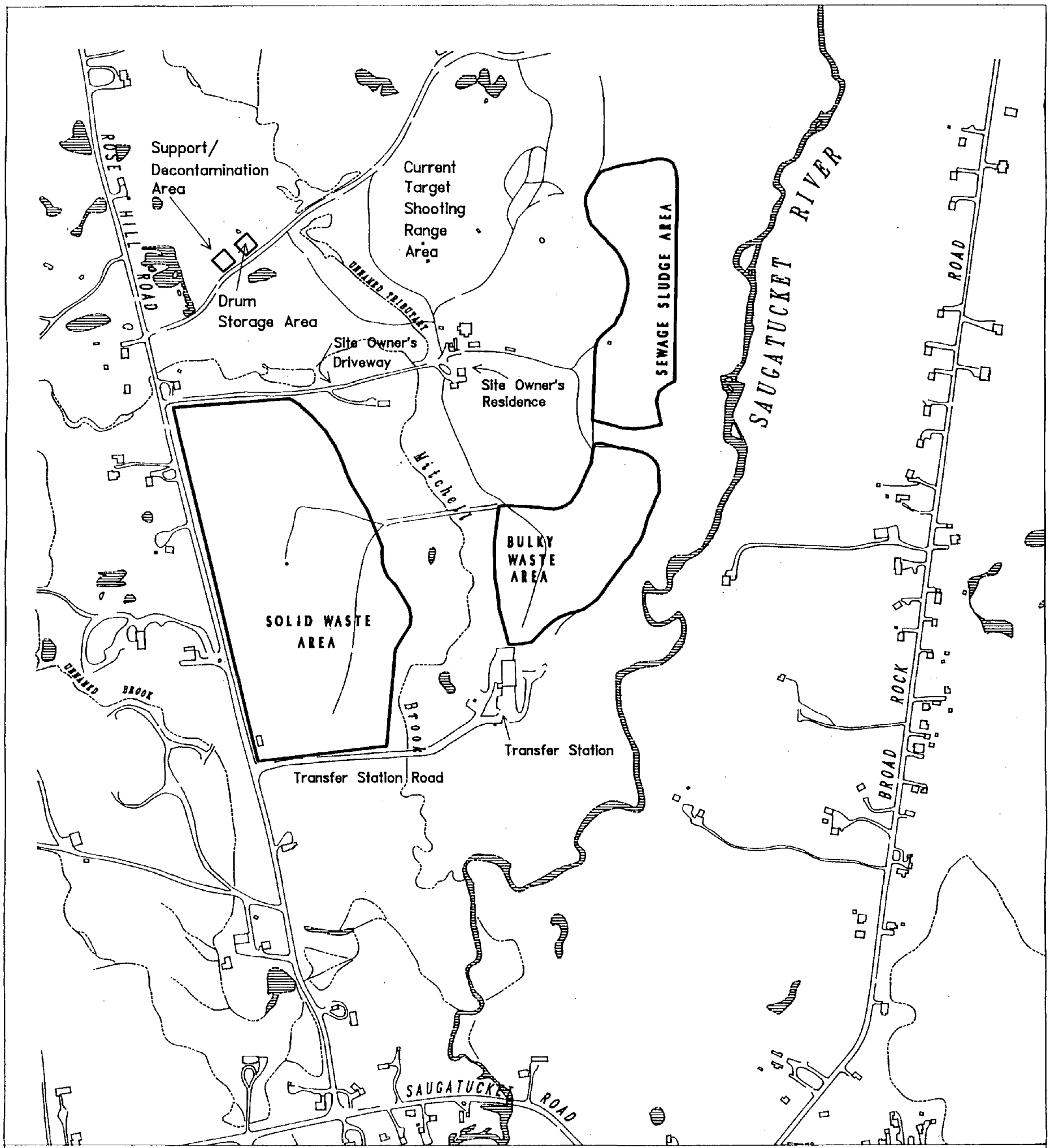
FIGURE 1-2

ROSE HILL SITE STUDY AREA

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

Section Two



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

SCALE IN FEET

500 0 100 500

FIGURE 2-1

SITE MAP

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

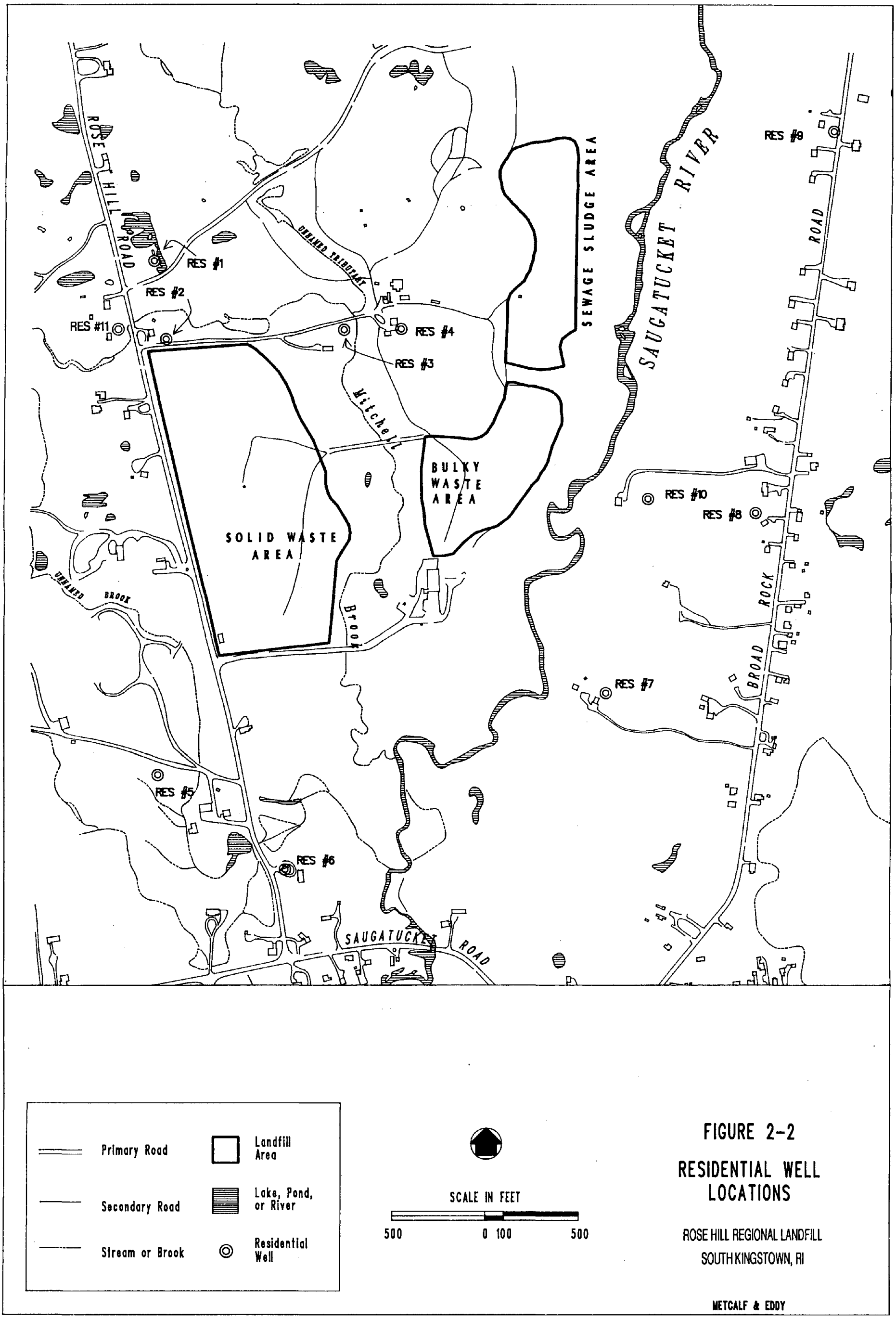
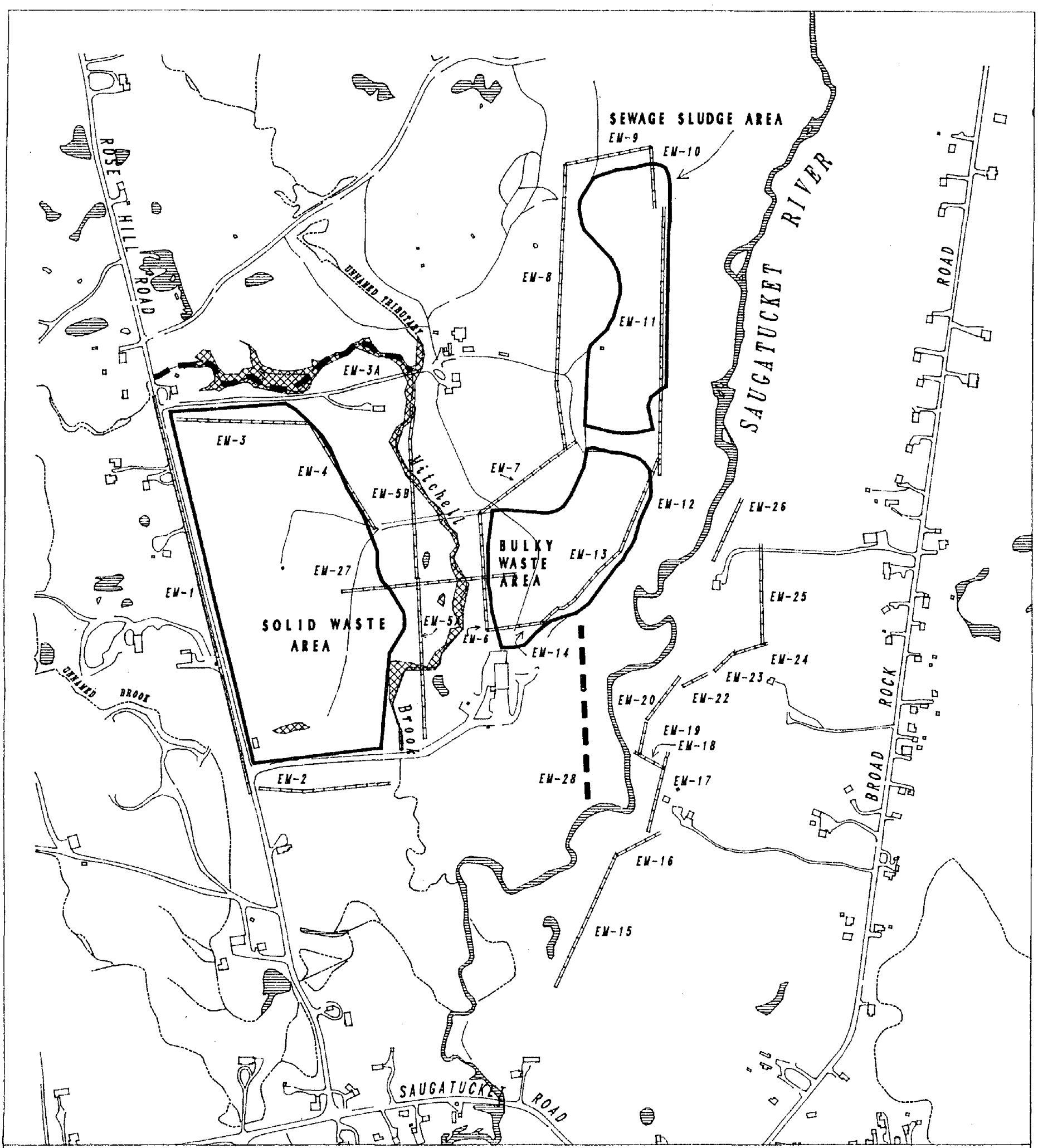


FIGURE 2-2

RESIDENTIAL WELL LOCATIONS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road
Secondary Road
Stream or Brook
EM 34 Line
EM 31 Line
Landfill Area
Lake, Pond, or River
Wetland

SCALE IN FEET
500 0 100 500

FIGURE 2-3

EM SURFACE GEOPHYSICAL SURVEY LINES

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

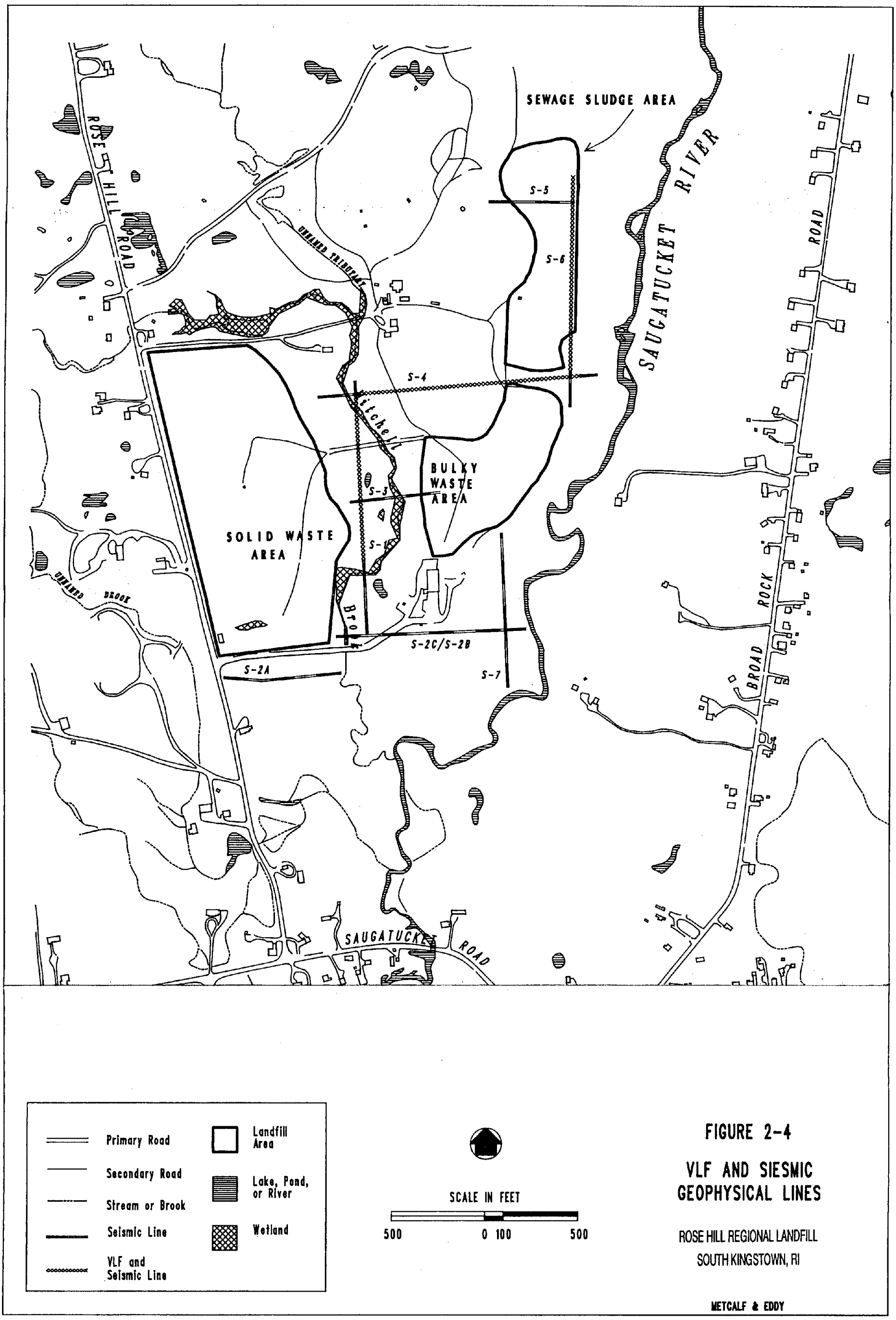
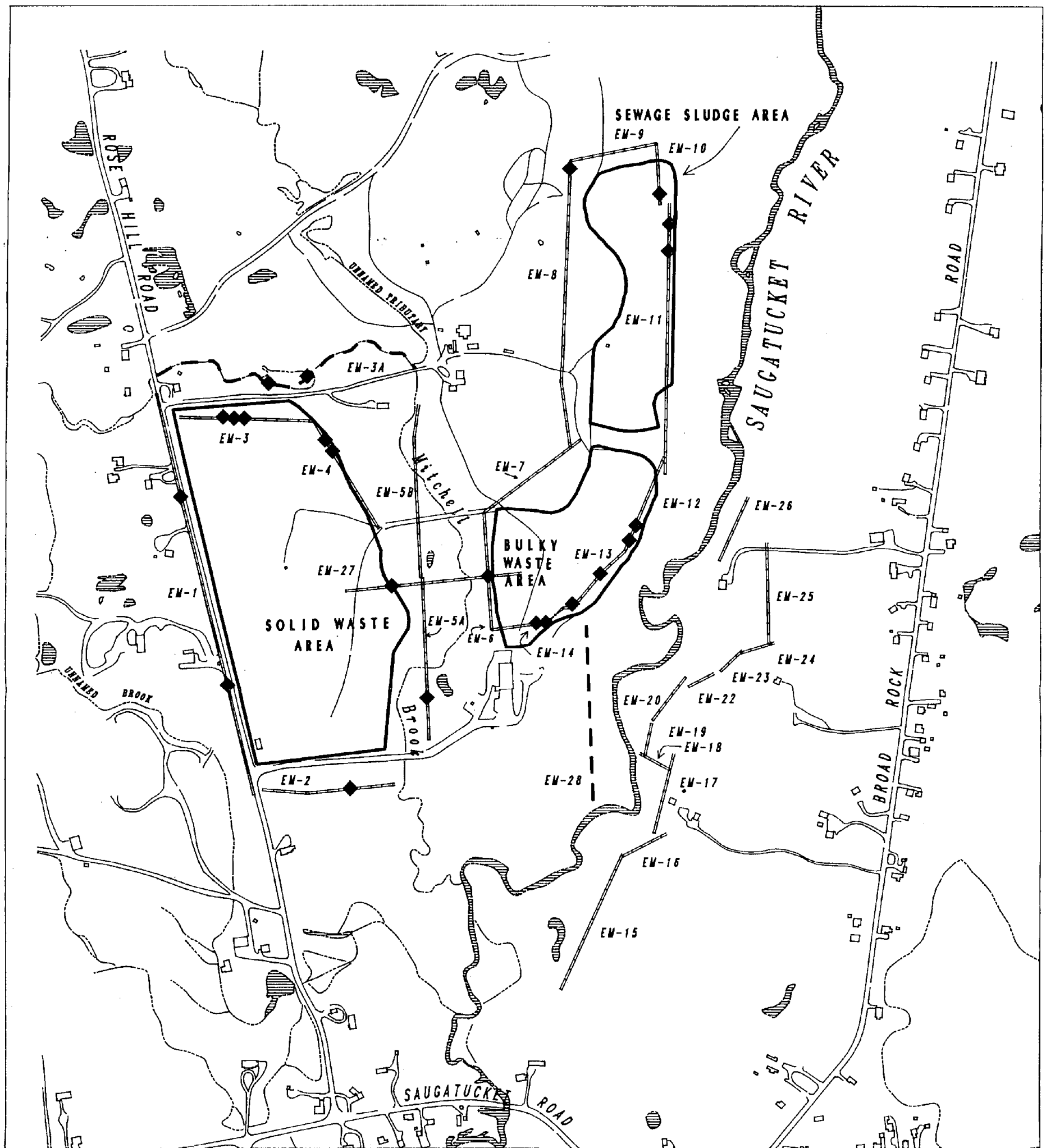


FIGURE 2-4

VLF AND SIESMIC GEOPHYSICAL LINES

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



Primary Road
Secondary Road
Stream or Brook
EM 34 Line
EM 31 Line
Landfill Area
Lake, Pond, or River
Surface Geophysical Anomaly

SCALE IN FEET
500 0 100 500

FIGURE 2-5

EM SURFACE GEOPHYSICAL ANOMALIES

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

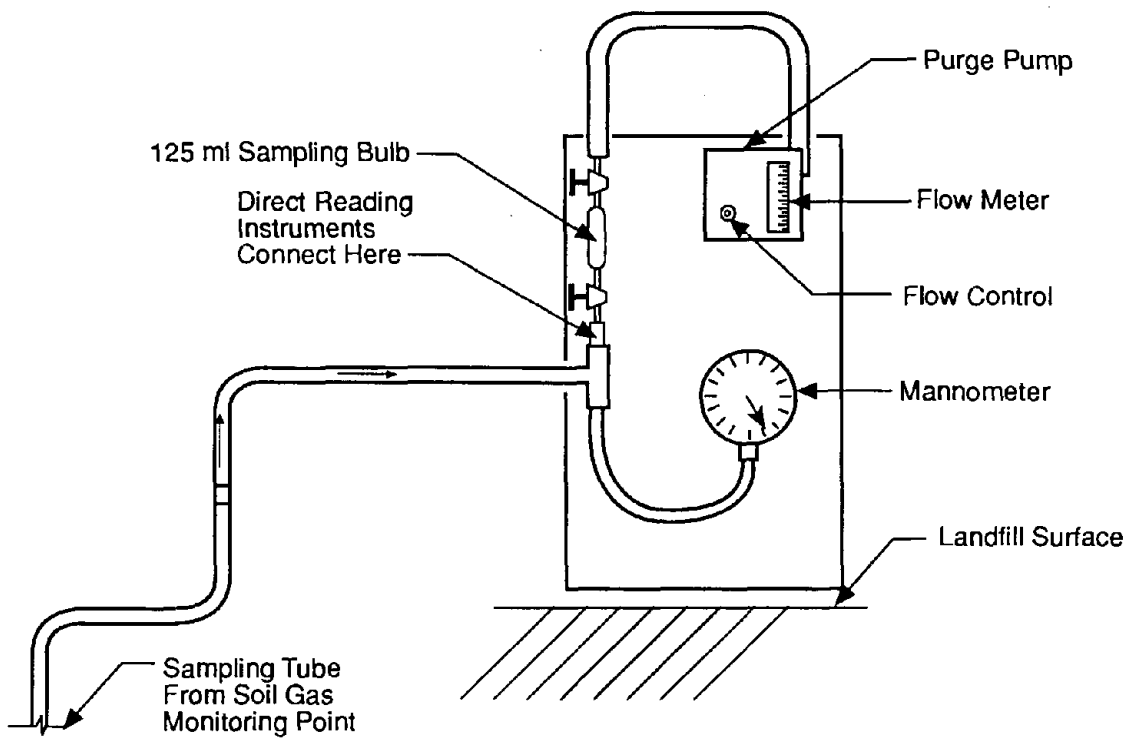
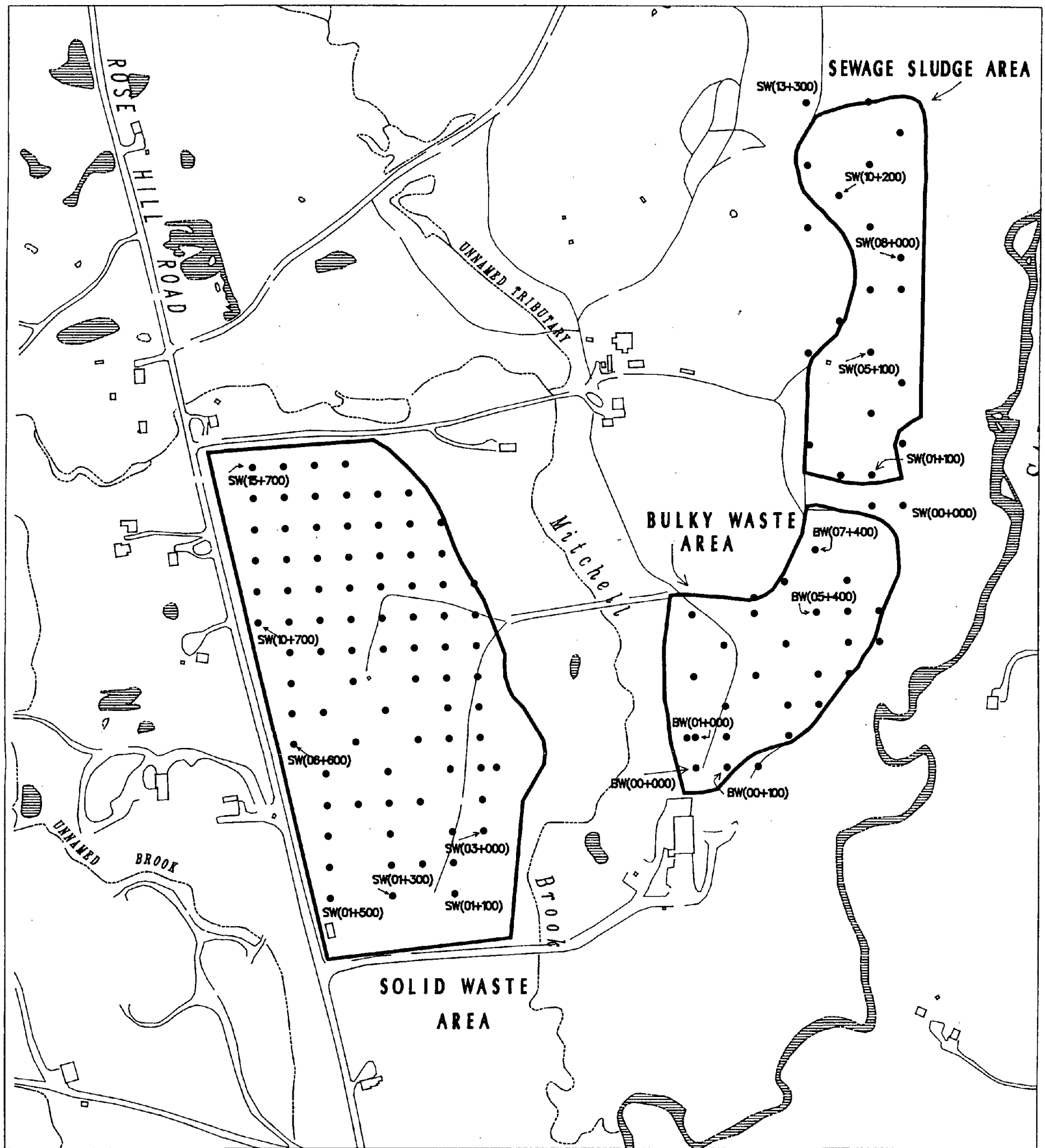


FIGURE 2-6. LANDFILL GAS SAMPLING APPRATUS DIAGRAM



Note: Not all points are labeled due to limitations in the available space.
Sampling locations were approximately based on a 100-foot-by-100-foot grid.

Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
Landfill Gas Sampling Location

SCALE IN FEET
350 0 100 350

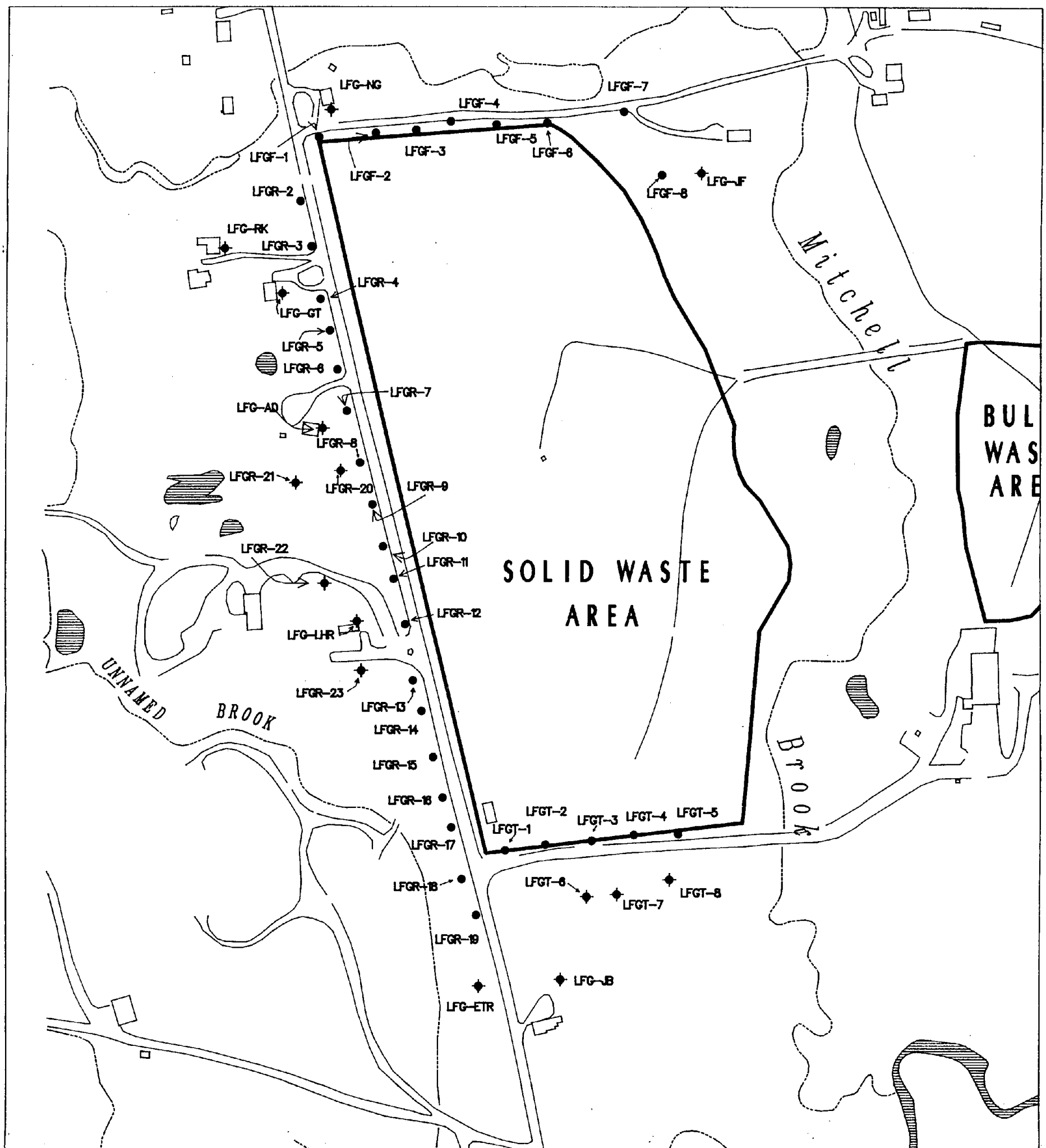
FIGURE 2-7.
TEMPORARY LANDFILL GAS SAMPLING LOCATIONS SAMPLED IN JUNE, 1991

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

NOTES: LFG - Permanent points.
TP - Temporary points sampled only in December, 1991.
Some points have both an LFG and a TP label. These points were first sampled as temporary points and then installed as permanent sampling locations.

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Landfill Gas Sampling Location, installed in June/July 1991.

Landfill Gas Samping Location, installed in December 1991.

SCALE IN FEET

250 0 100 250

FIGURE 2-8

PERMANENT LANDFILL GAS SAMPLING LOCATIONS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

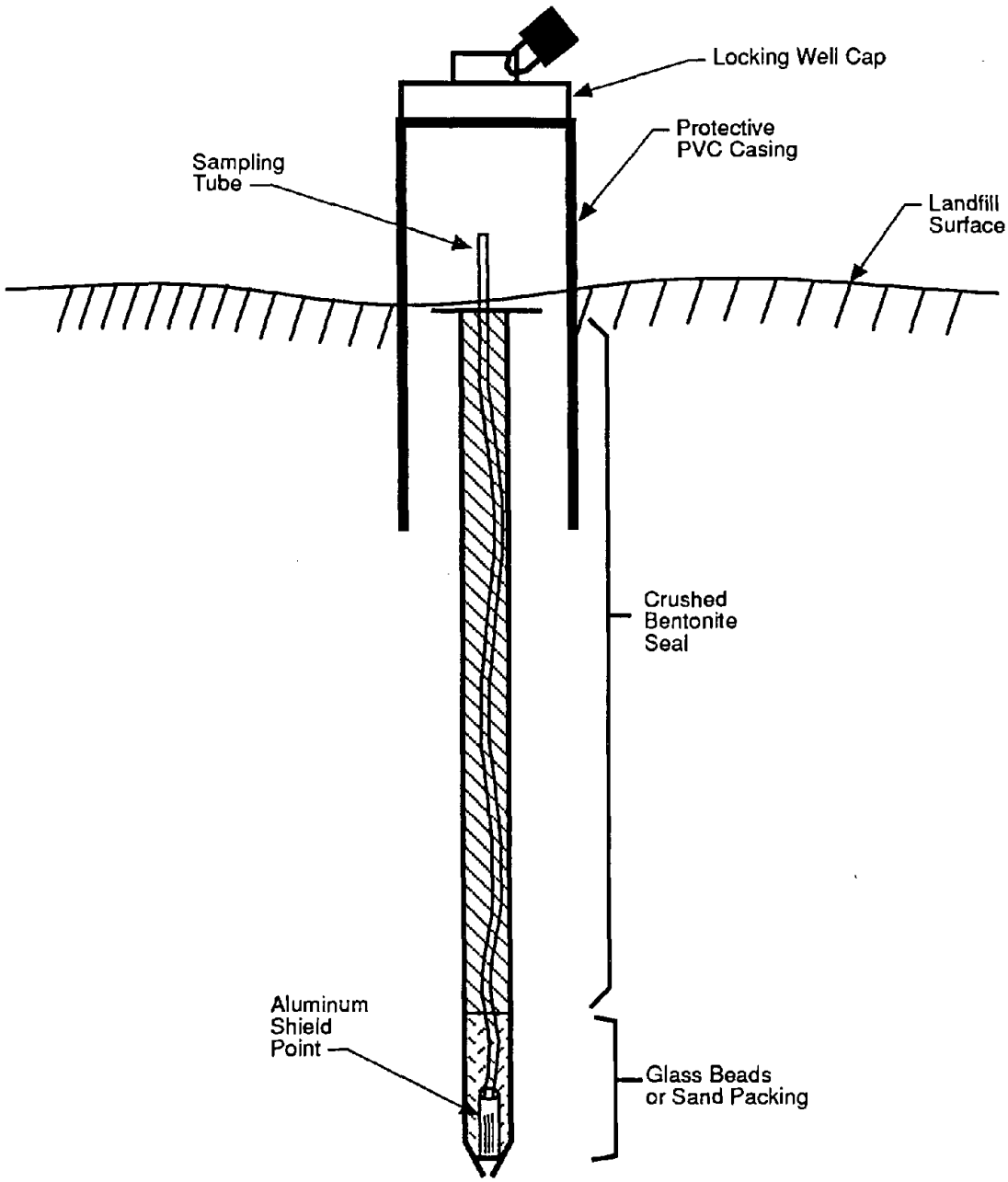


FIGURE 2-9. PERMANENT LANDFILL GAS SAMPLING POINT CONSTRUCTION DIAGRAM

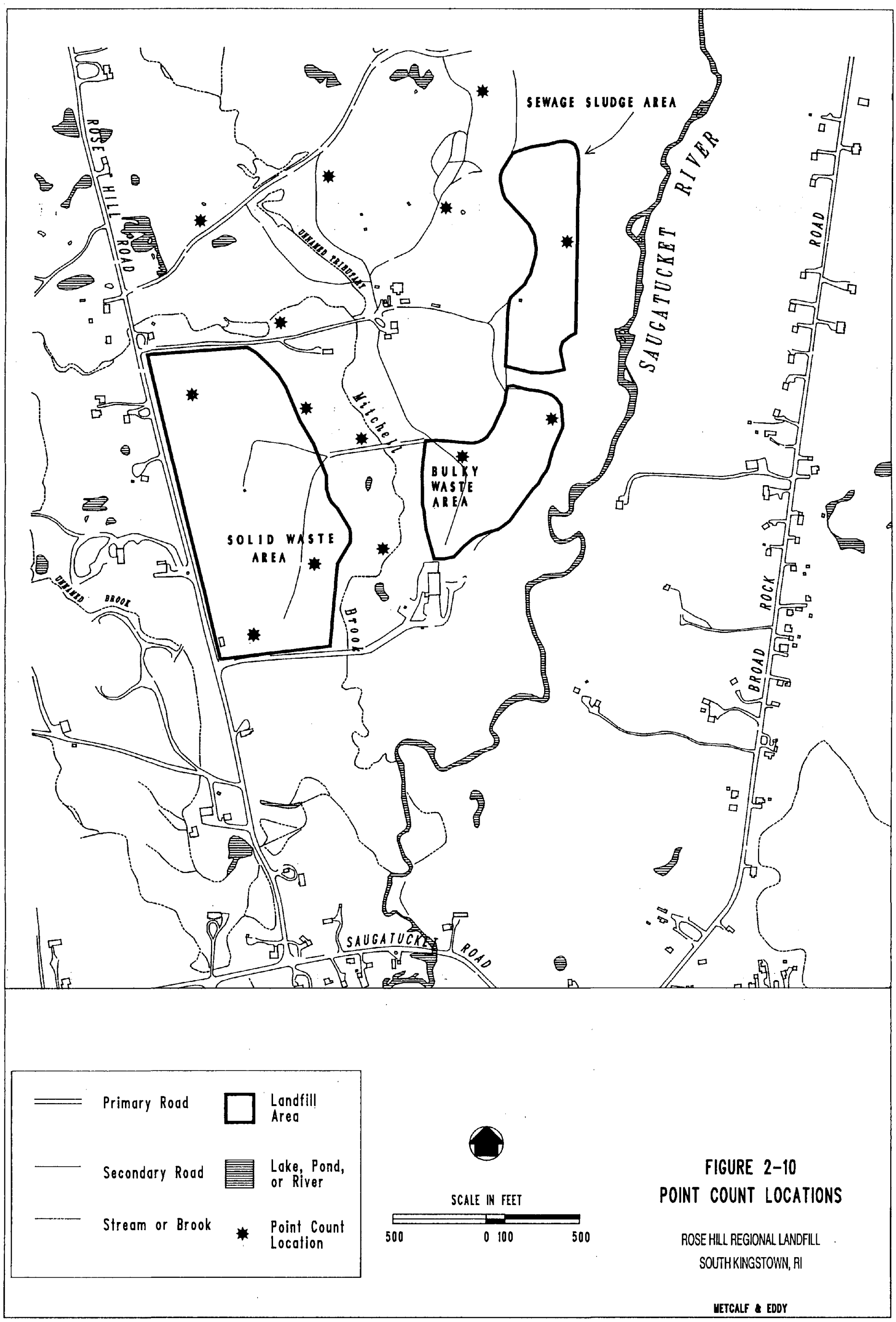


FIGURE 2-10
POINT COUNT LOCATIONS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

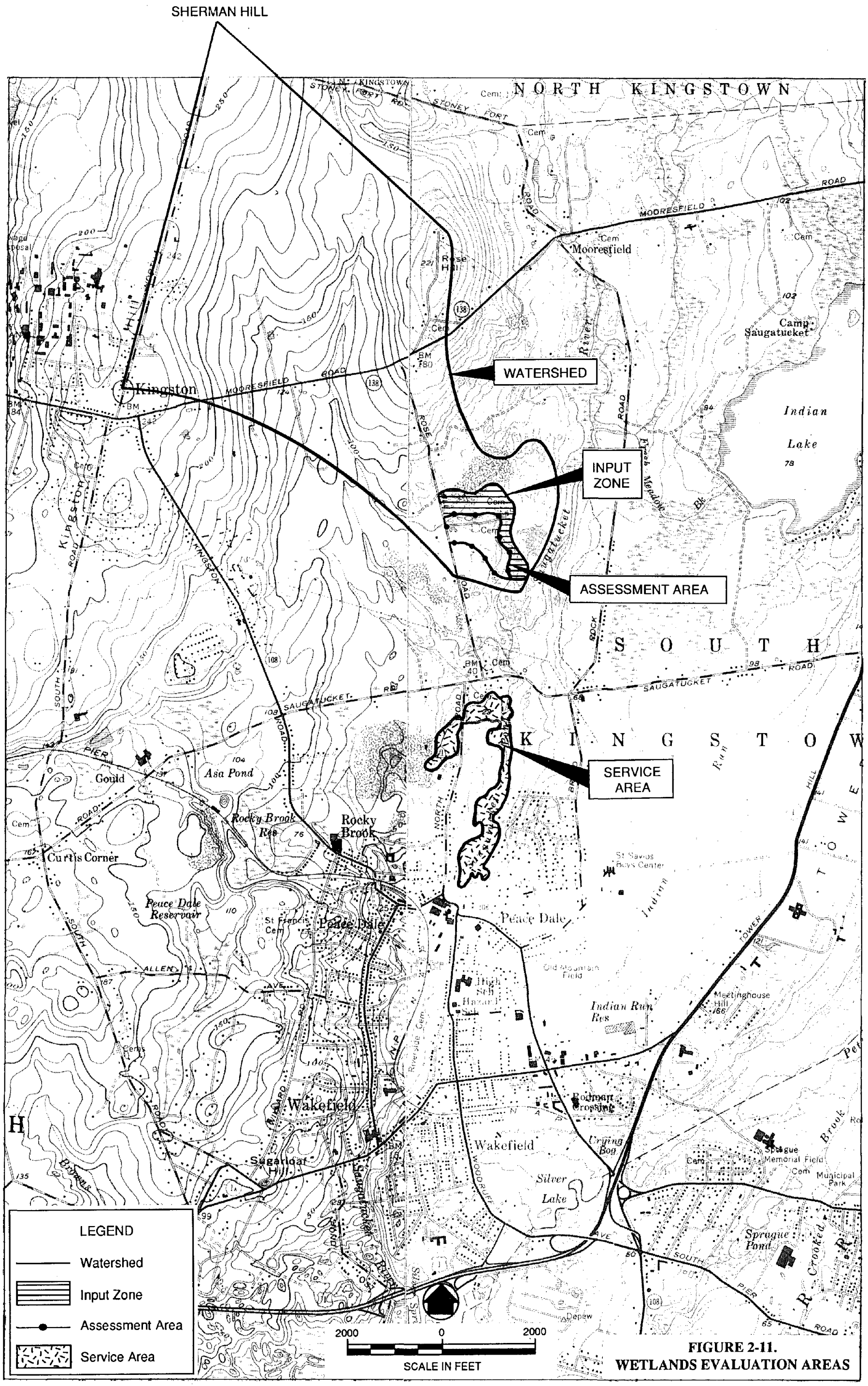
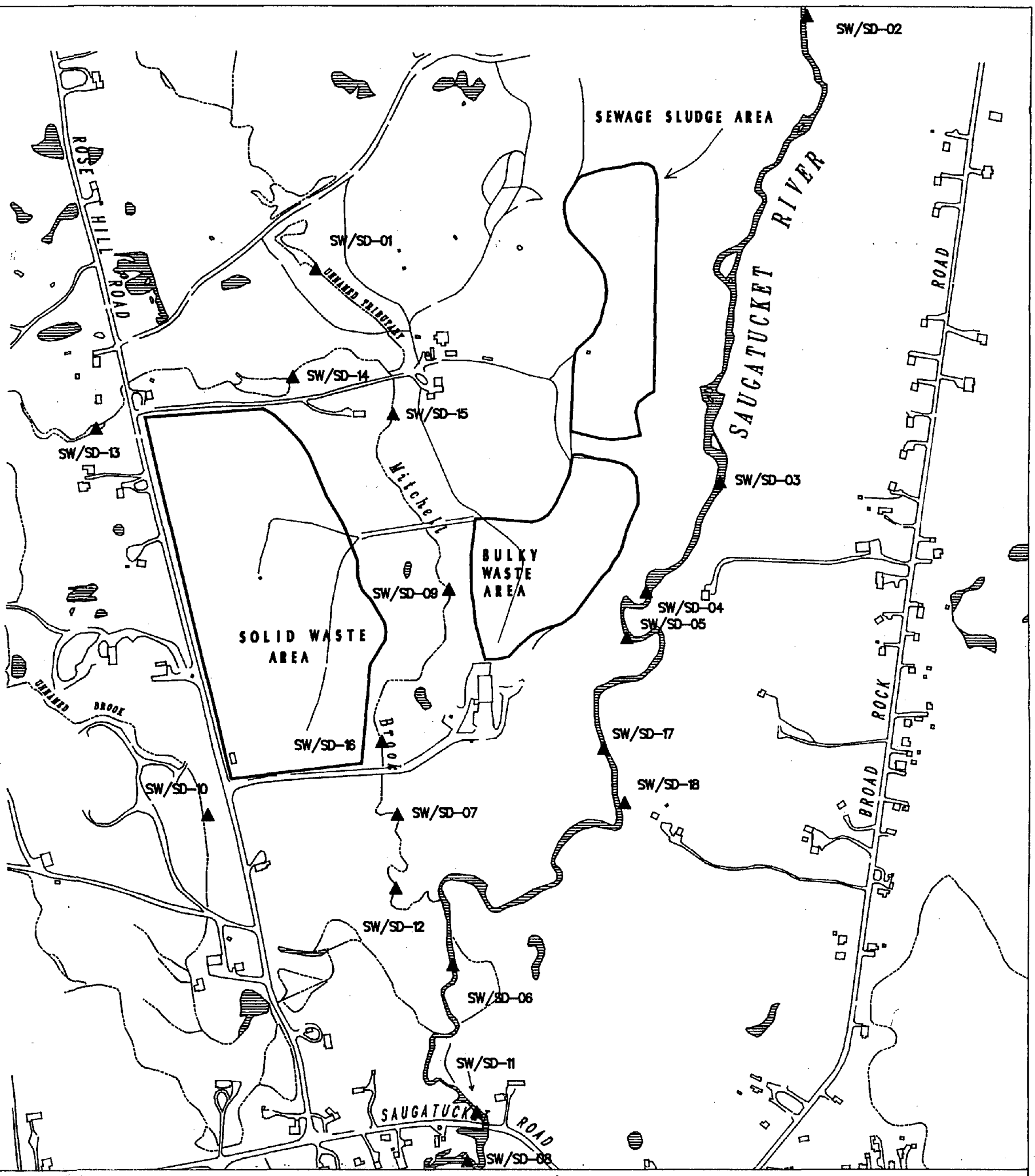


FIGURE 2-11.
WETLANDS EVALUATION AREAS



Note: SW/SD-11 was relocated to the Saugatucket River in September/ October, 1991, as the originally proposed location was not sampled due to lack of water.

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Surface Water/ Sediment Sampling Location

SCALE IN FEET

500 0 100 500

FIGURE 2-12

SURFACE WATER/SEDIMENT LOCATIONS ESTABLISHED DURING THE SITE RECONNAISSANCE

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

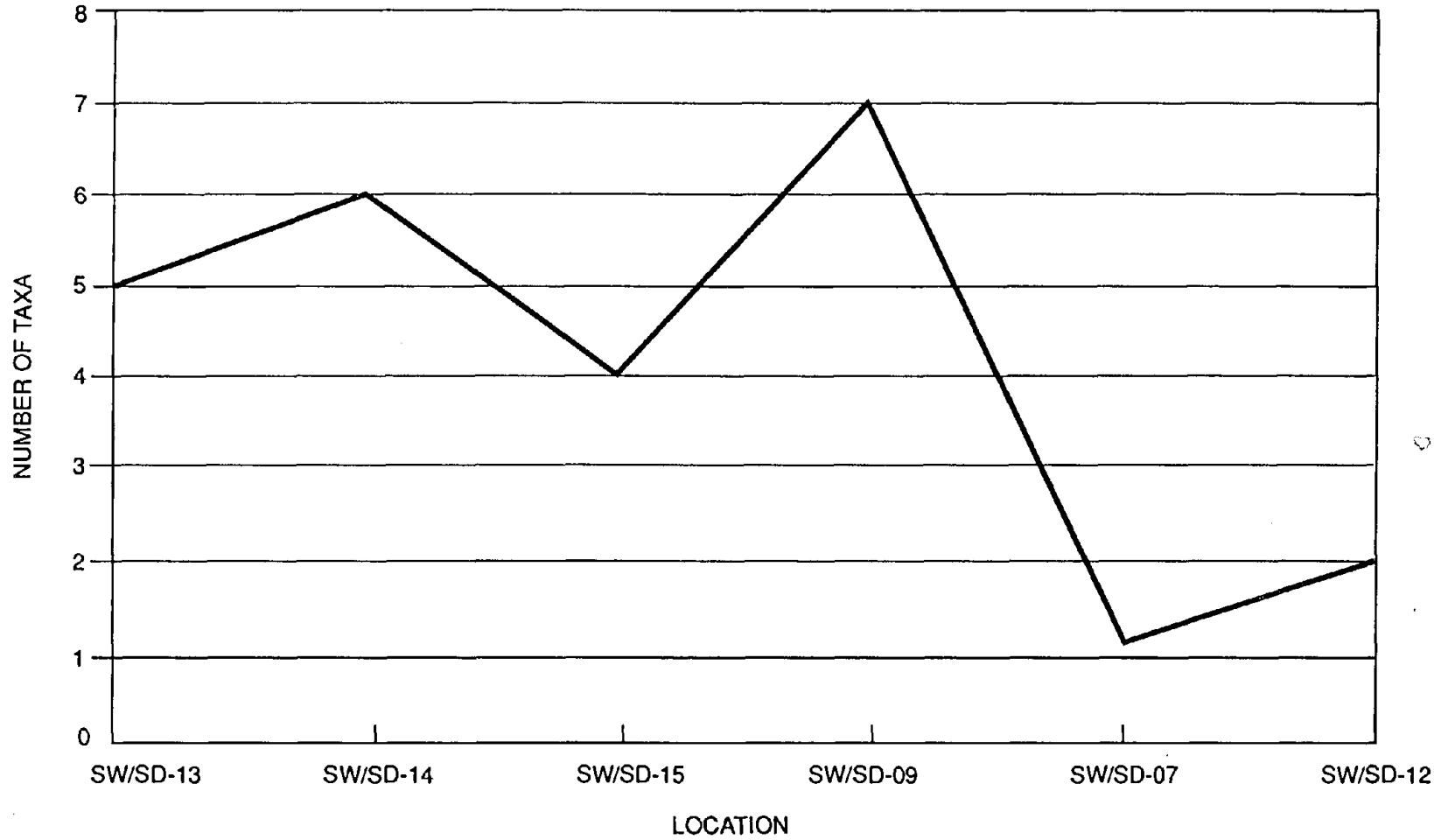


FIGURE 2-13. NUMBER OF BENTHIC TAXA OBSERVED IN MITCHELL BROOK DURING THE RECONNAISSANCE SURVEY

2747JP/94E

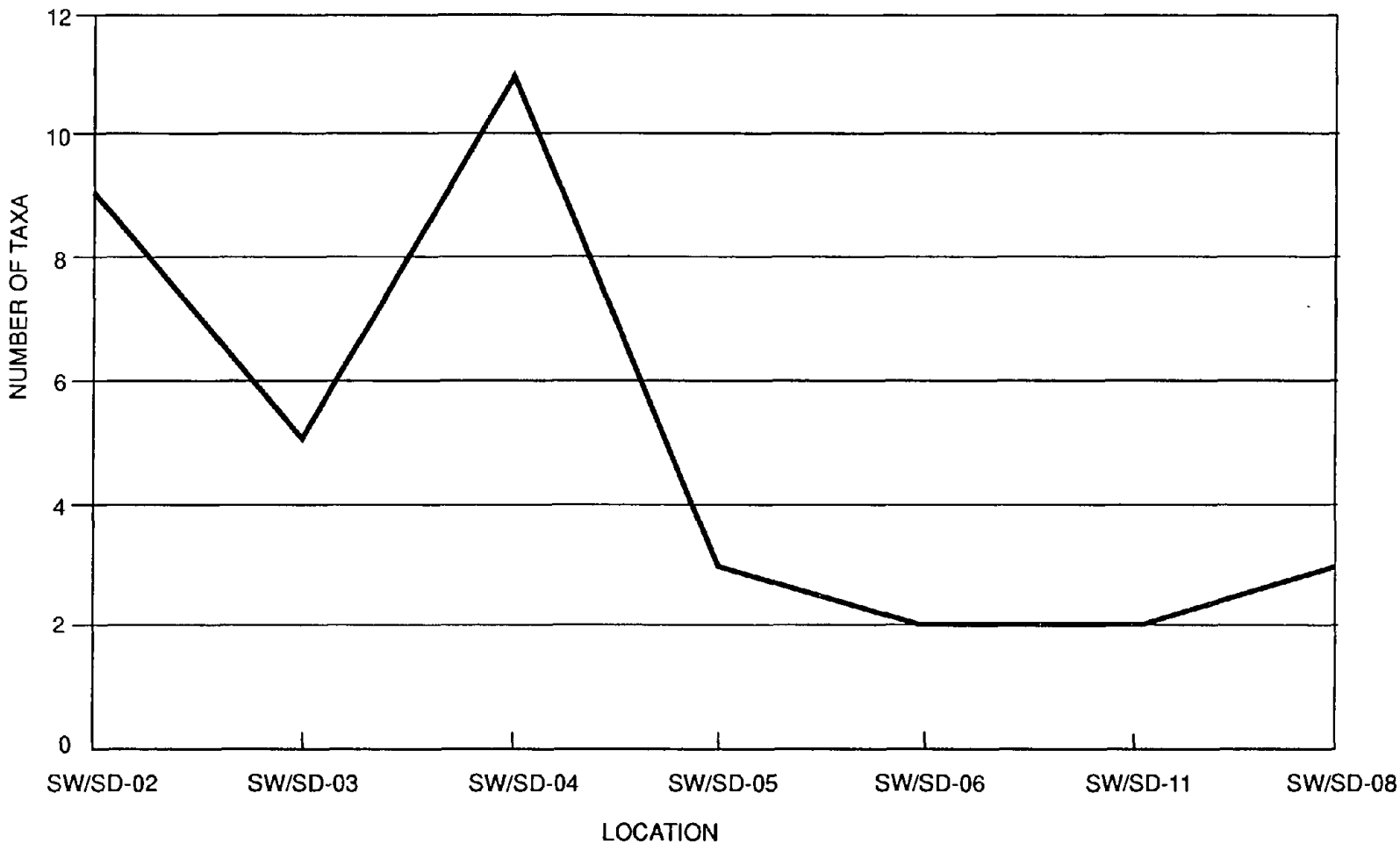


FIGURE 2-14. NUMBER OF BENTHIC TAXA OBSERVED IN THE SAUGATUCKET RIVER DURING THE RECONNAISSANCE SURVEY

2747JP

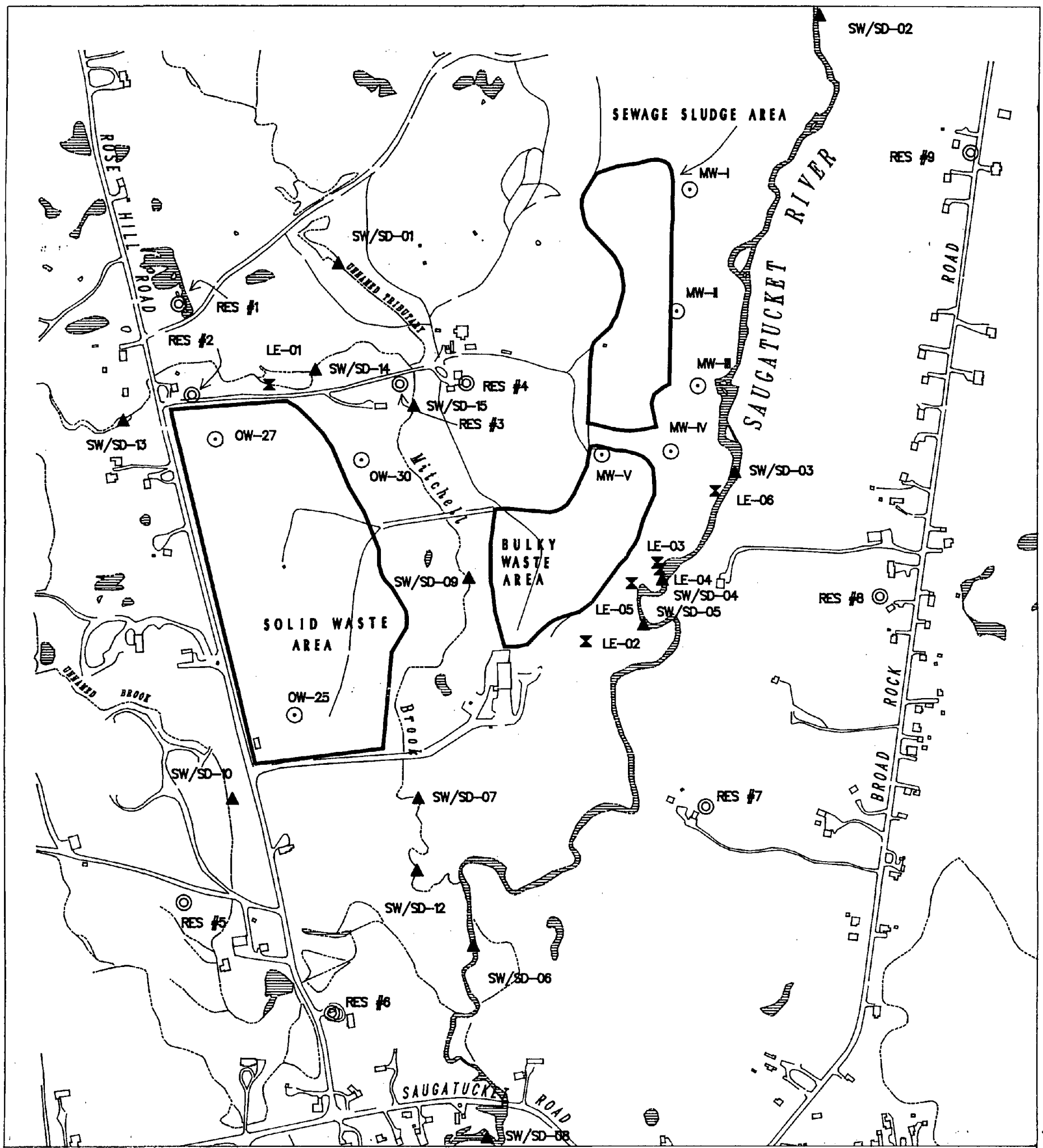


FIGURE 2-15

SITE RECONNAISSANCE SAMPLING LOCATIONS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

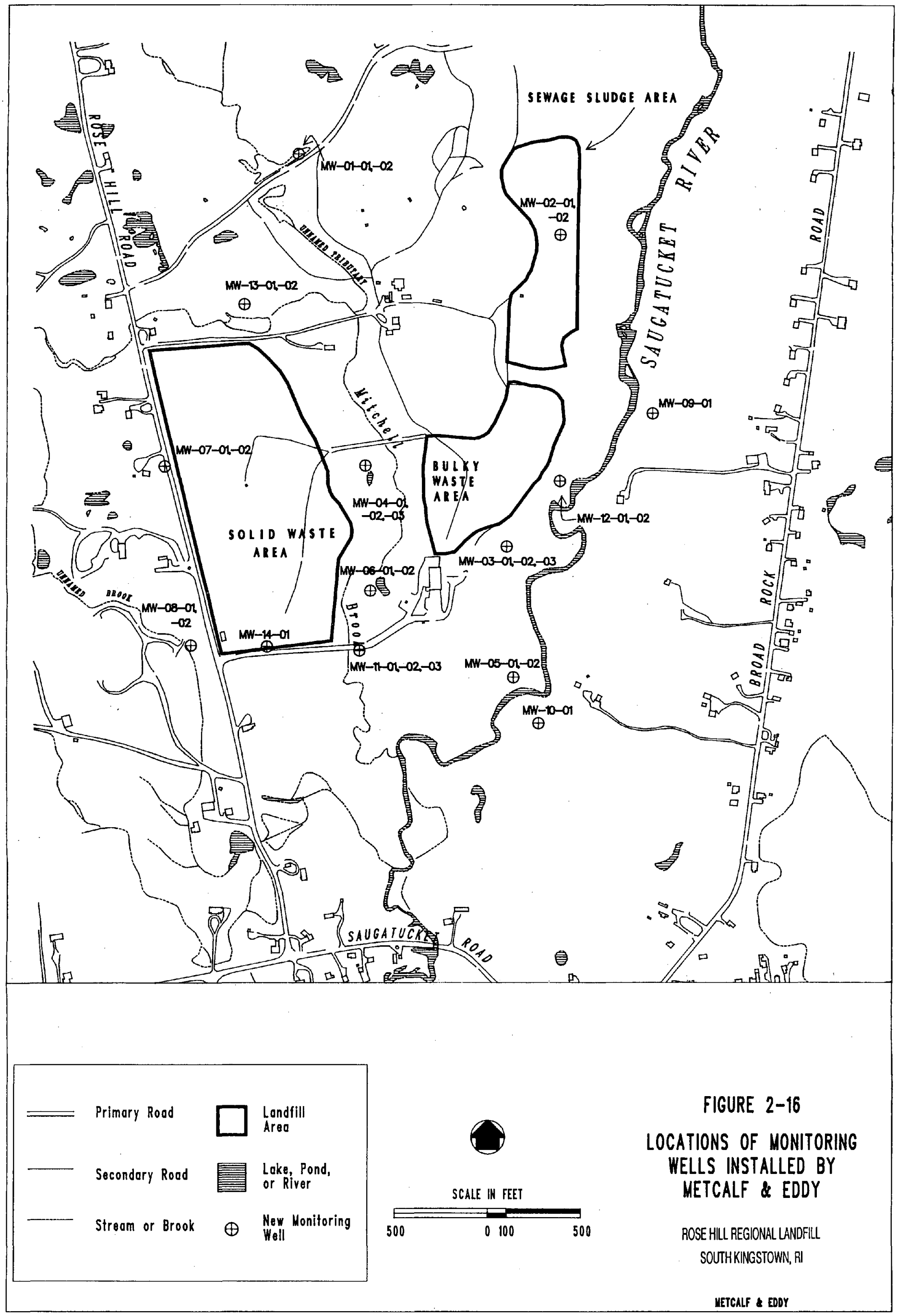
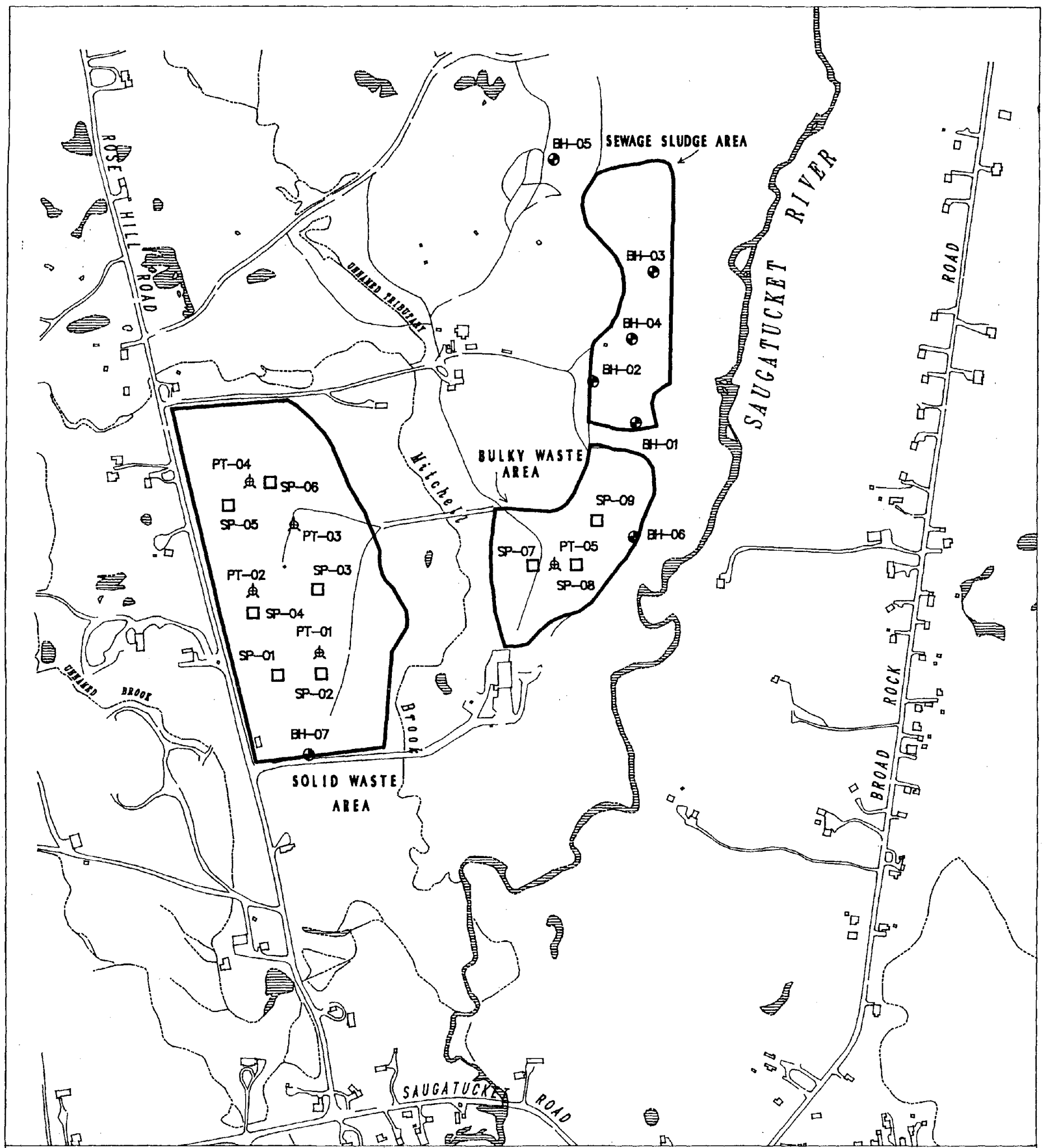


FIGURE 2-16

LOCATIONS OF MONITORING WELLS INSTALLED BY METCALF & EDDY

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
Settlement Platform
Permeability Test
Landfill Analytical Soil Boring

SCALE IN FEET
500 0 100 500

FIGURE 2-17

LOCATIONS OF SETTLEMENT PLATFORMS, PERMEABILITY TESTS, AND LANDFILL ANALYTICAL SOIL BORINGS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

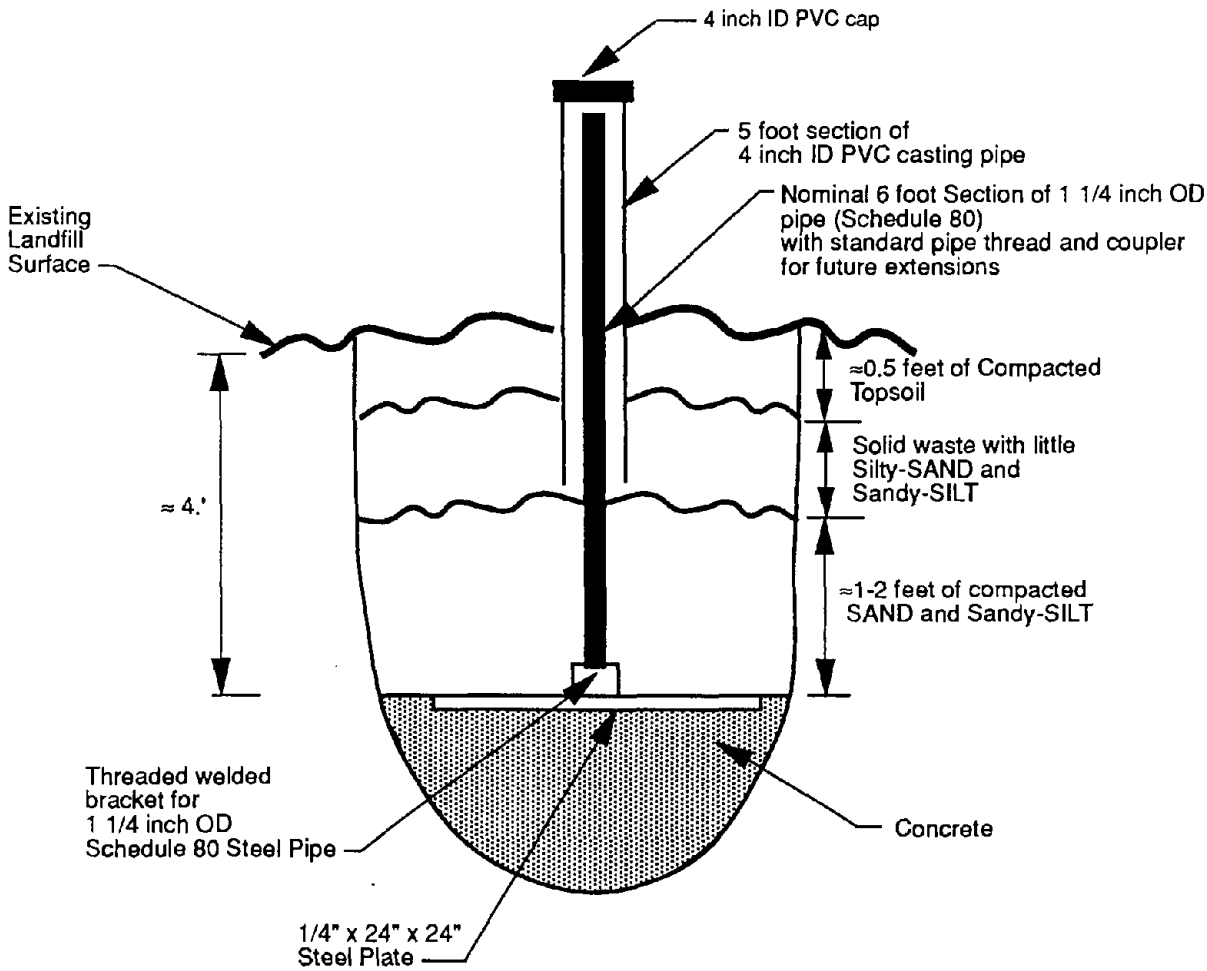


FIGURE 2-18. SETTLEMENT PLATFORM CONSTRUCTION DETAILS

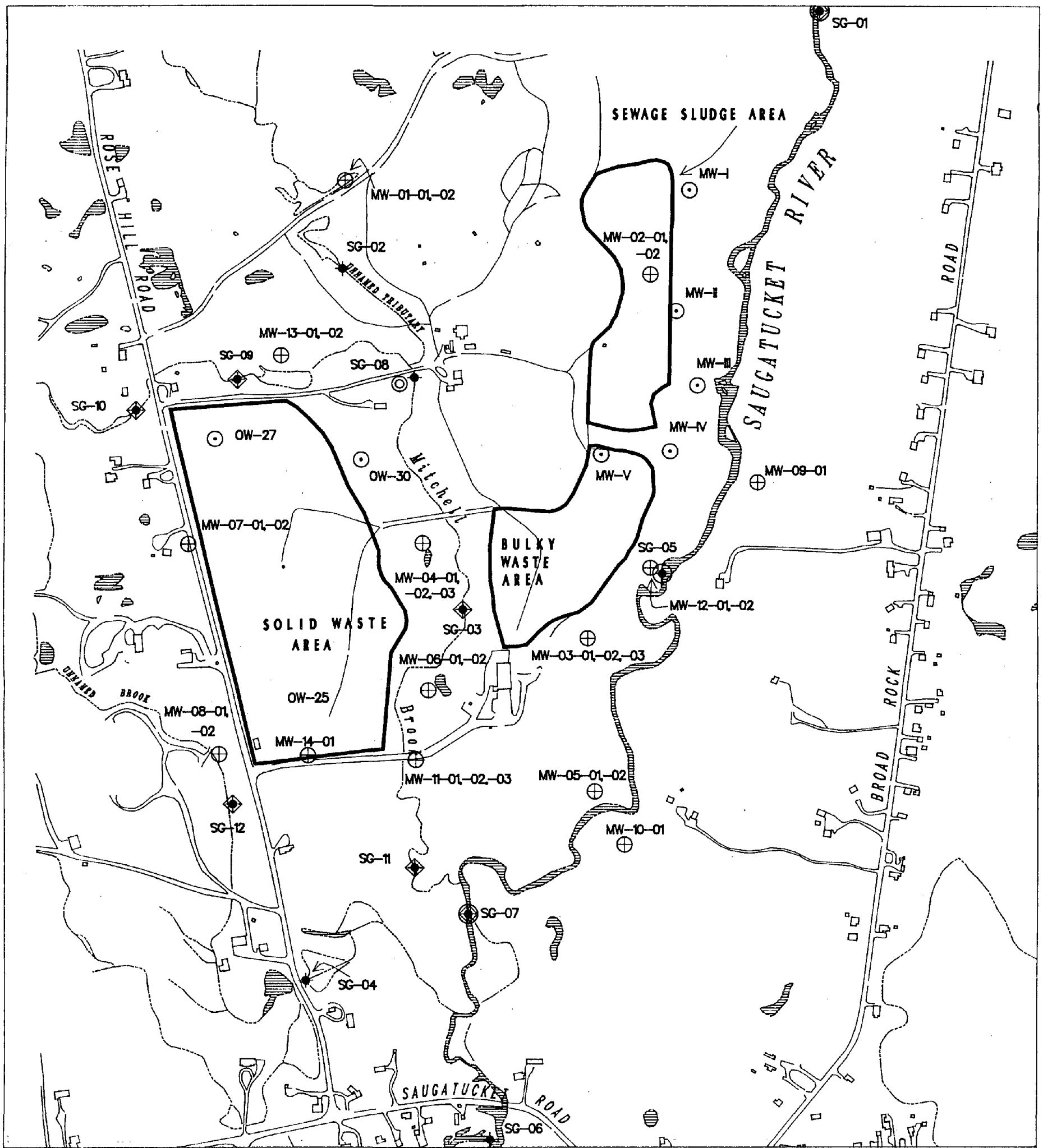
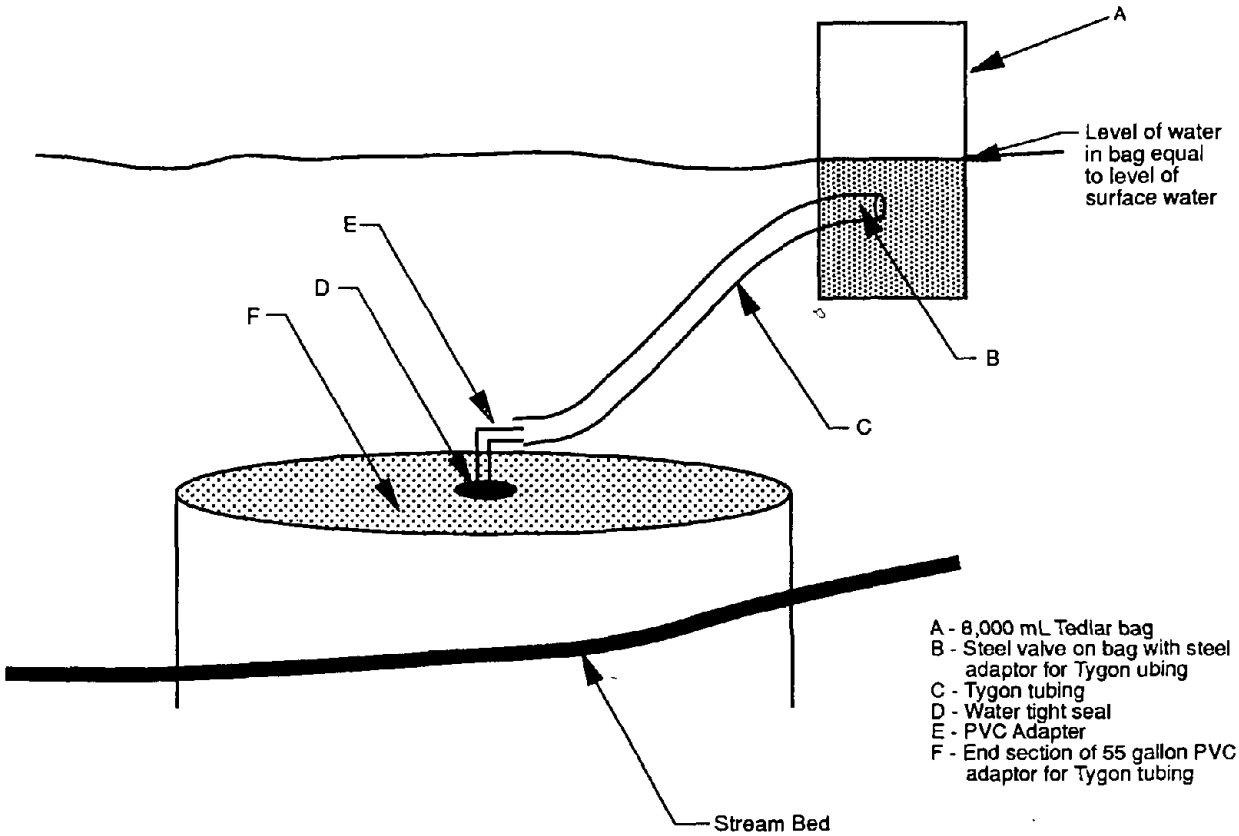


FIGURE 2-19

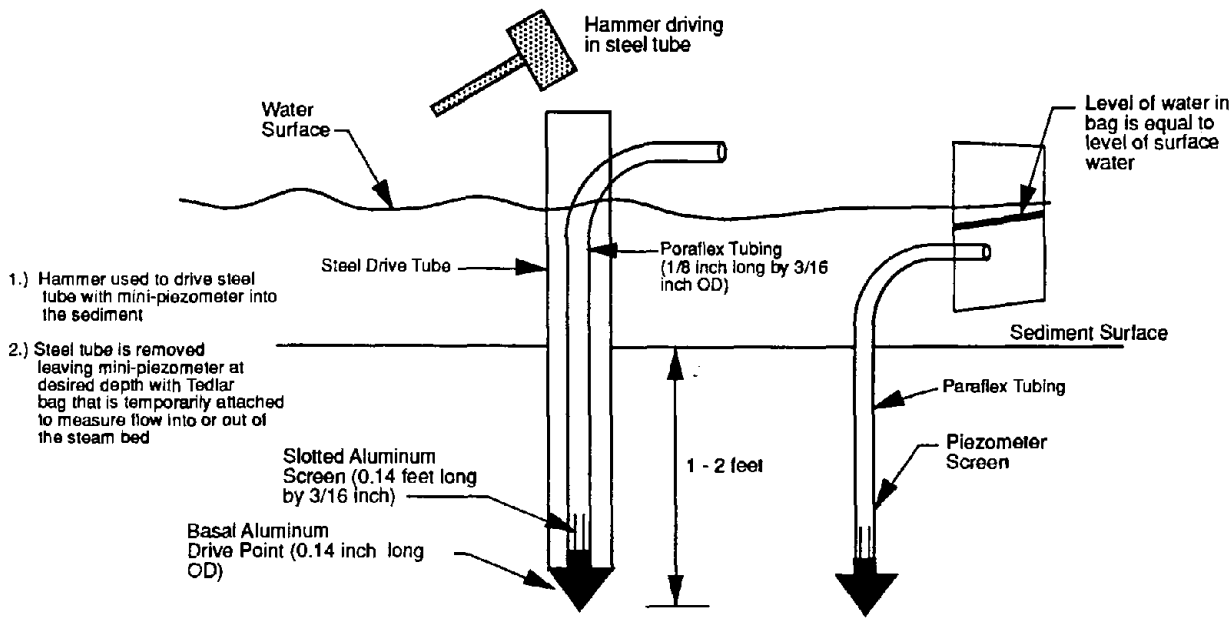
LOCATIONS OF SURFACE WATER MONITORING STATIONS AND GROUNDWATER MONITORING WELLS USED IN THE HYDRO-GEOLOGICAL INVESTIGATION

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

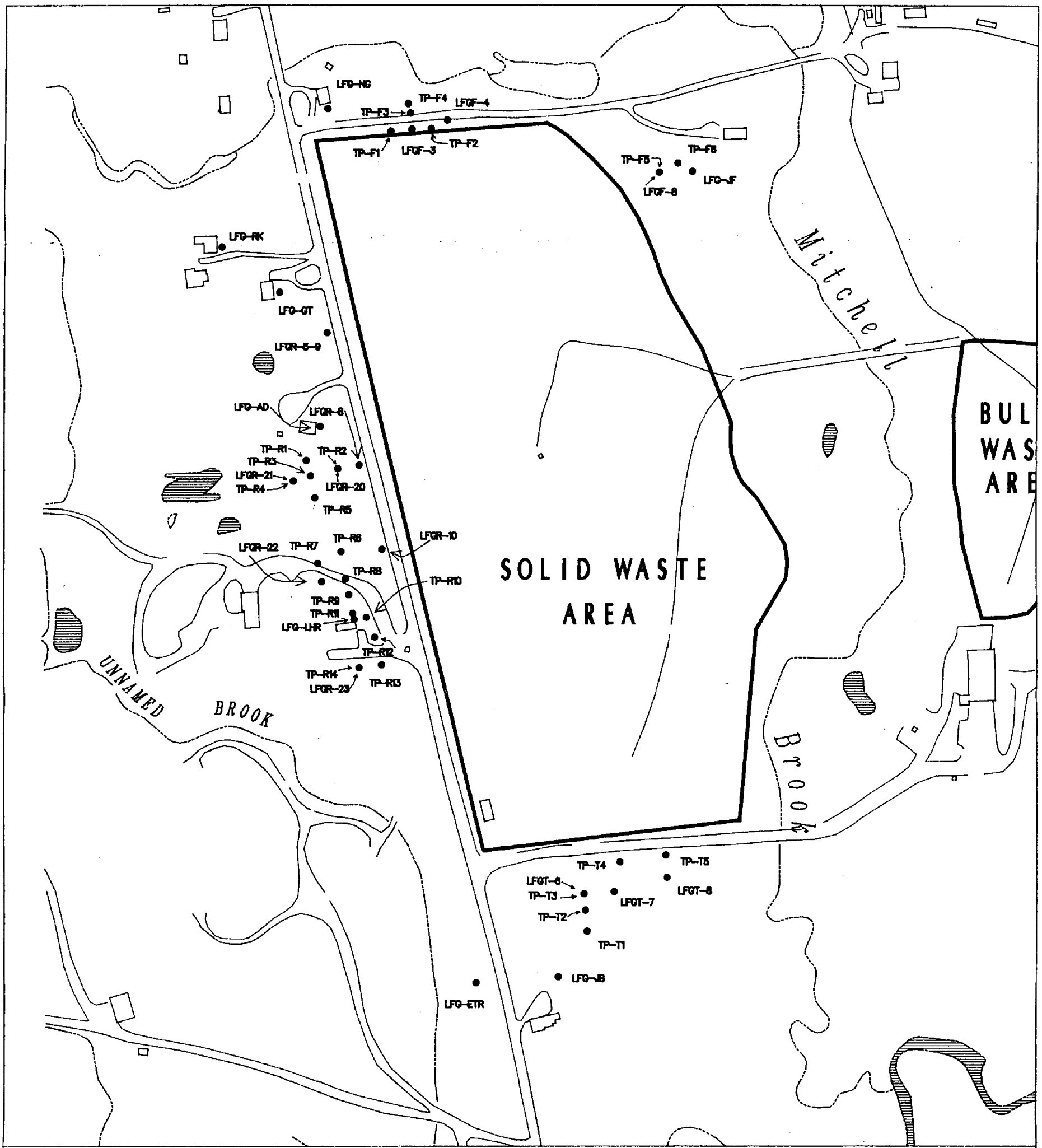


SEEPAGE METER



MINI-PIEZOMETER

FIGURE 2-20.
SEEPAGE METER AND MINI-PIEZOMETER CONSTRUCTION DETAIL



NOTES: LFG - Permanent points.
TP - Temporary points sampled only in December, 1991.
Some points have both an LFG and a TP label. These points were first sampled as temporary points and then installed as permanent sampling locations.

Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
December 1991 Sampling Locations

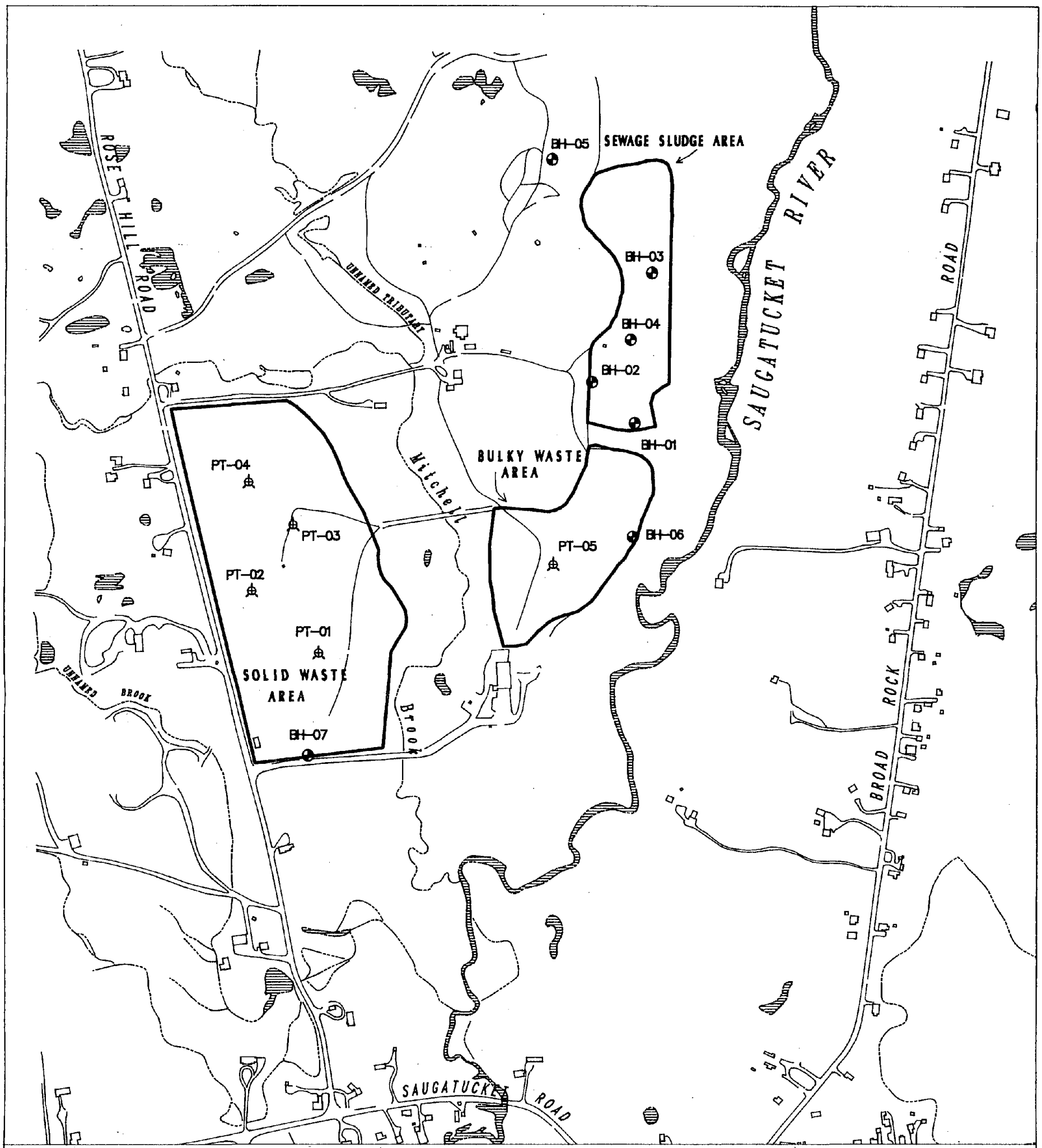
SCALE IN FEET
250 0 100 250

FIGURE 2-21

LANDFILL GAS LOCATIONS SAMPLED IN DECEMBER, 1991

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Permeability Test

Landfill Analytical Soil Boring

SCALE IN FEET

500 0 100 500

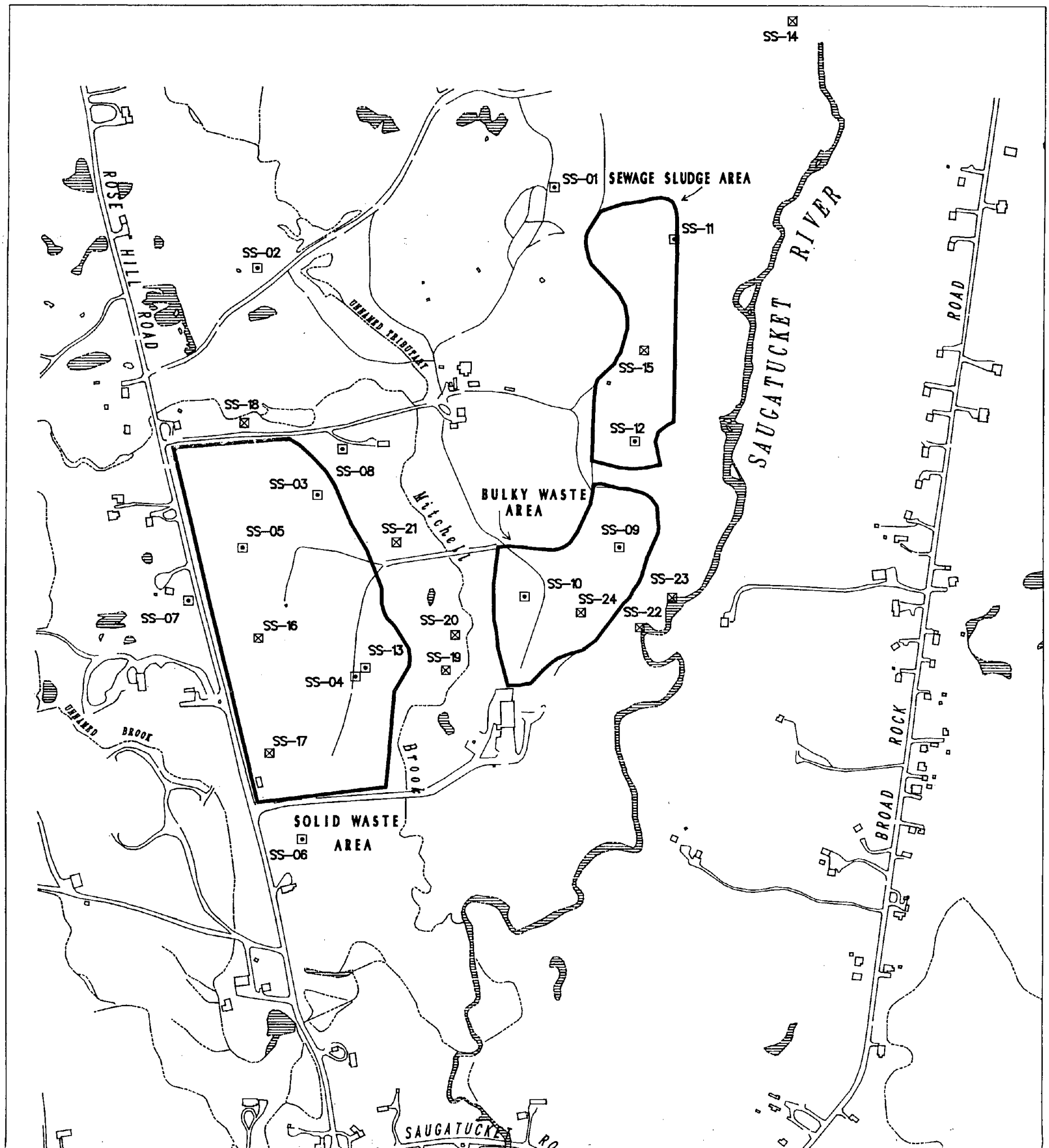
FIGURE 2-22

LOCATIONS OF PERMEABILITY TESTS AND LANDFILL ANALYTICAL SOIL BORINGS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Surface Soils, 0-6" Sampling Depth

Surface Soils, 0-12" Sampling Depth

SCALE IN FEET

500 0 100 500

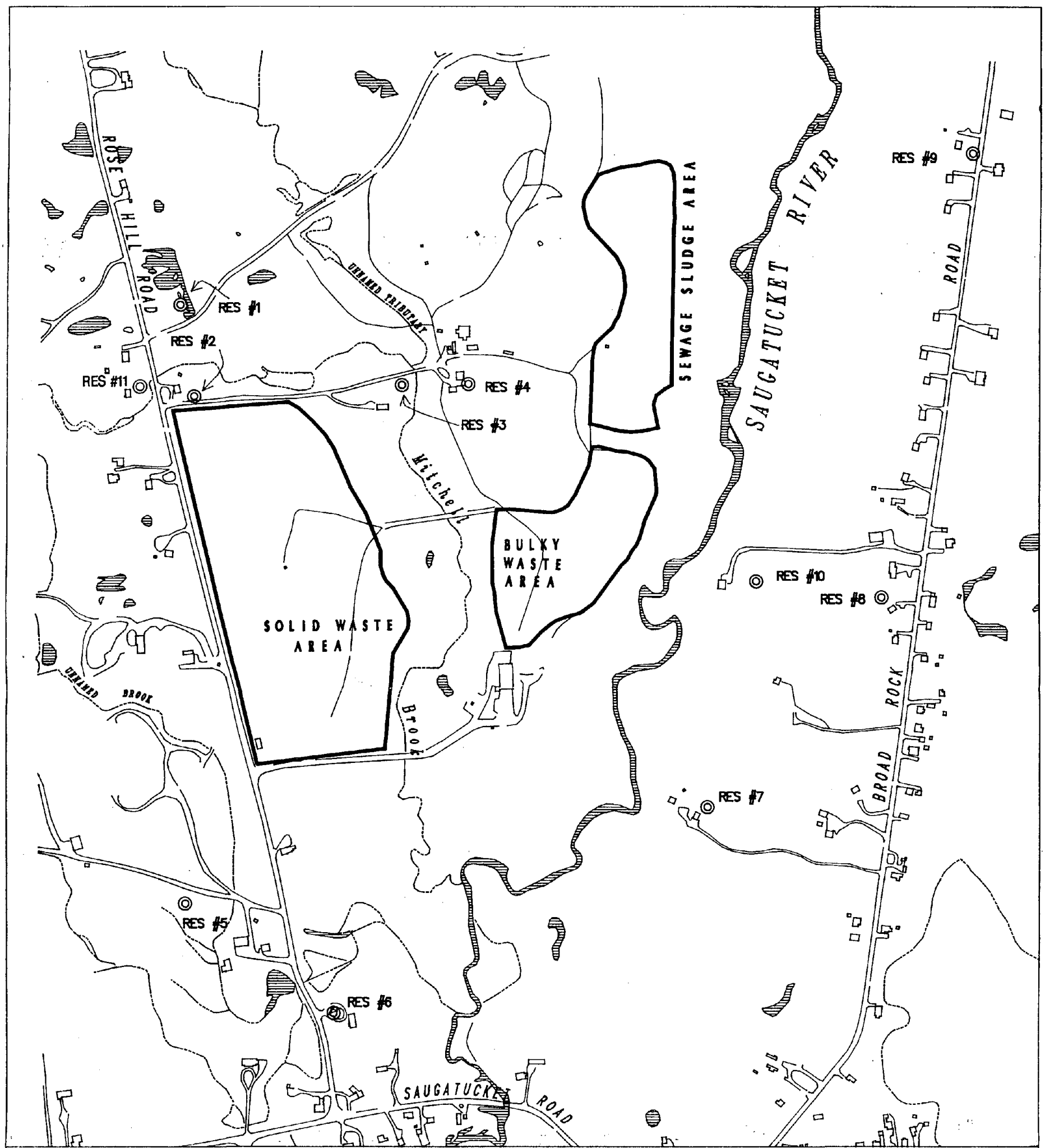
FIGURE 2-23

SURFACE SOIL SAMPLING LOCATIONS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Residential Well

SCALE IN FEET

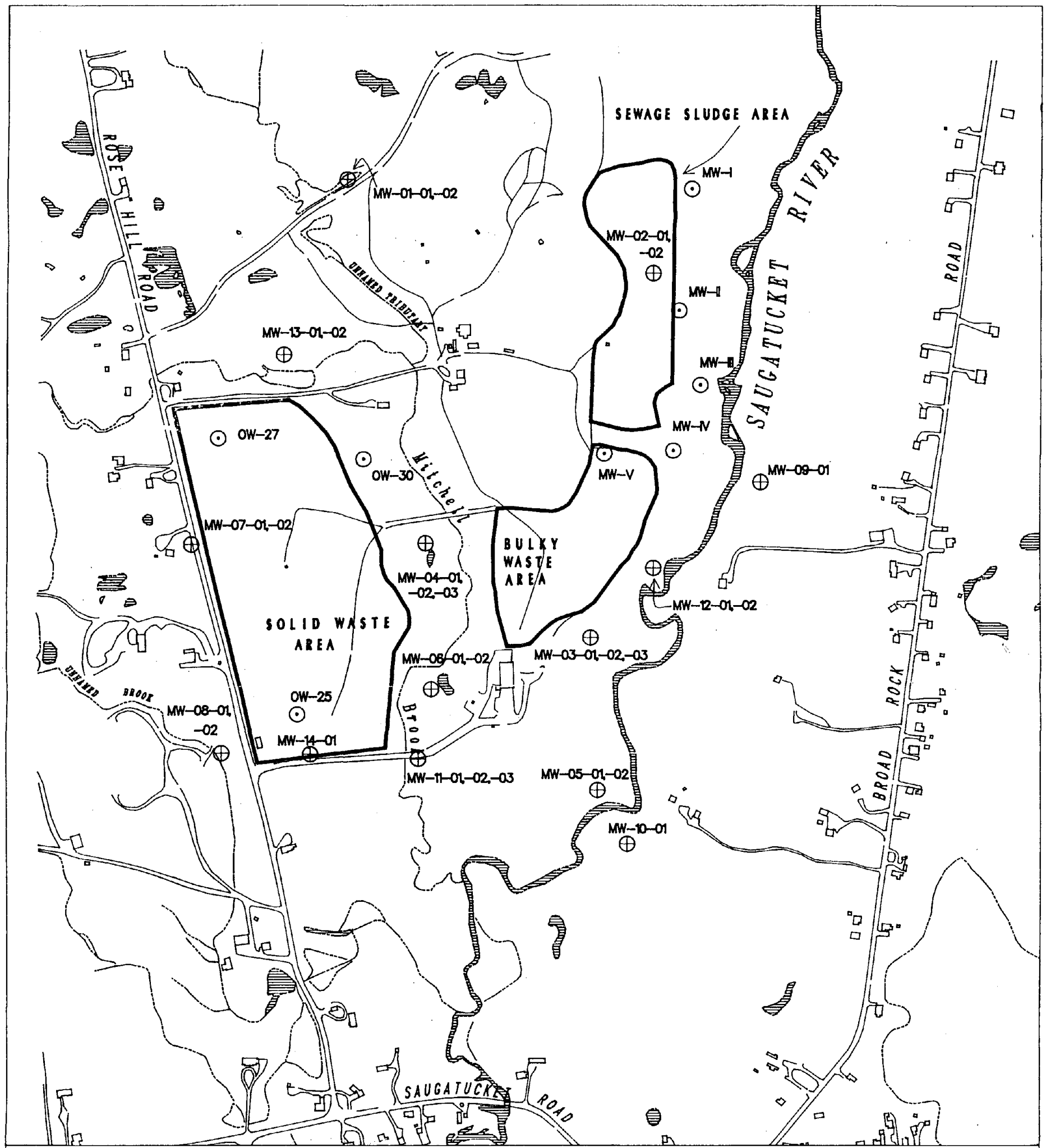
500 0 100 500

FIGURE 2-24

RESIDENTIAL WELL LOCATIONS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Existing Monitoring Well

New Monitoring Well

SCALE IN FEET

500 0 100 500

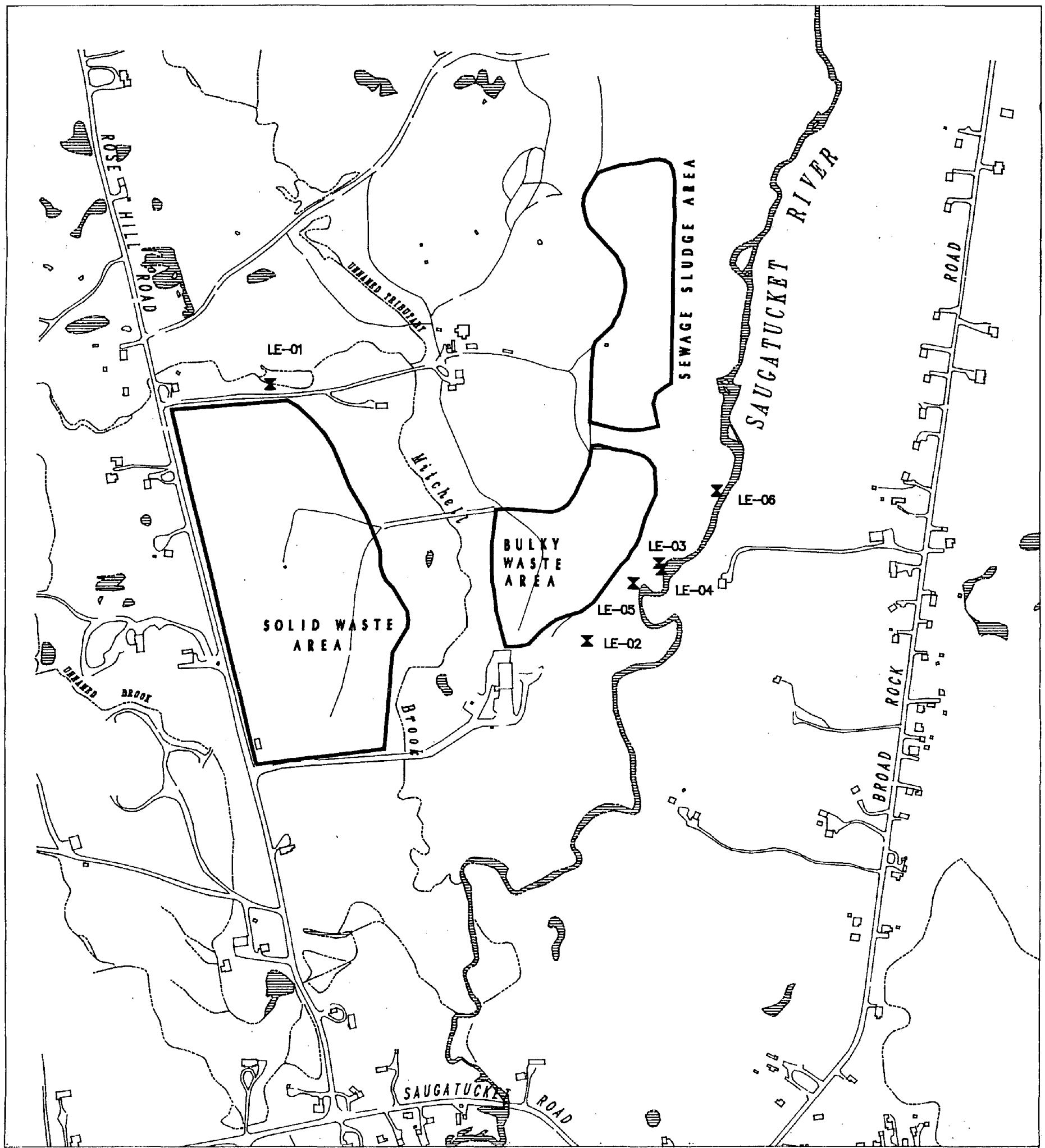
FIGURE 2-25

ON-SITE MONITORING WELL SAMPLING LOCATIONS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Leachate Sampling Location

SCALE IN FEET

500 0 100 500

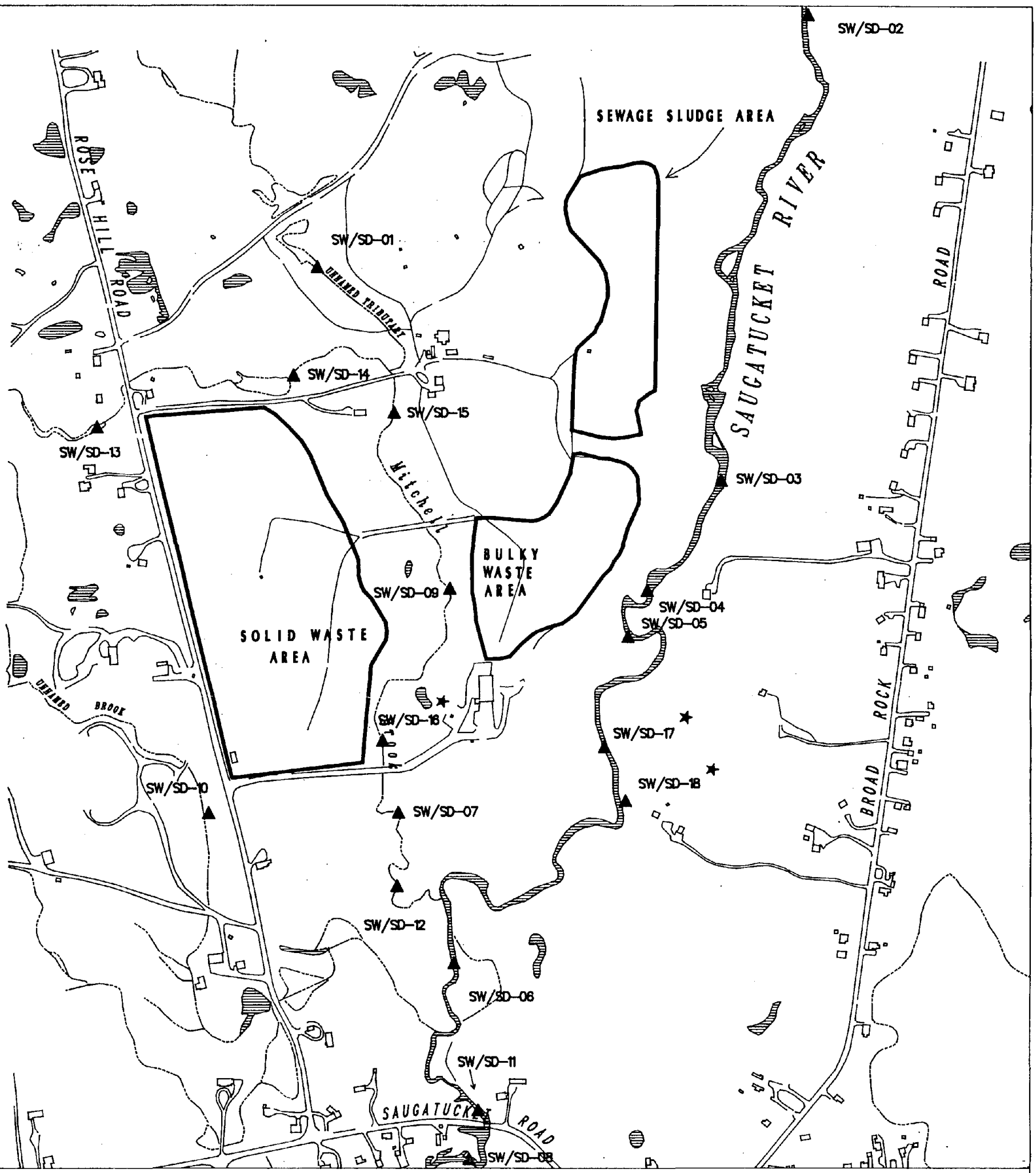
FIGURE 2-26

LEACHATE SAMPLING LOCATIONS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



Note: ✶ - These three locations were added in may 1992 as part of the ecological investigation.

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Surface Water/ Sediment Sampling Location

SCALE IN FEET

500 0 100 500

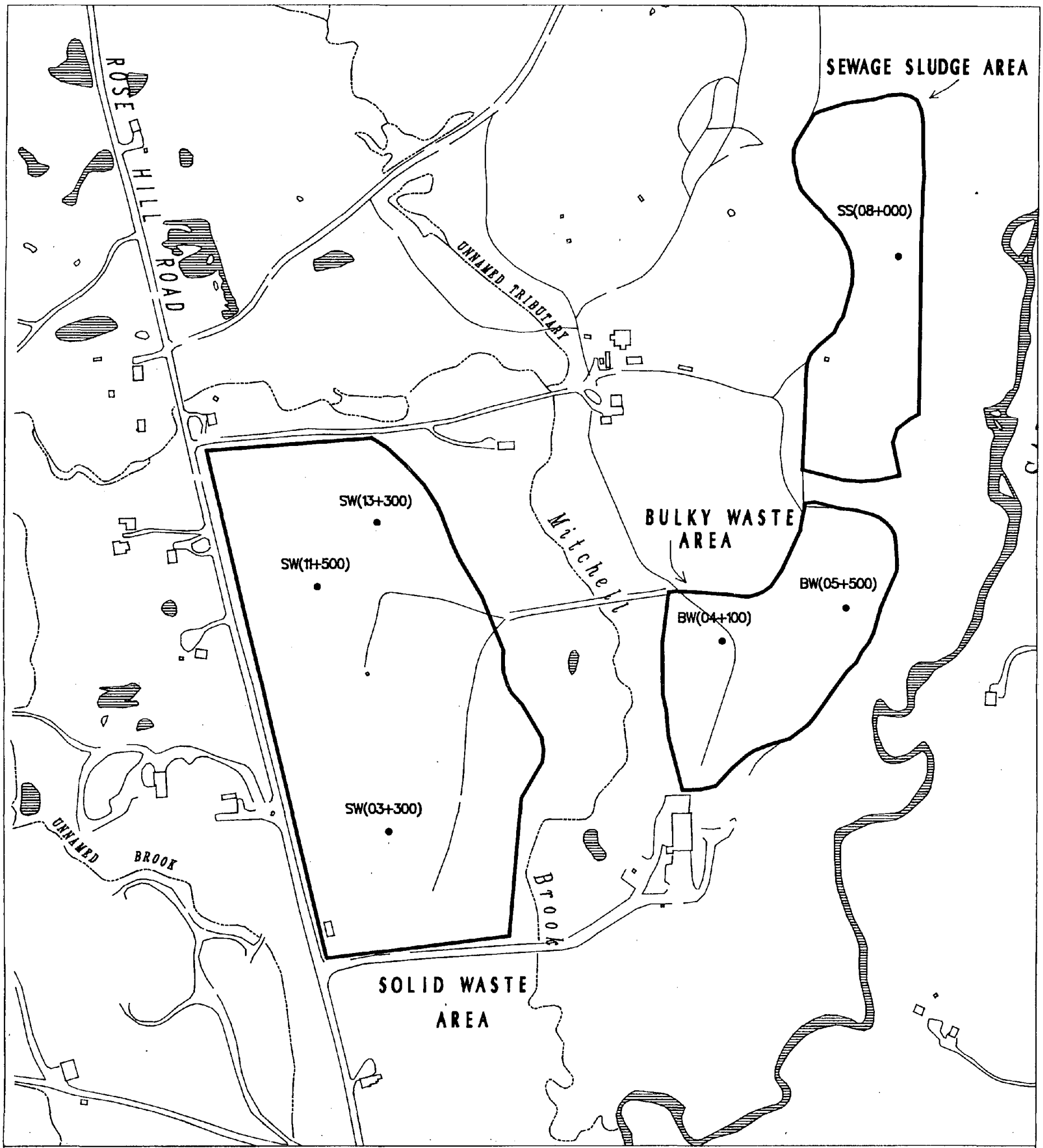
FIGURE 2-27

SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Locations of TO-14 and Reduced Sulfer Analysis of Landfill Gas

SCALE IN FEET

350 0 100 350

FIGURE 2-28

TO-14 and Reduced Sulfur Analysis Sampling Locations

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

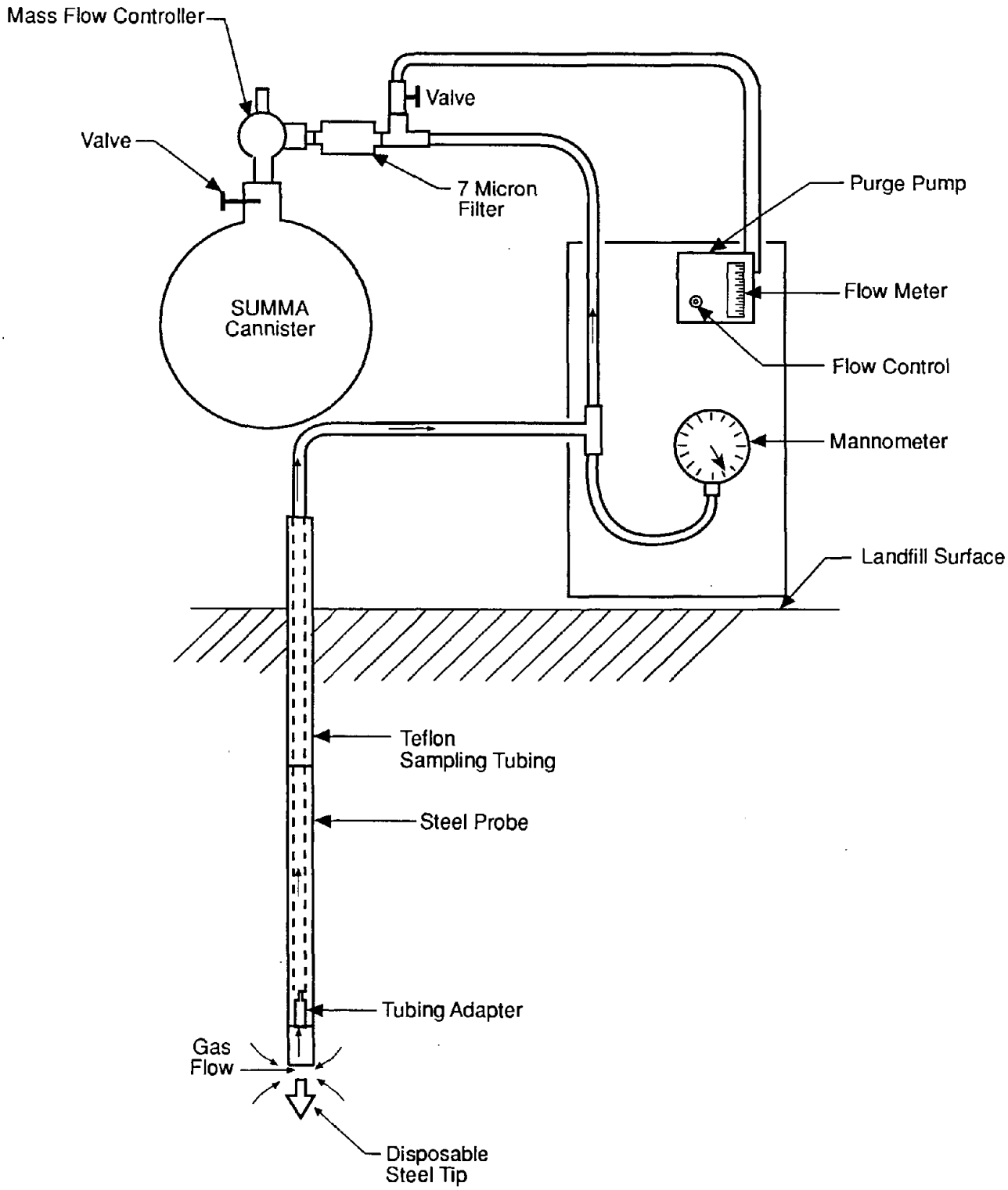


FIGURE 2-29. DIAGRAM OF THE SOIL GAS SAMPLING SYSTEM FOR SUMMA CANNISTER SAMPLING

2605jp

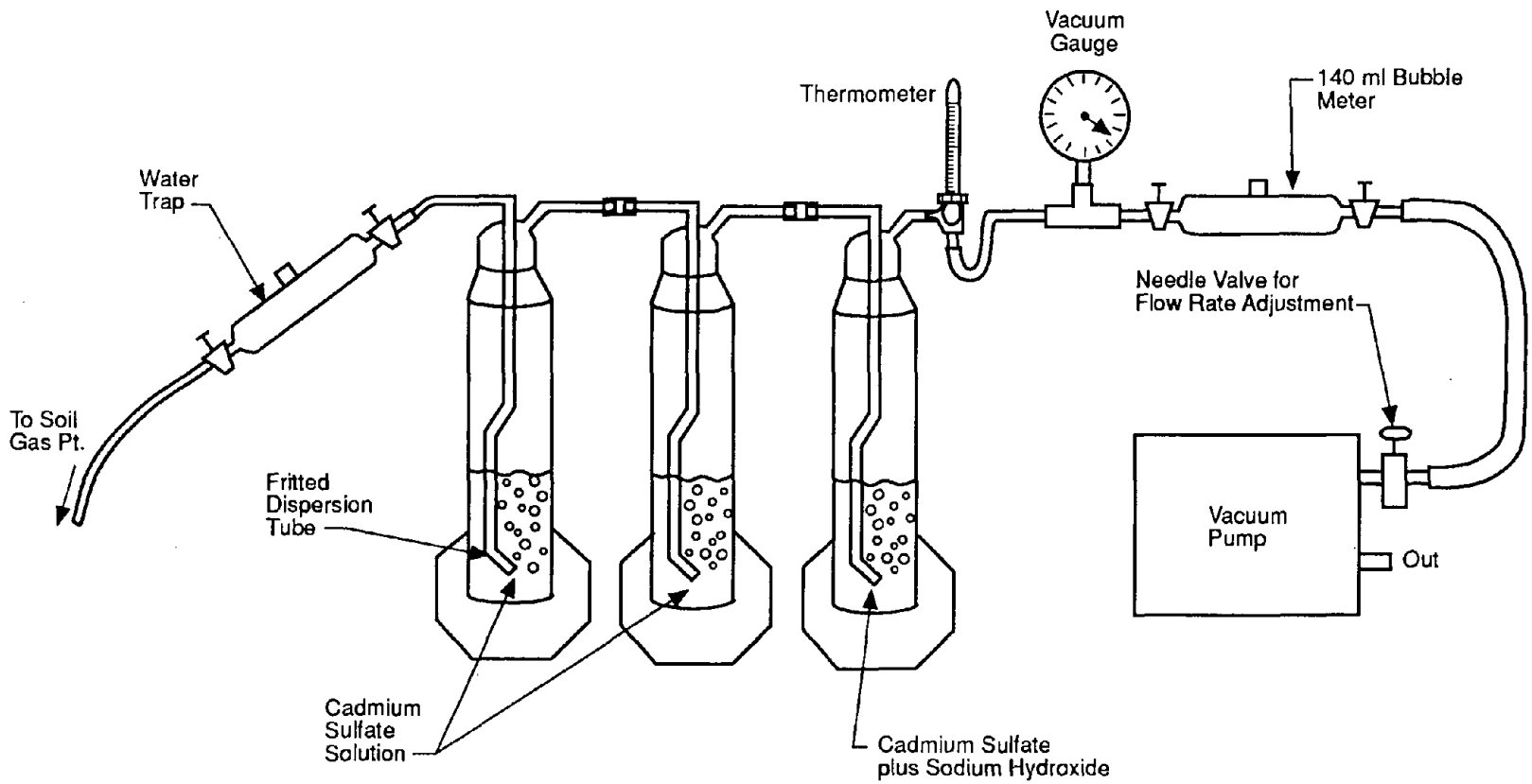
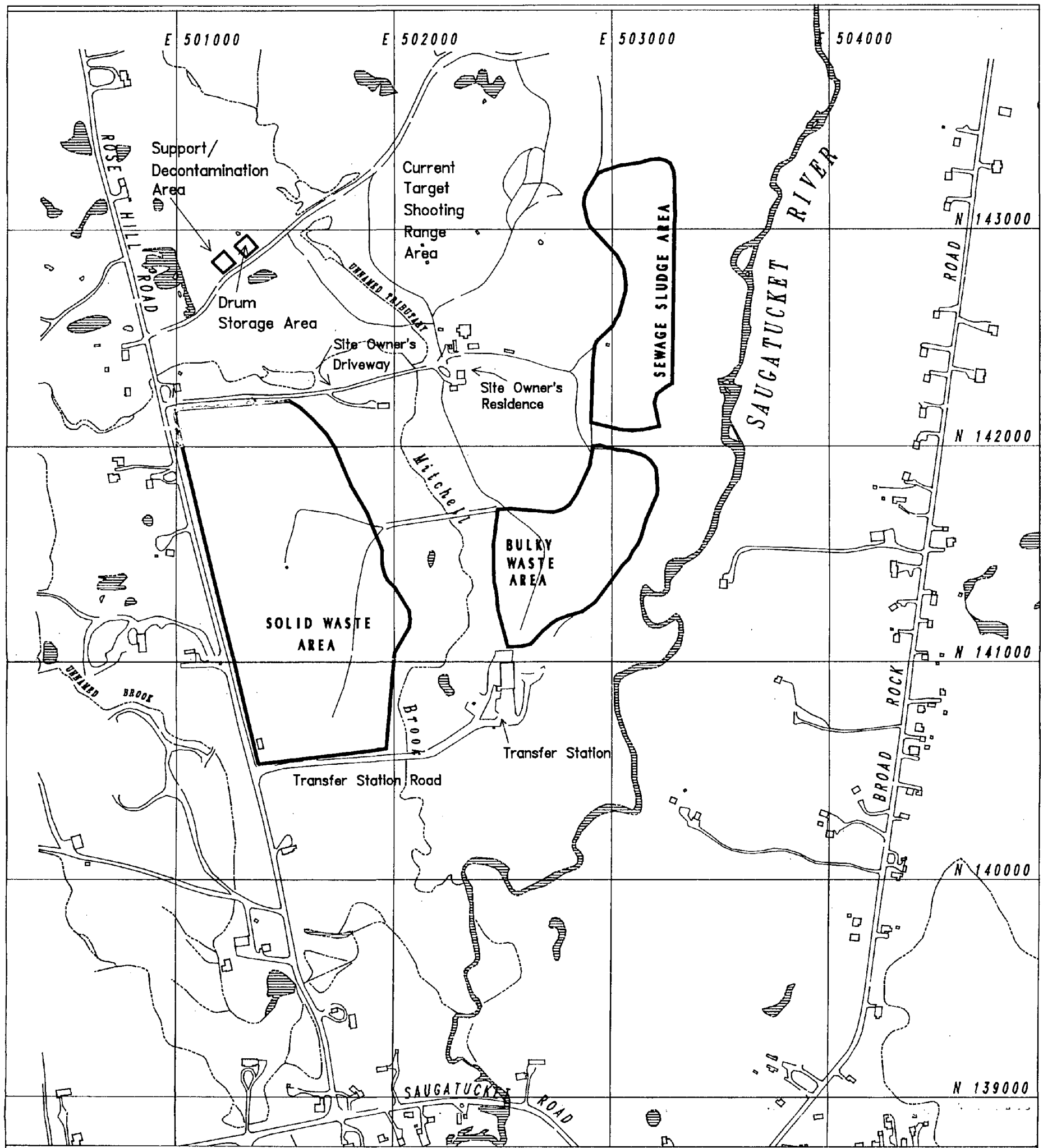


FIGURE 2-30. REDUCED SULFUR SAMPLING SYSTEM

2605JP



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

SCALE IN FEET

500 0 100 500

FIGURE 2-31

SITE STUDY AREA WITH STATE PLANE COORDINATE GRID

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

Section Three

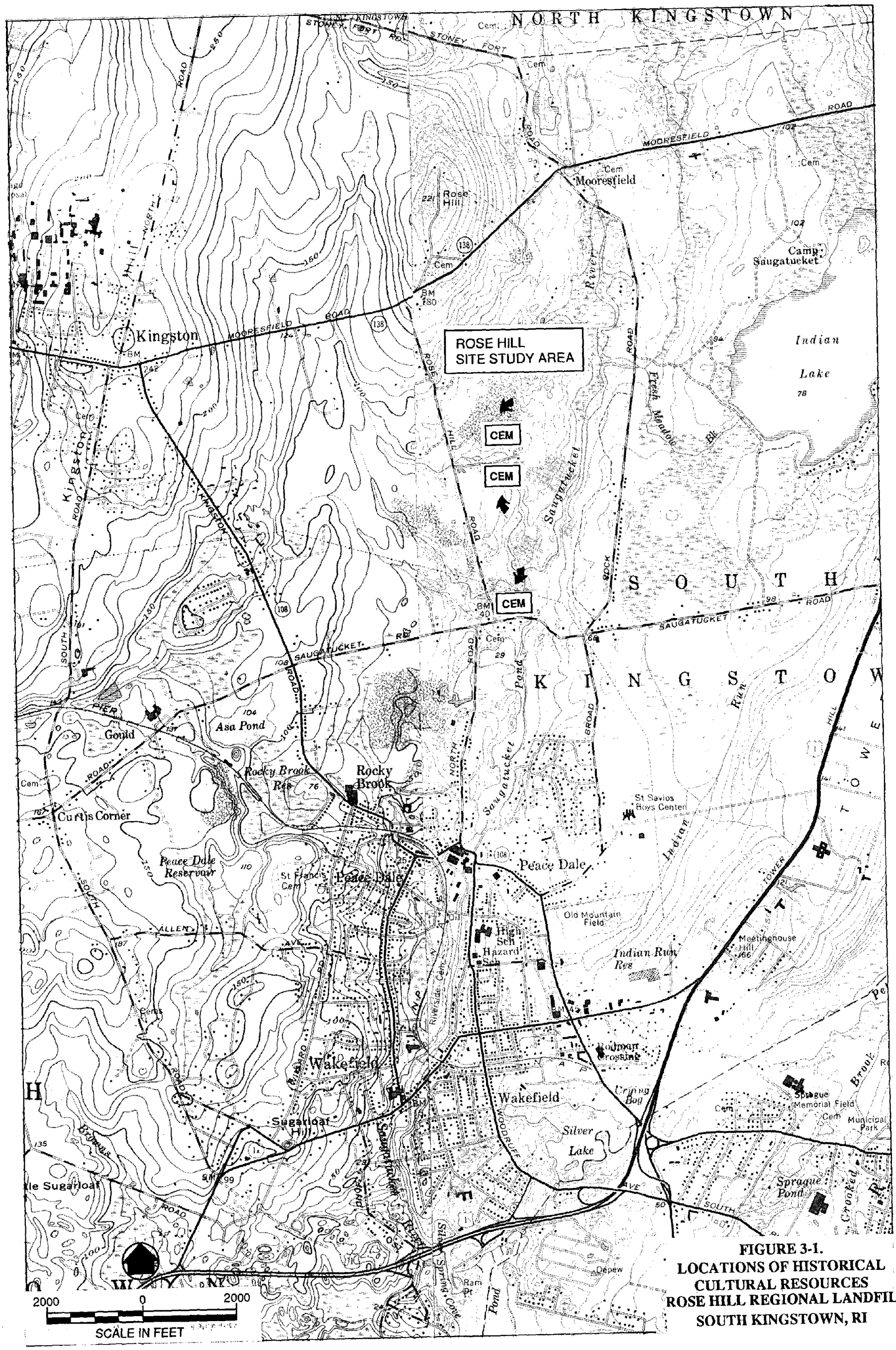
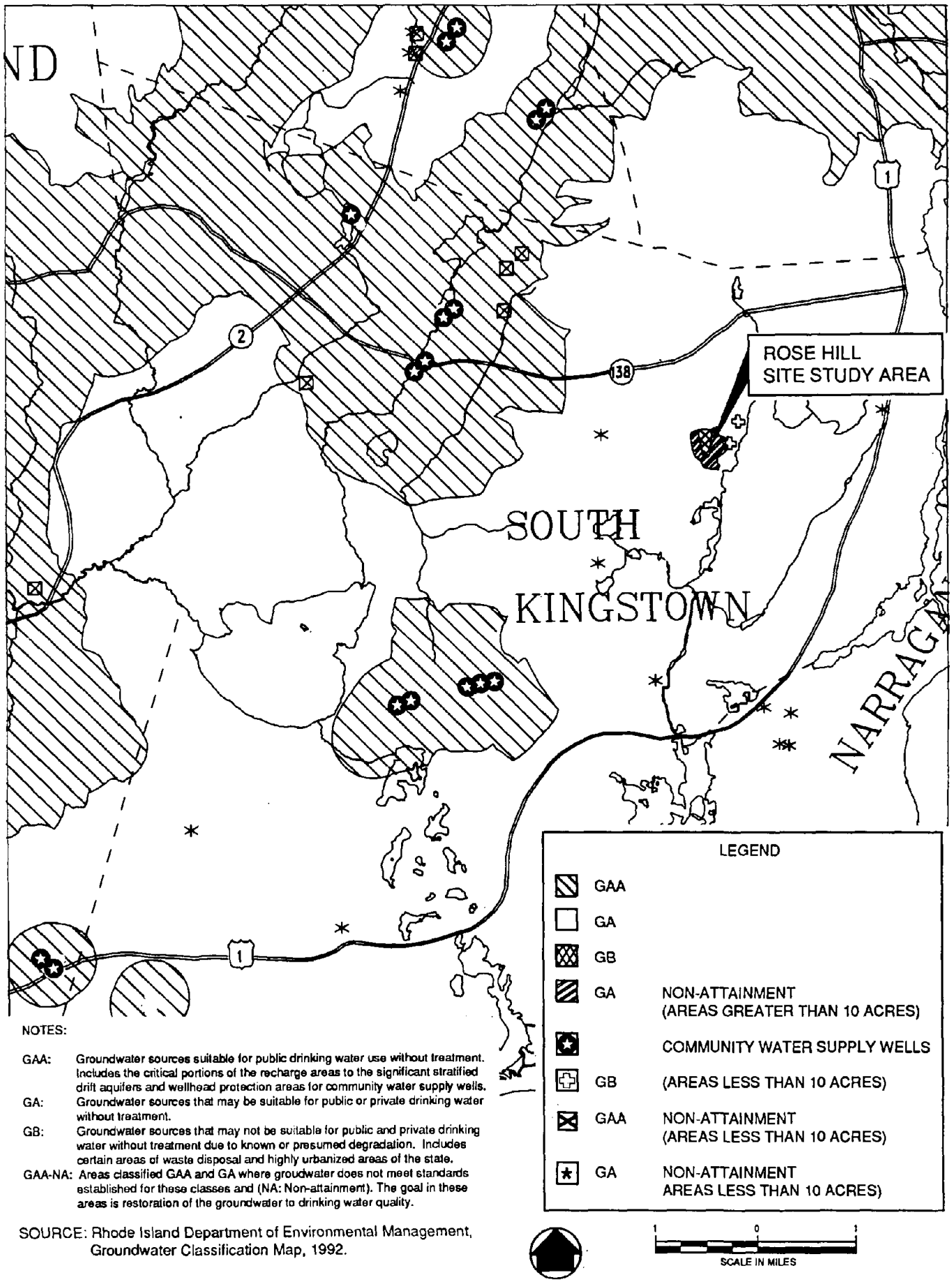


FIGURE 3-1.
LOCATIONS OF HISTORICAL CULTURAL RESOURCES
ROSE HILL REGIONAL LANDFILL,
SOUTH KINGSTOWN, RI



NOTES:

GAA: Groundwater sources suitable for public drinking water use without treatment. Includes the critical portions of the recharge areas to the significant stratified drift aquifers and wellhead protection areas for community water supply wells.

GA: Groundwater sources that may be suitable for public or private drinking water without treatment.

GB: Groundwater sources that may not be suitable for public and private drinking water without treatment due to known or presumed degradation. Includes certain areas of waste disposal and highly urbanized areas of the state.

GAA-NA: Areas classified GAA and GA where groudwater does not meet standards established for these classes and (NA: Non-attainment). The goal in these areas is restoration of the groundwater to drinking water quality.

SOURCE: Rhode Island Department of Environmental Management, Groundwater Classification Map, 1992.

FIGURE 3-2. DRINKING WATER SUPPLY WELL LOCATION MAP

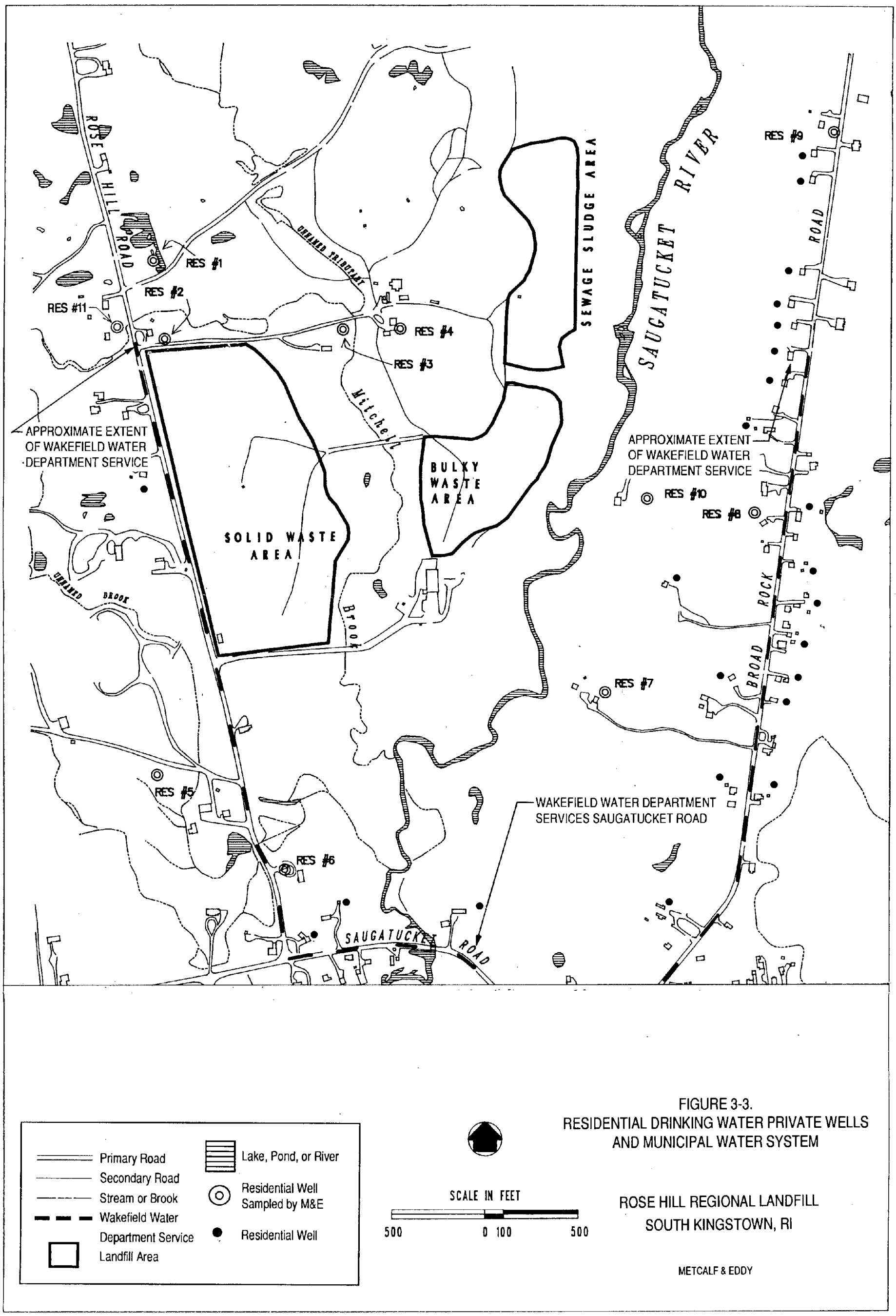
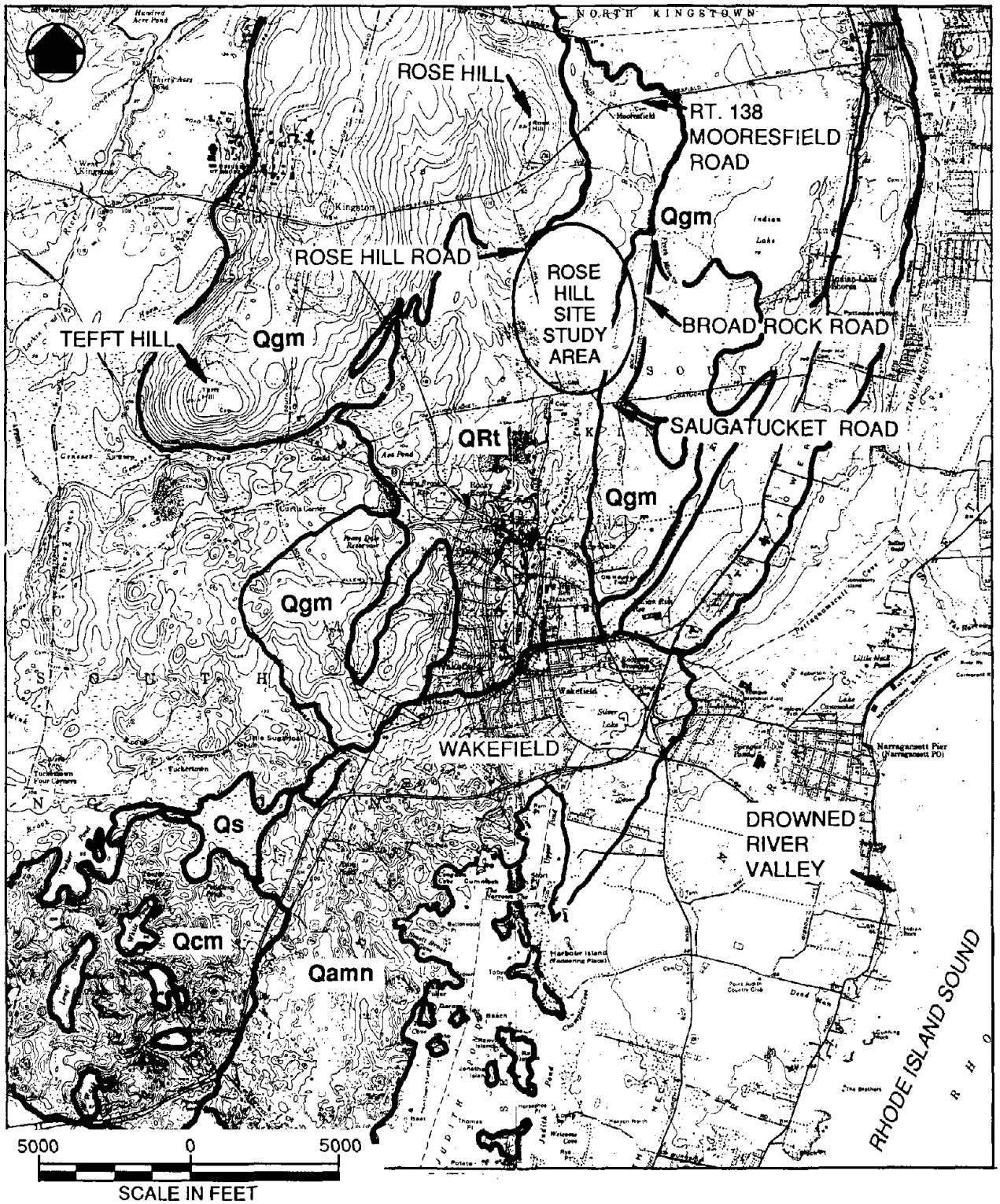


FIGURE 3-3.
RESIDENTIAL DRINKING WATER PRIVATE WELLS AND MUNICIPAL WATER SYSTEM

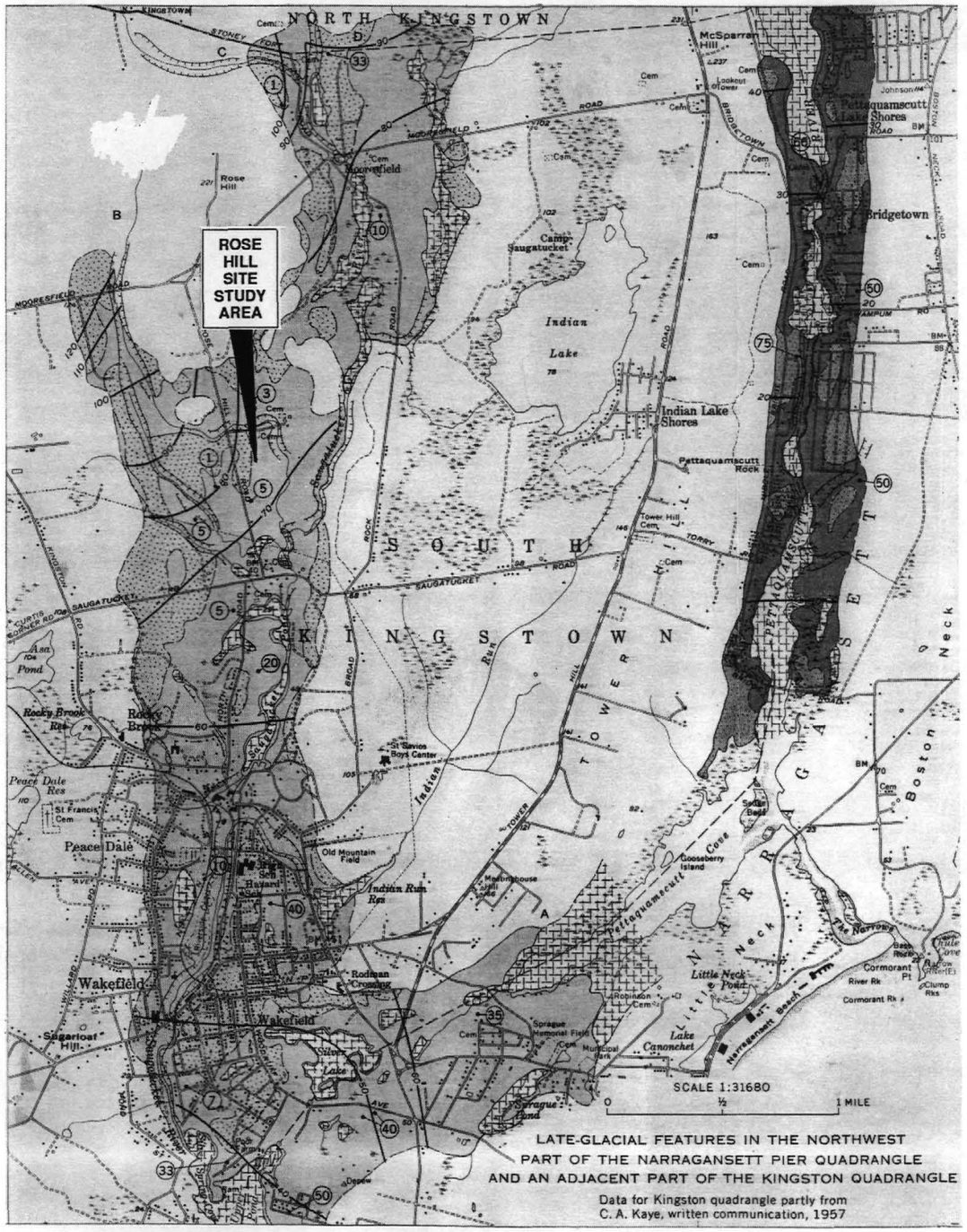


Legend		
Qs	Swamp & Marsh Deposits	Holocene
QRt	Ice Contact Deposits, mostly glaciofluvial kame terraces	Pleistocene (Wisconsin)
Qcm	Charlestown Moraine	
Qgm	Ground Moraine Deposits	
Qamn	Ablation Moraine Complex of Narragansett Basin Ice	

SOURCES:

1. USGS Topographic Maps
   Narragansett Pier, R.I., 1975
   Kingston, R.I., 1975
2. U.S. Geological Survey (USGS), 1961 Surficial Geology of the Narragansett Pier Quadrangle, Rhode Island. Survey Map GQ-91. Prepared for the USGS by N.P. Schafer.

FIGURE 3-4. REGIONAL SURFICIAL GEOLOGY



LATE-GLACIAL FEATURES IN THE NORTHWEST PART OF THE NARRAGANSETT PIER QUADRANGLE AND AN ADJACENT PART OF THE KINGSTON QUADRANGLE

Data for Kingston quadrangle partly from C. A. Kaye, written communication, 1957

EXPLANATION

(INSERT MAP)

Sequence 1 — Sequence 2

Ice-contact deposits

Stippled areas show little or no collapse; unstippled areas show moderate to strong collapse. Includes some swamp deposits and alluvium

Ice-block depressions and kettles

Occupied by buried or projecting ice blocks at time of ice-contact deposition

Stream-eroded trench

Cut in ice-contact deposits and, in some places, in ground moraine, in late-glacial and postglacial time

100

Restored contour

Shows approximate elevation, in feet above present sea level, of surface of sequence before collapse occurred

A

Meltwater sources for Sequence 1

Lettered in order of time of activity; A *is oldest and* D *is youngest*

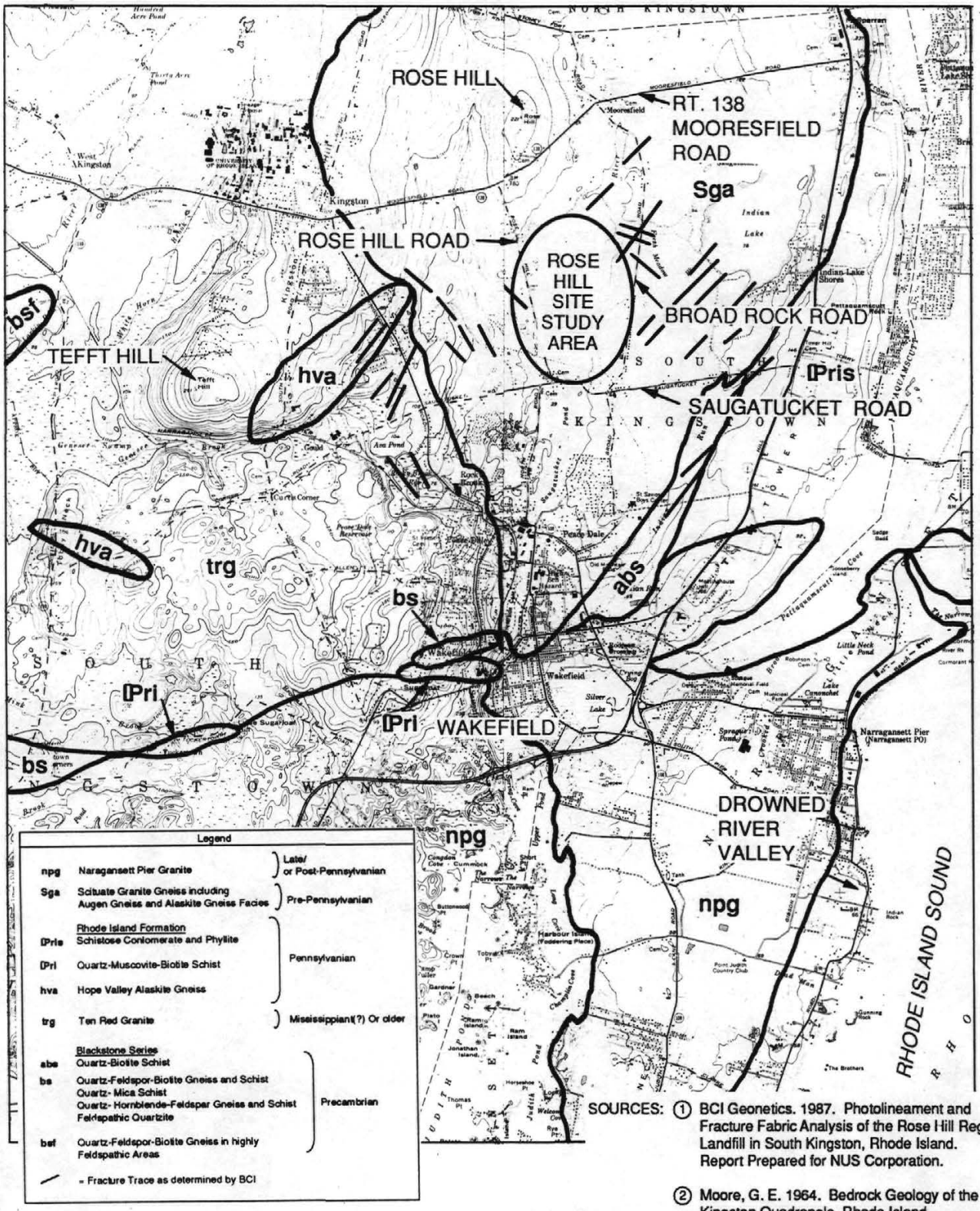
66

Estimated percentage of stones of Pennsylvanian rock types in gravel

Point of observation is at dot

SOURCE: U.S. Geological Survey (USGS). 1961. Surficial Geology of the Narragansett Pier Quadrangle, Rhode Island. Survey Map GQ-140. Prepared for the USGS by N.P. Schafer.

FIGURE 3-5.
GLACIAL FEATURES AND DEPOSITS



SOURCES:

1. BCI Geonetics. 1987. Photolineament and Fracture Fabric Analysis of the Rose Hill Regional Landfill in South Kingston, Rhode Island. Report Prepared for NUS Corporation.
2. Moore, G. E. 1964. Bedrock Geology of the Kingston Quadrangle, Rhode Island. Geological Society of America Bulletin 1158-E.
3. U.S. Geological Survey (USGS). 1956. Bedrock Geology of the Narragansett Pier Quadrangle, Rhode Island. Survey Map GQ-91. Prepared for the USGS by P.R. Nichols.
4. USGS Topographic Map, Kingston, R.I. Quadrangle 1975.
5. USGS Topographic Map, Narragansett Pier, R.I. Quadrangle, 1975.

FIGURE 3-6.
REGIONAL BEDROCK GEOLOGY

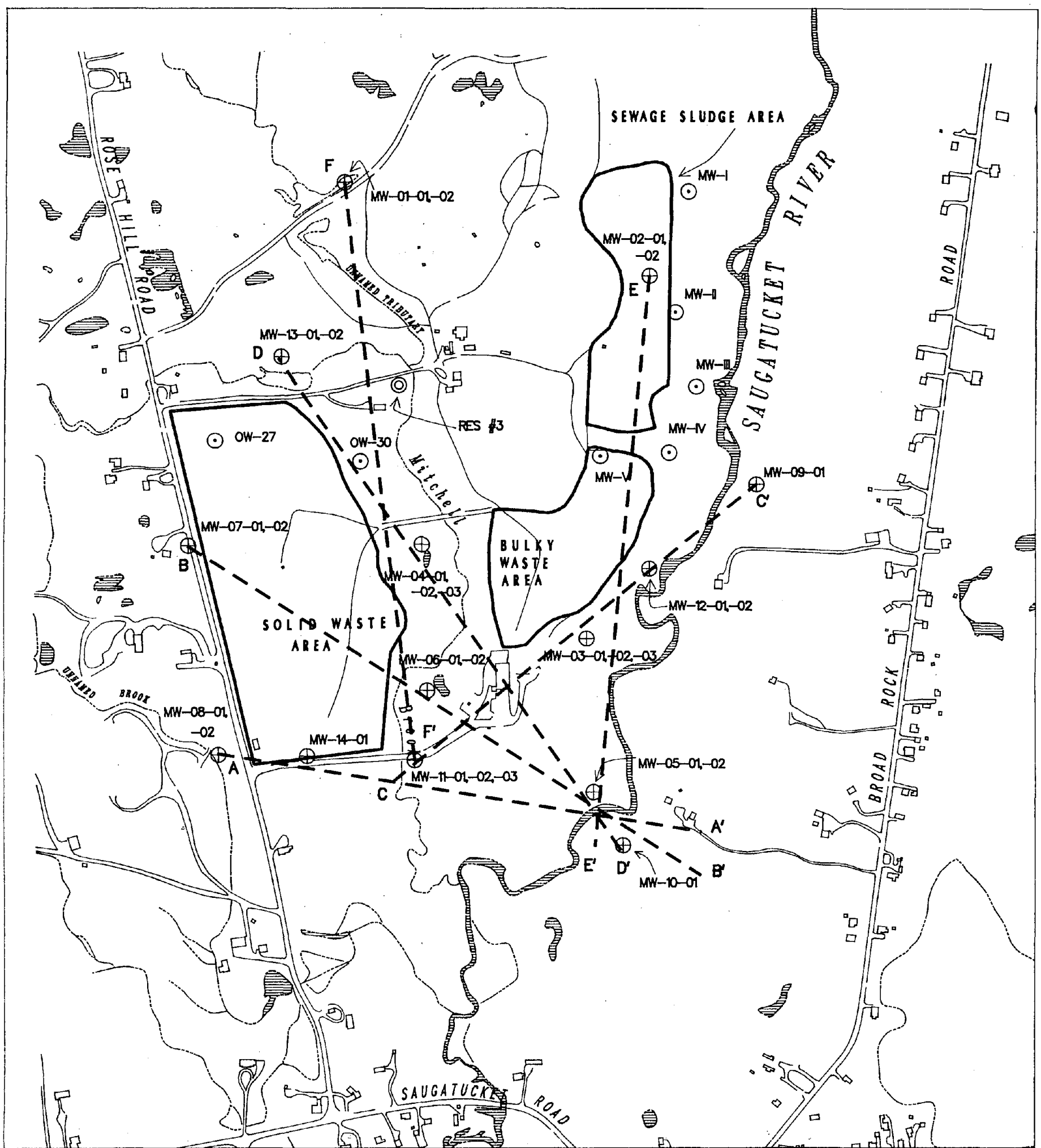
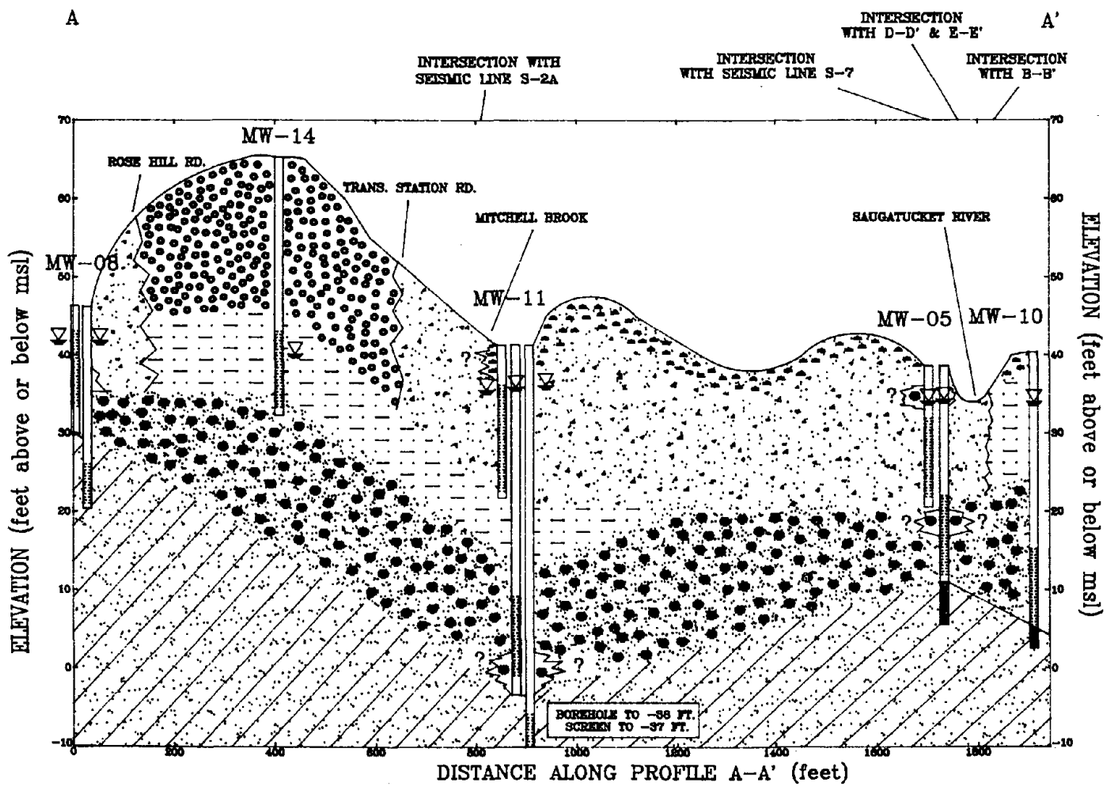
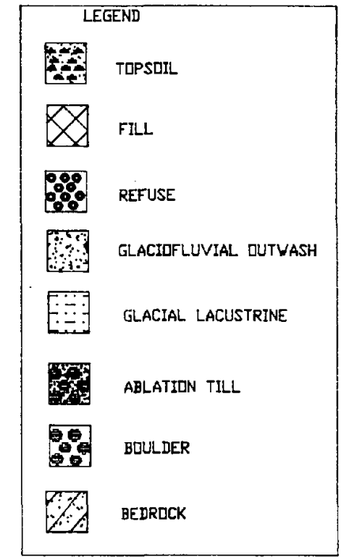


FIGURE 3-7.
GEOLOGIC CROSS
SECTION ALIGNMENTS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY





HORIZONTAL SCALE IN FEET

300 0 300

VERTICAL SCALE IN FEET

20 0 20

Notes: -Test boring lithologies up to a maximum of 200 feet on either side of the section were projected perpendicularly onto the section line.
-The surface topography between each test boring used for the creation of the cross section was projected perpendicularly onto the section line.

Grouted Bedrock Core

Screened Interval

Static Water Level (09/30/91)

- - - - Inferred Contact

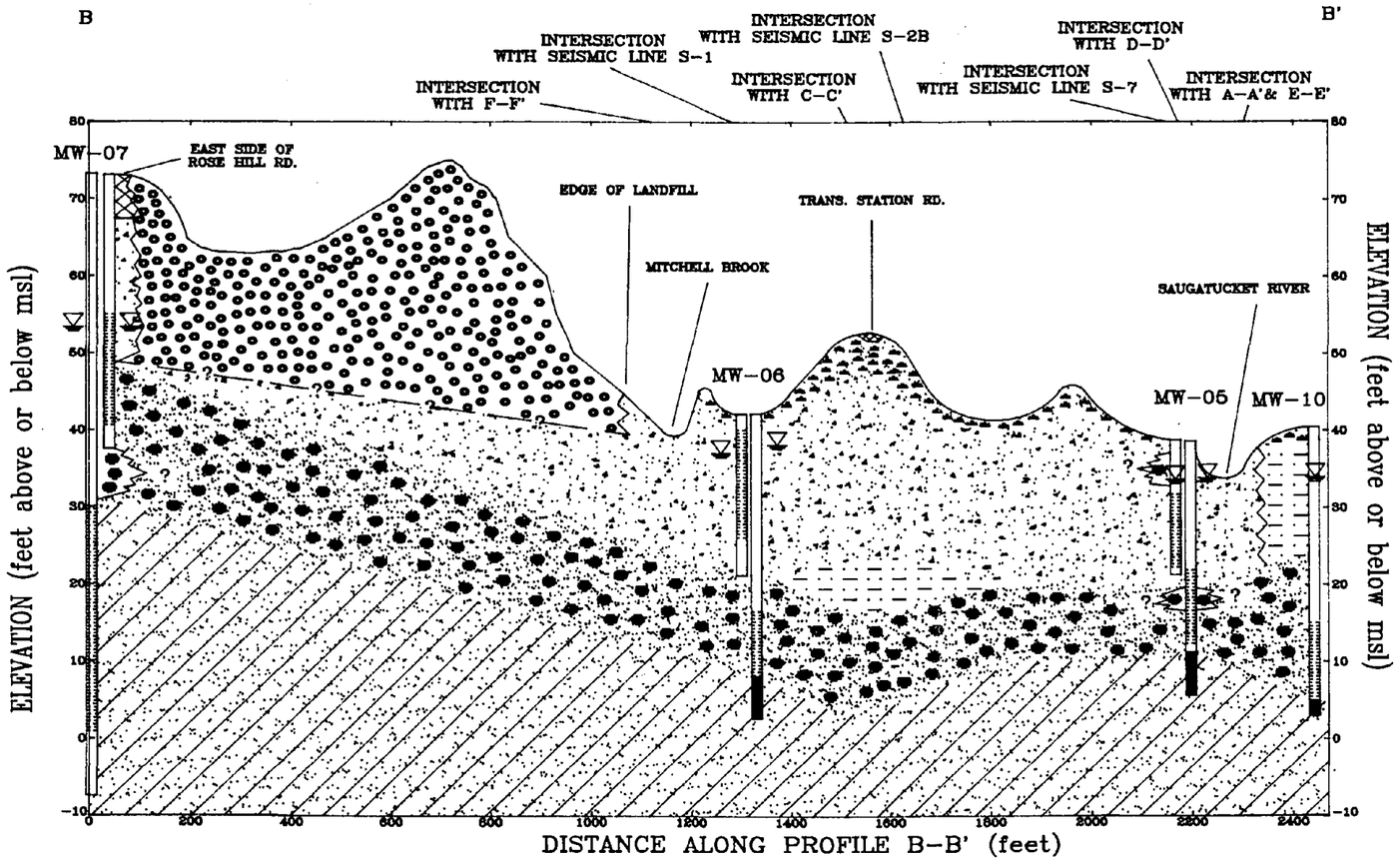
——— Formational Contact

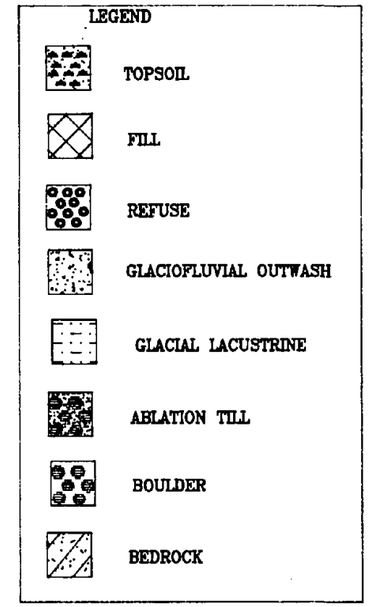
-?-?-?- Extent of geologic knowledge based on test boring information.

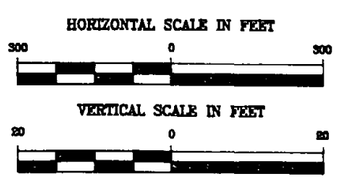
msl Mean Sea Level

FIGURE 3-8.
GEOLOGIC CROSS SECTION A-A'

M&E







Notes: -Test boring lithologies up to a maximum of 200 feet on either side of the section were projected perpendicularly onto the section line.
-The surface topography between each test boring used for the creation of the cross-section was projected perpendicularly onto the section line.

Grouted Bedrock Core

Screened Interval

Static Water Level (09/30/91)

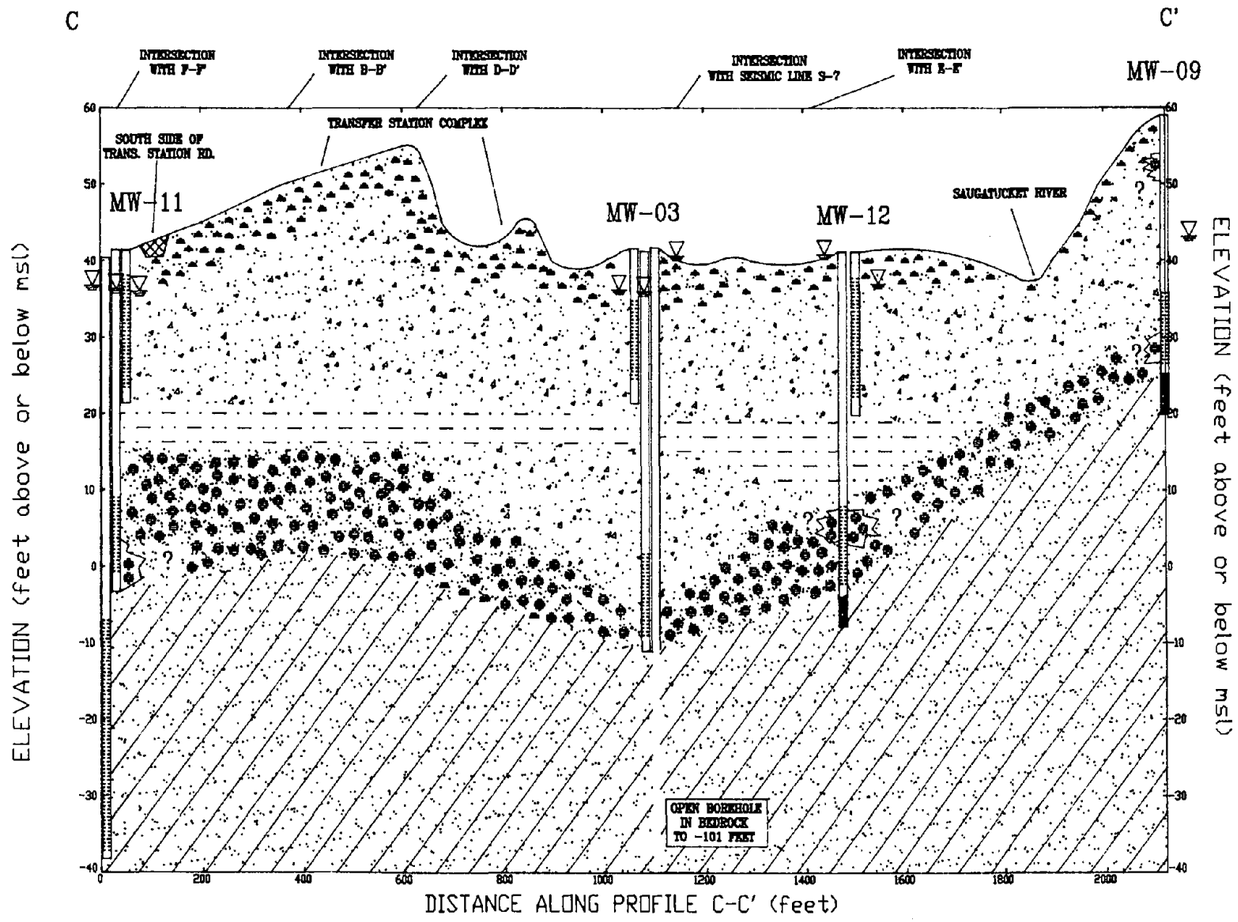
- - - - Inferred Contact

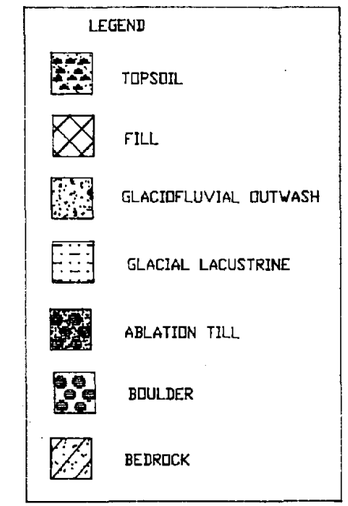
——— Formational Contact

-?-?-?- Extent of geologic knowledge based on test boring information.

msl Mean Sea Level

FIGURE 3-9.
GEOLOGIC CROSS SECTION B-B'





HORIZONTAL SCALE IN FEET

300 0 300

VERTICAL SCALE IN FEET

20 0 20

Notes: -Test boring lithologies up to a maximum of 200 feet on either side of the section were projected perpendicularly onto the section line.
-The surface topography between each test boring used for the creation of the cross-section was projected perpendicularly onto the section line.

Grouted Bedrock Core

Screened Interval

Static Water Level (09/30/91)

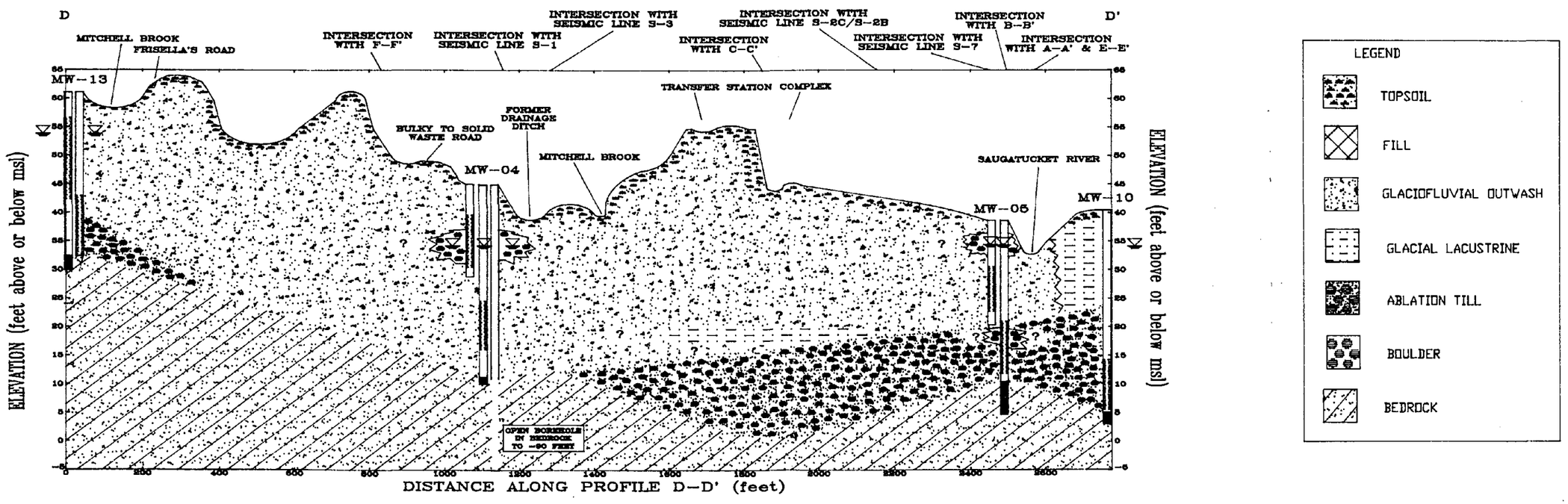
- - - - Inferred Contact

——— Formational Contact

-?-?-?- Extent of geologic knowledge based on test boring information.

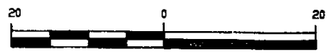
msl Mean Sea Level

FIGURE 3-10.
GEOLOGIC CROSS SECTION C-C'



HORIZONTAL SCALE IN FEET

VERTICAL SCALE IN FEET



Notes: -Test boring lithologies up to a maximum of 200 feet on either side of the section were projected perpendicularly into the section line.
-The surface topography between each test boring used for the creation of the cross-section was projected perpendicularly onto the section line.

Grouted Bedrock Core

Screened Interval

Static Water Level (09/30/91)

- - - - Inferred Contact

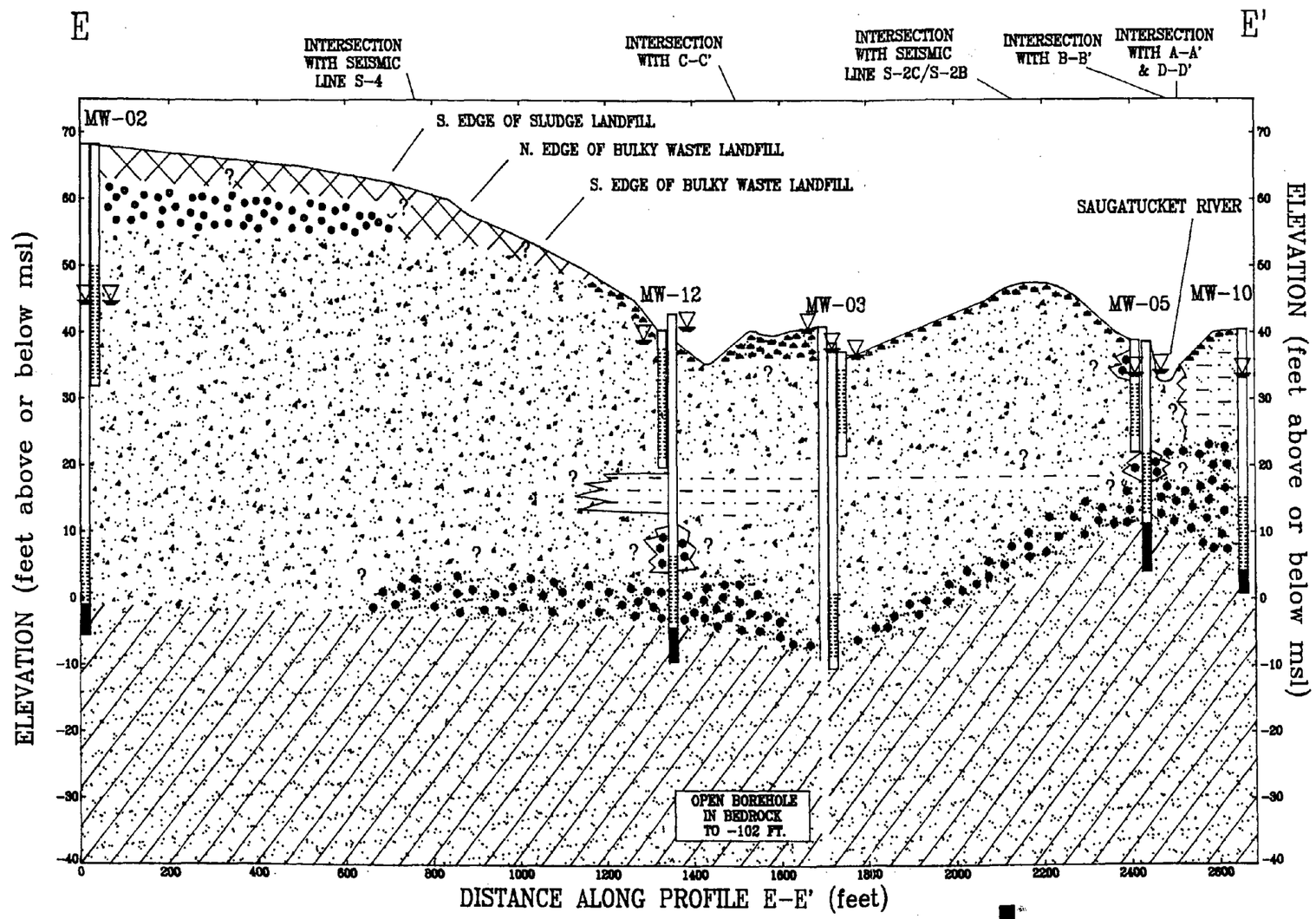
——— Formational Contact

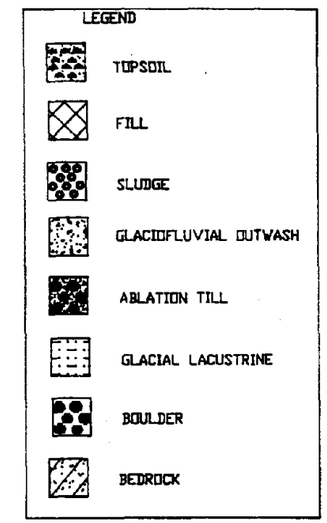
-?-?-?- Extent of geologic knowledge based on test boring information.

msl Mean Sea Level

FIGURE 3-11.
GEOLOGIC CROSS SECTION D-D'

M&E





HORIZONTAL SCALE IN FEET

300 0 300

VERTICAL SCALE IN FEET

20 0 20

Notes: -Test boring lithologies up to a maximum of 200 feet on either side of the section were projected perpendicularly into the section line.
-The surface topography between each test boring used for the creation of the cross-section was projected perpendicularly onto the section line.

Grouted Bedrock Core

Screened Interval

Static Water Level (09/30/91)

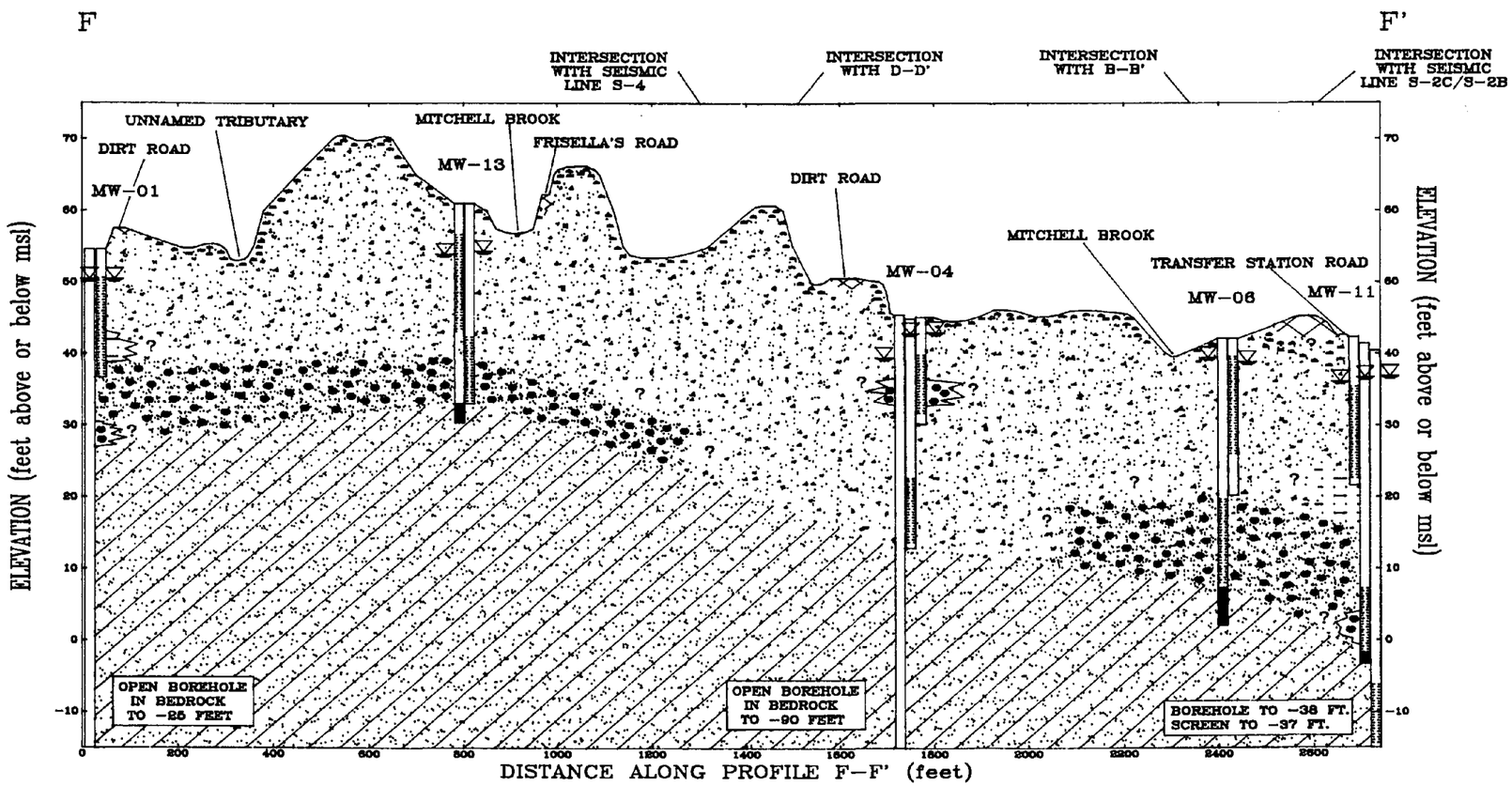
- - - - Inferred Contact

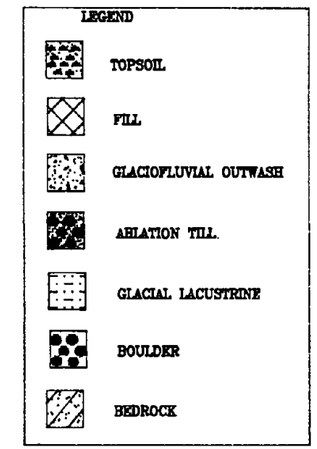
——— Formational Contact

-?-?-?- Extent of geologic knowledge based on test boring information.

msl Mean Sea Level

FIGURE 3-12.
GEOLOGIC CROSS SECTION E-E'





HORIZONTAL SCALE IN FEET

300 0 300

VERTICAL SCALE IN FEET

20 0 20

Notes: -Test boring lithologies up to a maximum of 200 feet on either side of the section were projected perpendicularly into the section line.
-The surface topography between each test boring used for the creation of the cross-section was projected perpendicularly onto the section line.

Grouted Bedrock Core

Screened Interval

Static Water Level (09/30/91)

- - - - Inferred Contact

——— Formational Contact

-?-?-?- Extent of geologic knowledge based on test boring information.

msl Mean Sea Level

FIGURE 3-13.
GEOLOGIC CROSS SECTION F-F'

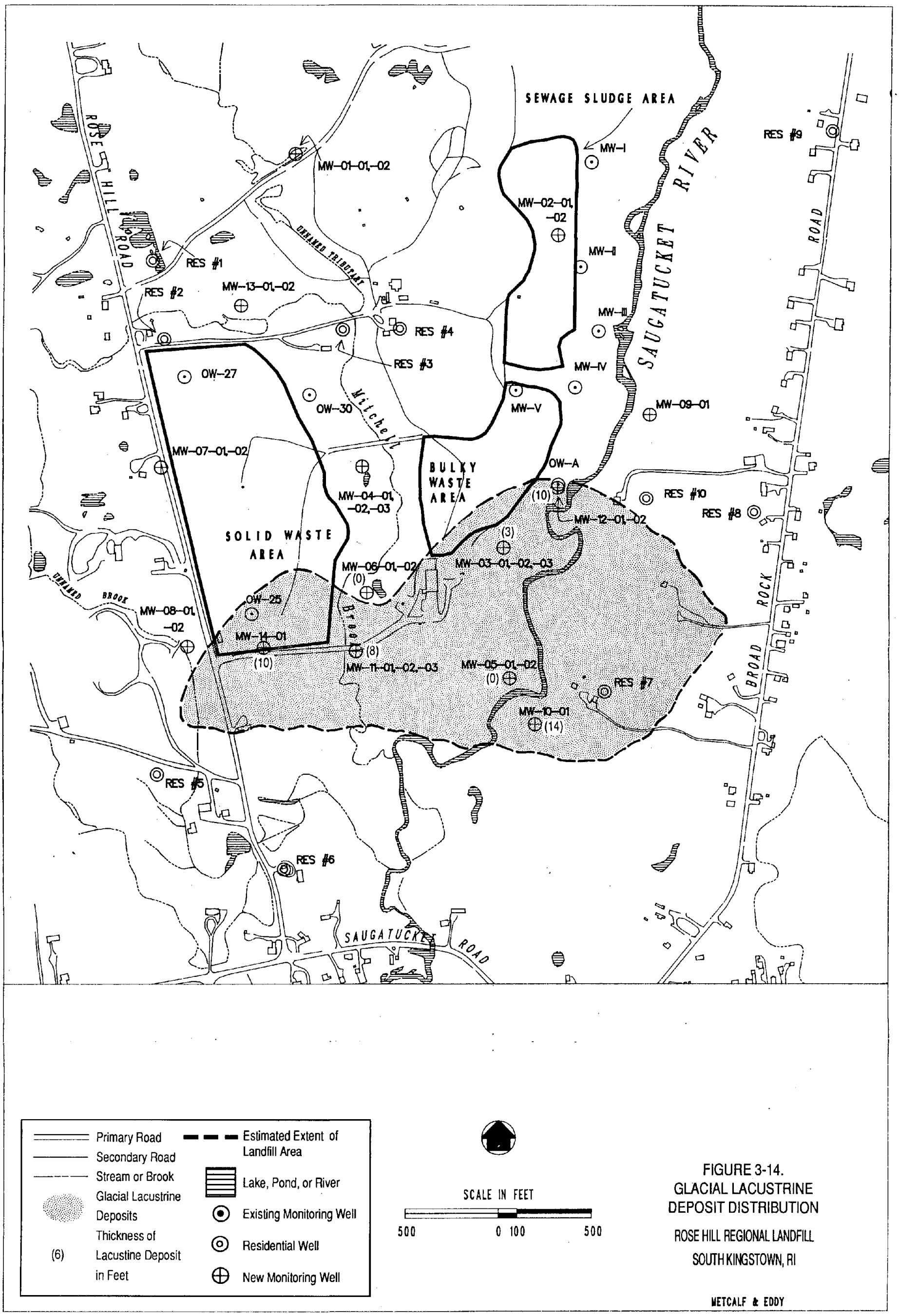


FIGURE 3-14.
GLACIAL LACUSTRINE DEPOSIT DISTRIBUTION

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

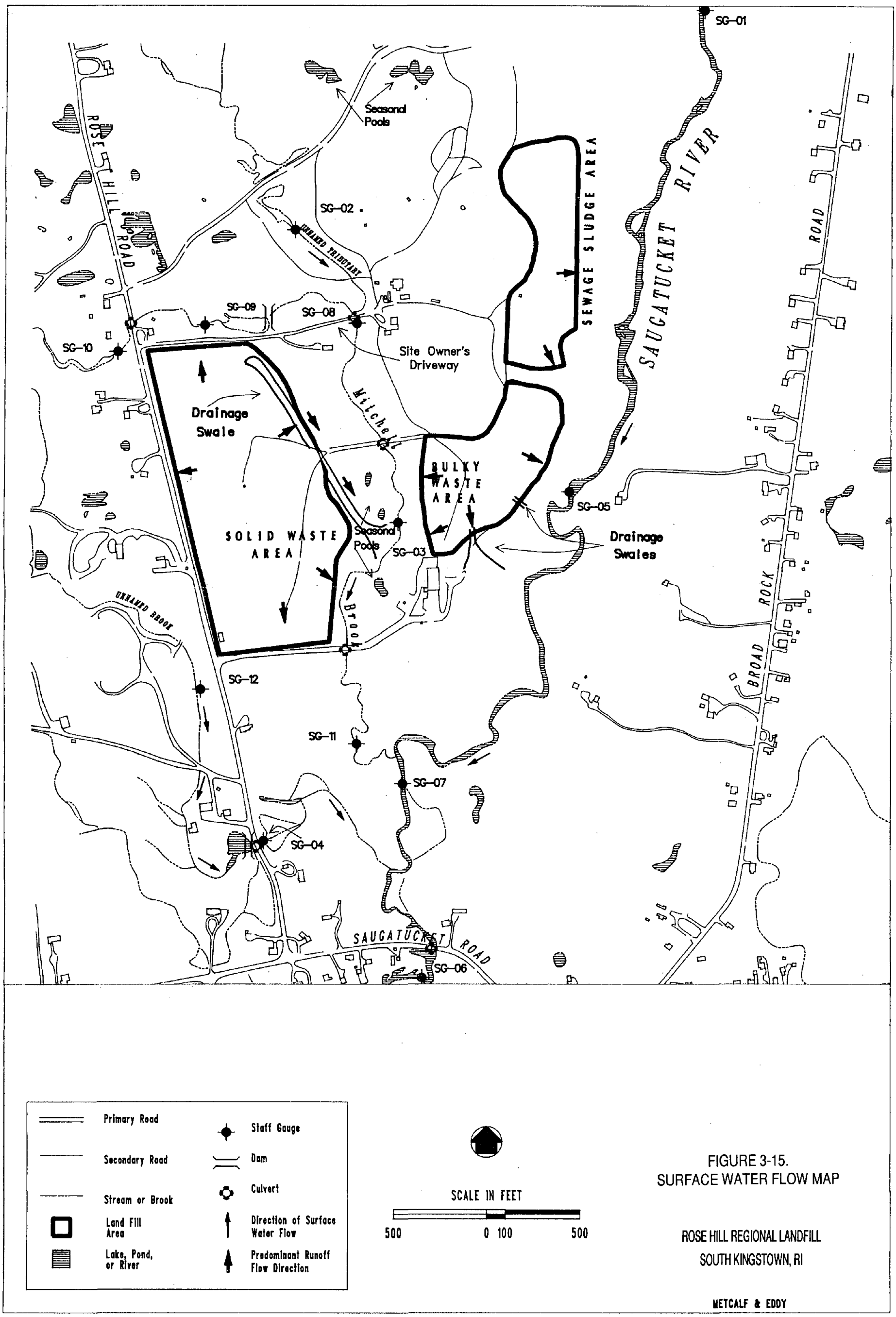
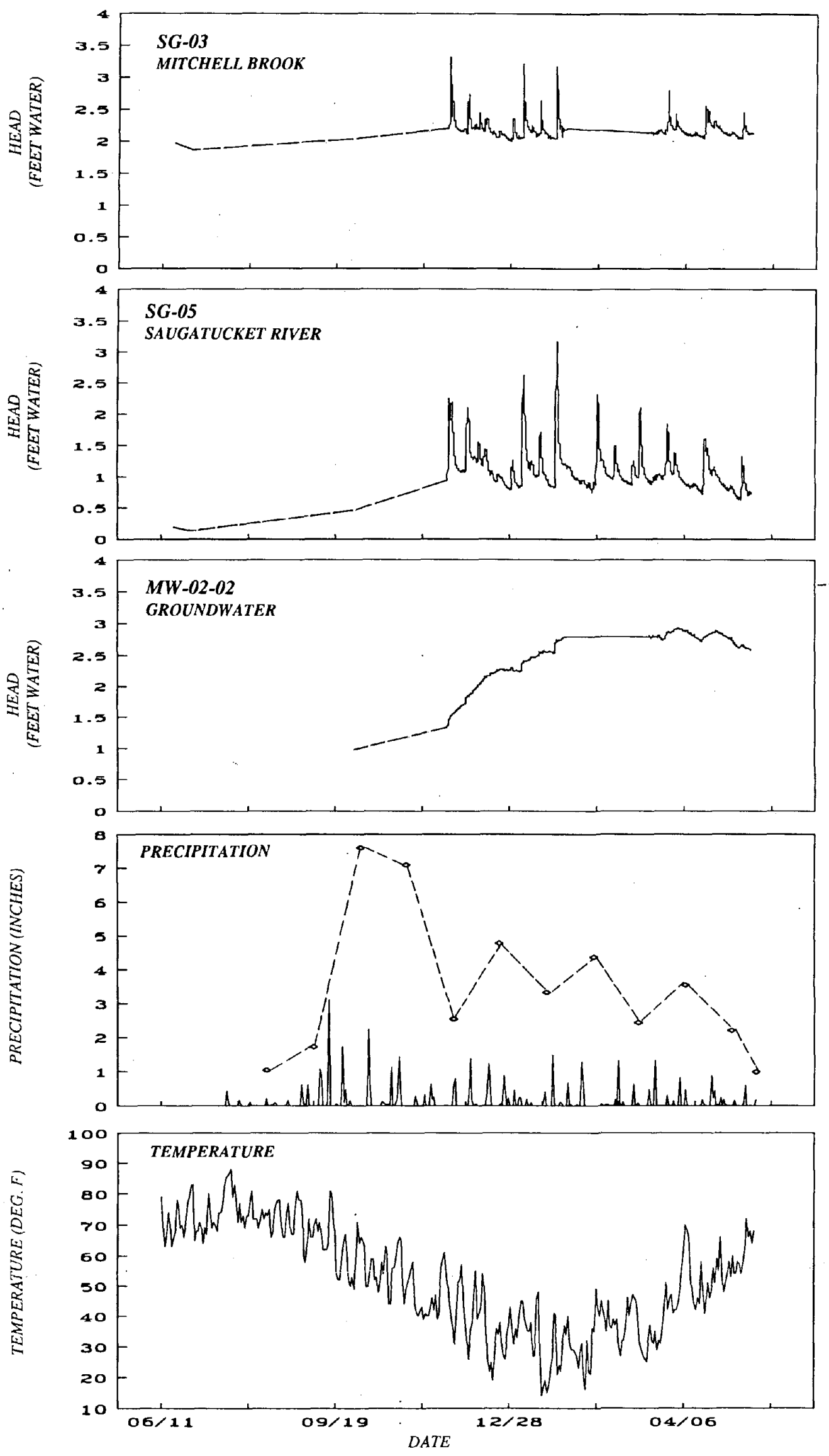


FIGURE 3-15.
SURFACE WATER FLOW MAP

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



NOTES:
- An In Situ data logging system consisting of a data logger and a 10 psi transducer was used to collect surface water head pressure data, in feet, beginning on 11/21/91 at 13:00 hours.
- Surface water levels were calculated based on surface water measurements made on 9/30/91 at 11:45 hours and the calculated surface water elevation and initial levels recorded on 11/21/91 at 13:00 hours when long term monitoring was begun.
- Head measurements do not correspond to actual surface water elevations.

— — — — : Estimated heads between:
- Round 2 water level measurements at 11:55 hours on 9/30/91 and the beginning of long term monitoring on 11/21/91 at 13:00 hours.
- 09:00 hours on 1/29/92 and 08:00 hours on 3/1792

Precipitation and Temperature Data:
- Hourly precipitation and daily mean temperature data was acquired from and recorded at the Providence Rhode Island T.F. Green Airport located in Warwick, Rhode Island.
- Monthly total rainfall was calculated by summing up the total rainfall for each month.

–◇–◇– Monthly total precipitation calculated by summing the total precipitation for each month.

FIGURE 3-16.
LONG-TERM SURFACE WATER HYDROGRAPHS
ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

NOTES: • Hourly Precipitation was aquired from and recorded at Providence Rhode Island T.F. Green Airport located in Warwick, Rhode Island.
• Duration of direct recharge was calculated using the equation A 02, where A equals the drainage areas upstream of the gauging station (Fetter 1988).
• Head measurements do not correspond to actual surface water elevations.

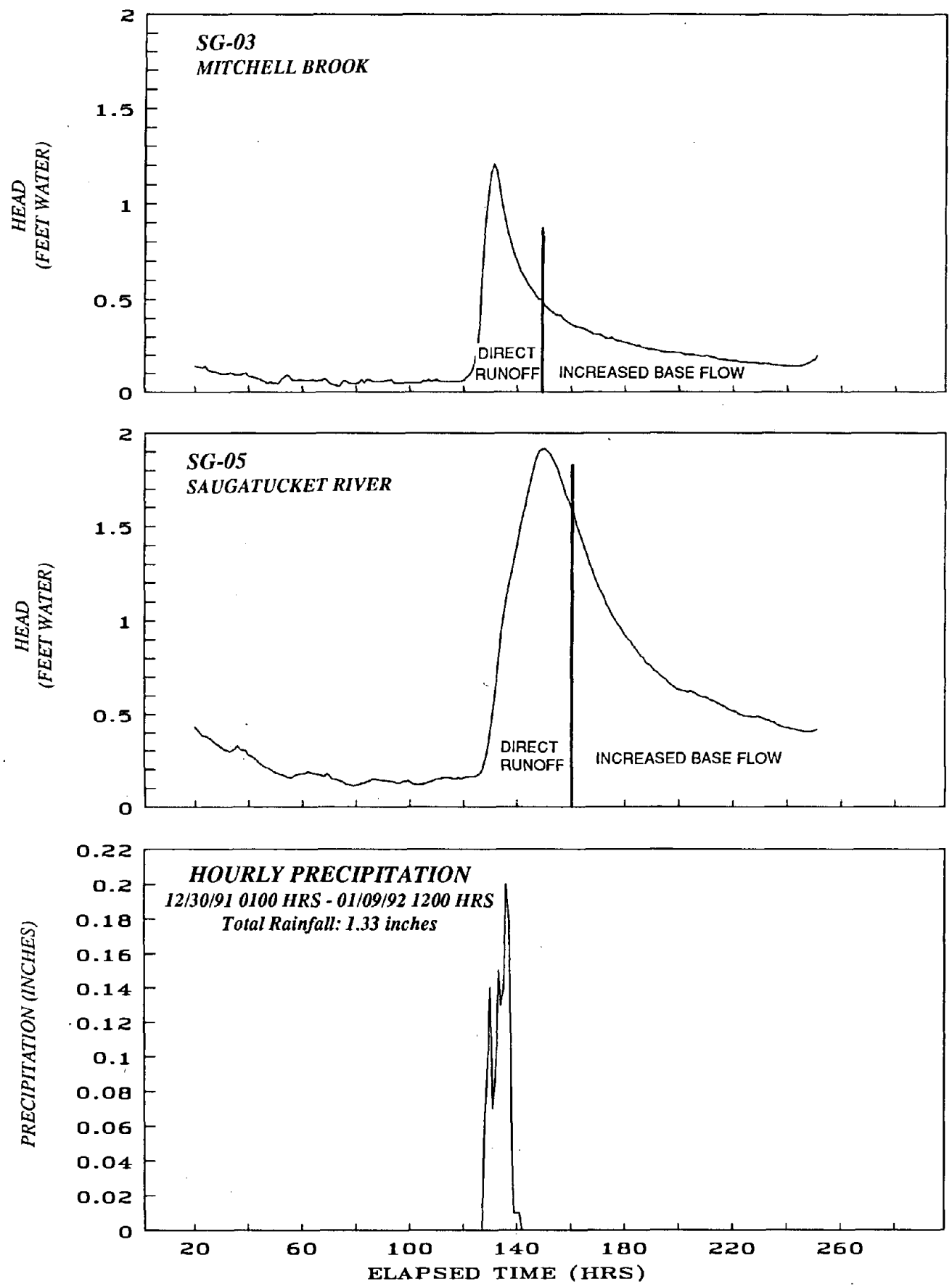
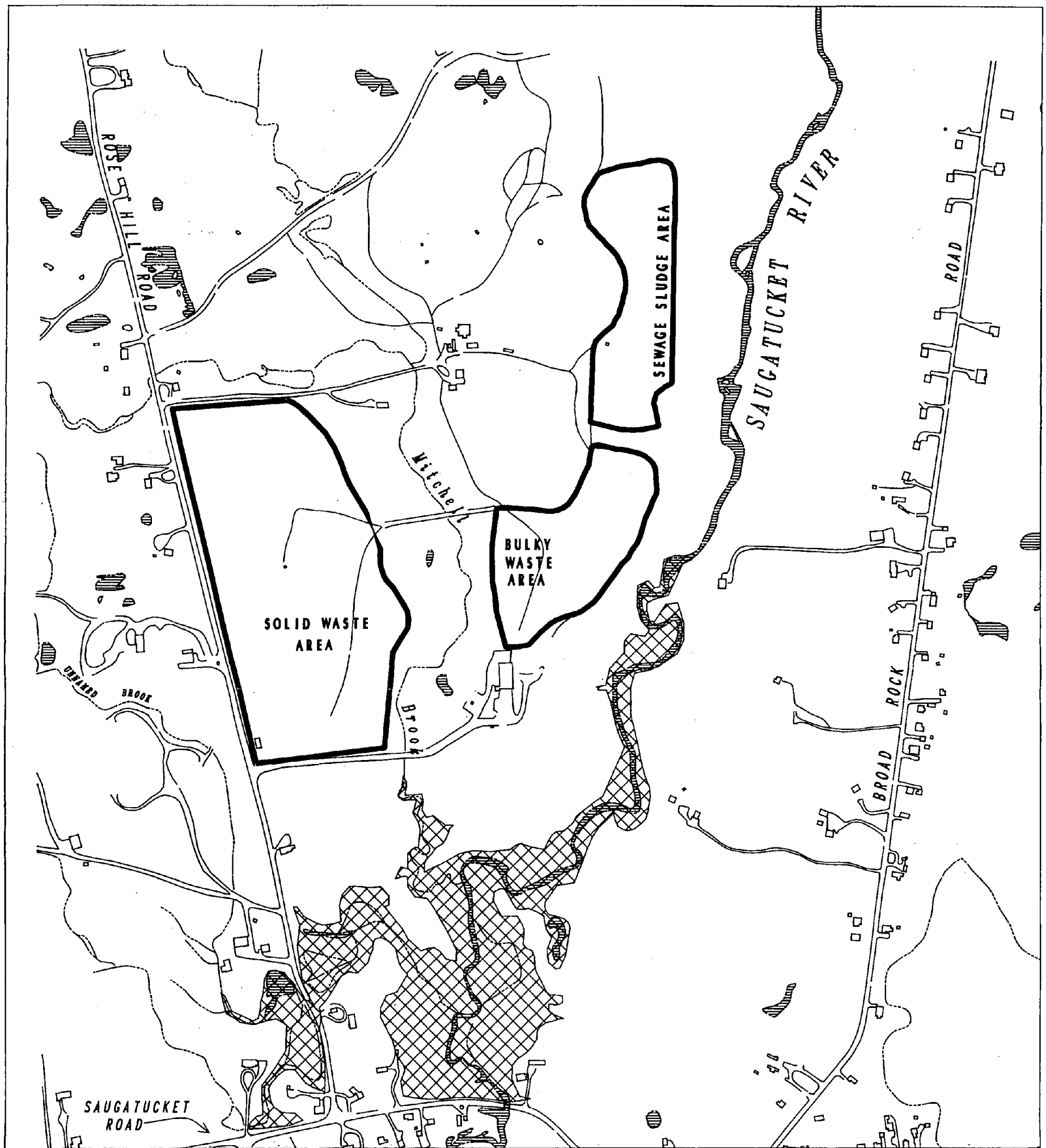


FIGURE 3-17.
SHORT-TERM STORM SURFACE WATER HYDROGRAPHS
ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



Note: 100-year flood elevations adjacent to Saugatucket River were estimated based on FEMA modelling of the control structure at Saugatucket Road.

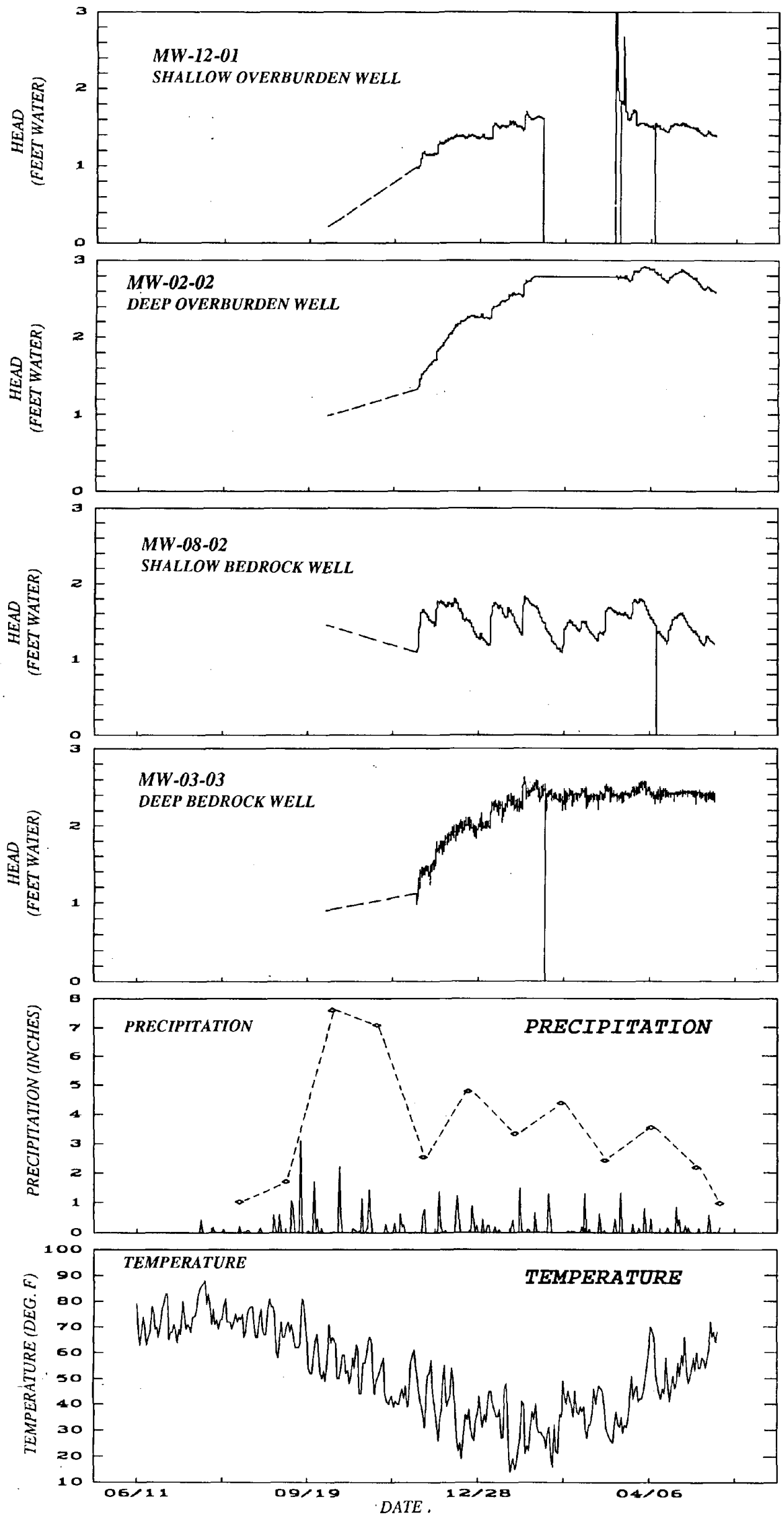
Primary Road
Secondary Road
Stream or Brook
Land Fill Area
Lake, Pond, or River
100-Year Flood Plain

SCALE IN FEET
500 0 100 500

FIGURE 3-18.
ONE HUNDRED-YEAR FLOODPLAIN

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTES:
- An In Situ data logging system consisting of a data logger and a 10 psi transducer was used to collect hourly water pressure data, in feet, beginning on 11/21/91 at 13:00 hours.
- The data recorded from well MW-02-02 between 09:00 hours on 1/29/92 and 08:00 hours on 3/16/92 was lost due to a faulty rs232 In Situ downloading cable that prevented the neutralization of the static electrical charge on the data logger. The static electrical charge erased the data stored in the data logger when attemps were made to download the data to a field personal computer.
- No data for well MW-12-01 was recorded between 16:00 hours on 2/3/92 and 17:00 hours on 3/16/92 due to vandalism on the transducer. Collection of hourly data was re-established at 18:00 hours on 3/17/92.
- Expected heads calculated based on groundwater level measurements made on 9/31/91 at 11:55 hours and the calculated groundwater elevation and initial head pressure recorded on 11/21/91 at 13:00 hours when long term monitoring was begun.
- Head measurements do not correspond to actual surface water elevations.

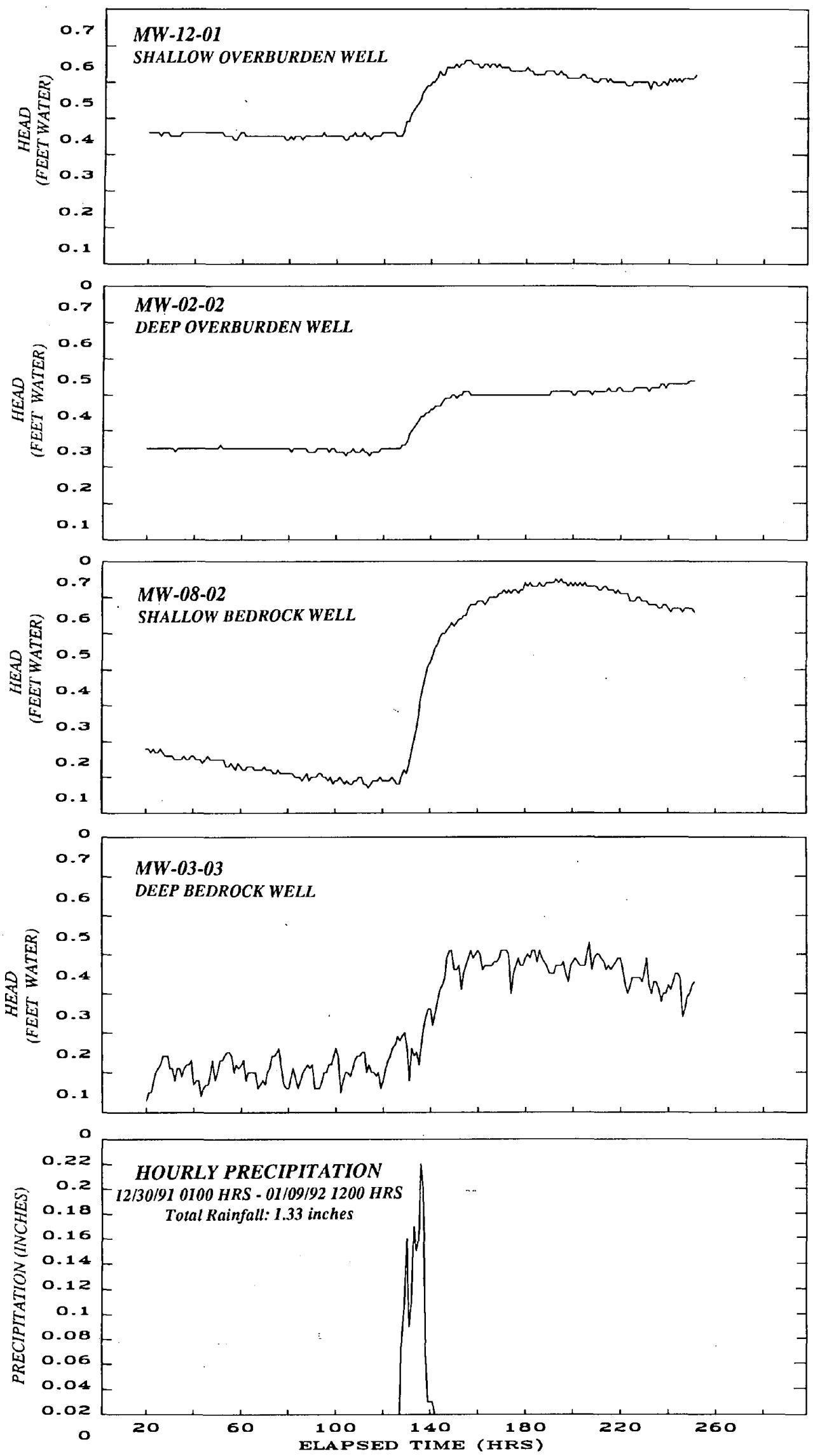
— — — : Estimated heads between:
- Round 2 water level measurements at 11:55 hours on 9/30/91 and the beginning of long term monitoring on 11/21/91 at 13:00 hours.
- 09:00 hours on 1/29/92 and 08:00 hours on 3/1792

Precipitation and Temperature Data:
- Hourly precipitation and daily mean temperature data was acquired from and recorded at the Providence Rhode Island T.F. Green Airport located in Warwick, Rhode Island.

–◇– – – –◇– Monthly total precipitation calculated by summing the total precipitation for each month.

FIGURE 3-19.
LONG-TERM GROUNDWATER HYDROGRAPHS
ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

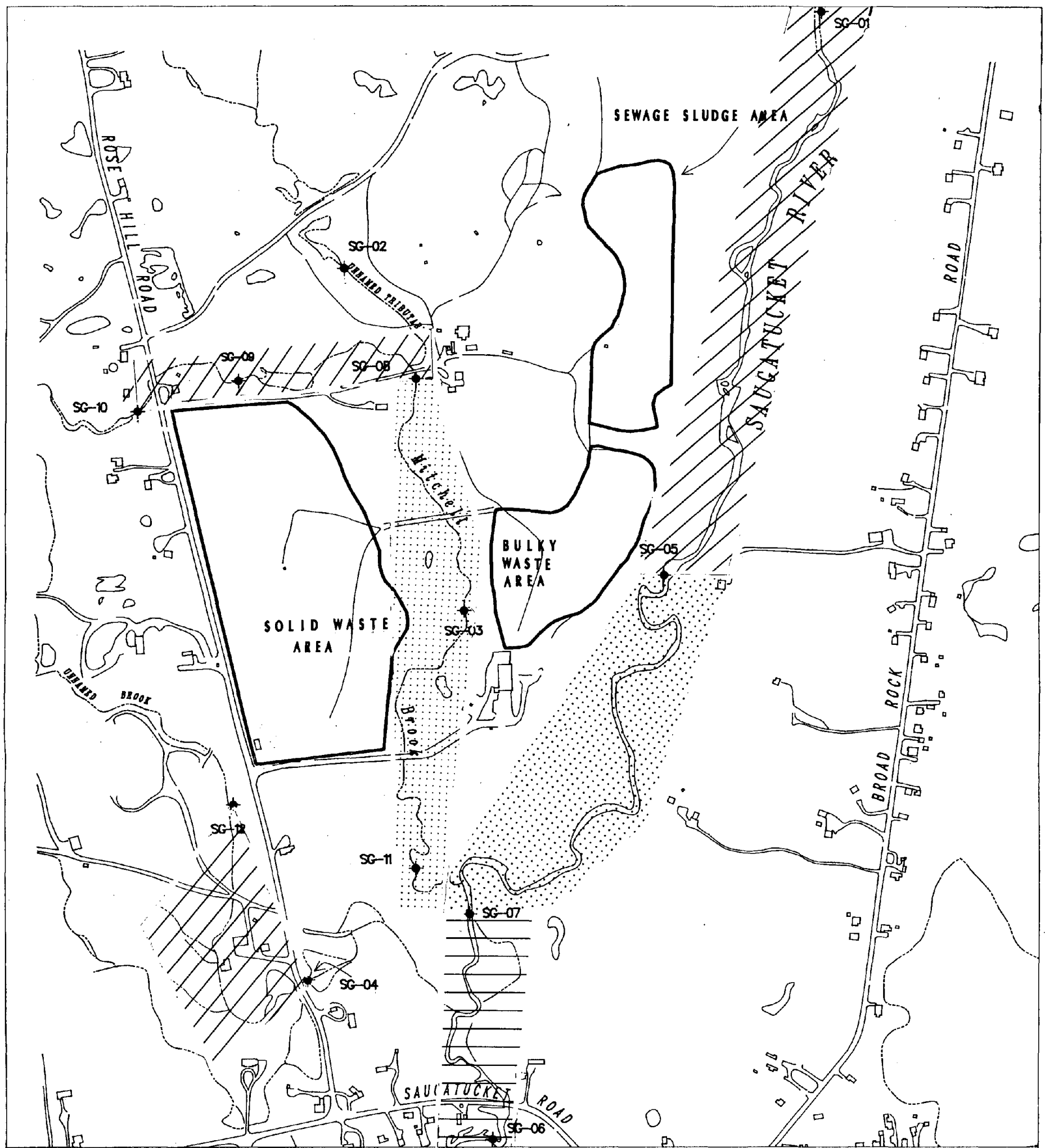
METCALF & EDDY



NOTES : • Hourly precipitation was acquired from and recorded at the Providence, Rhode Island T.F. Green Airport located in Warwick, RI

• Head measurements do not correspond to actual surface water elevations.

FIGURE 3-20.
SHORT-TERM GROUNDWATER HYDROGRAPHS
ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



PRIMARY ROAD
SECONDARY ROAD
STREAM OR BROOK
REACH 1
REACH 3
LANDFILL AREA
STAFF GAUGE
REACH 2

SCALE IN FEET
500 0 100 500

FIGURE 3-21.
SELECTED REACHES OF THE
SURFACE WATER RECEPTORS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

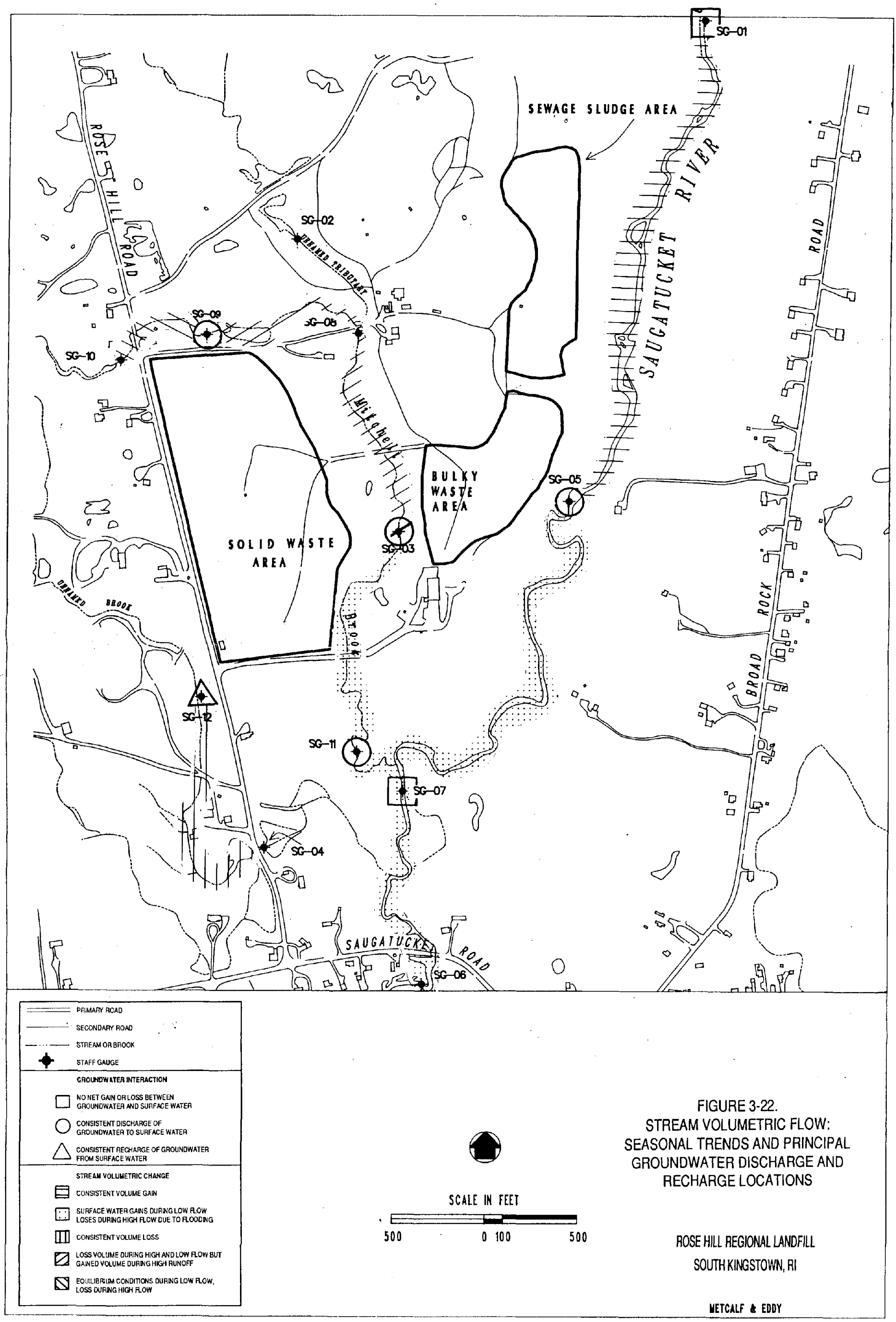
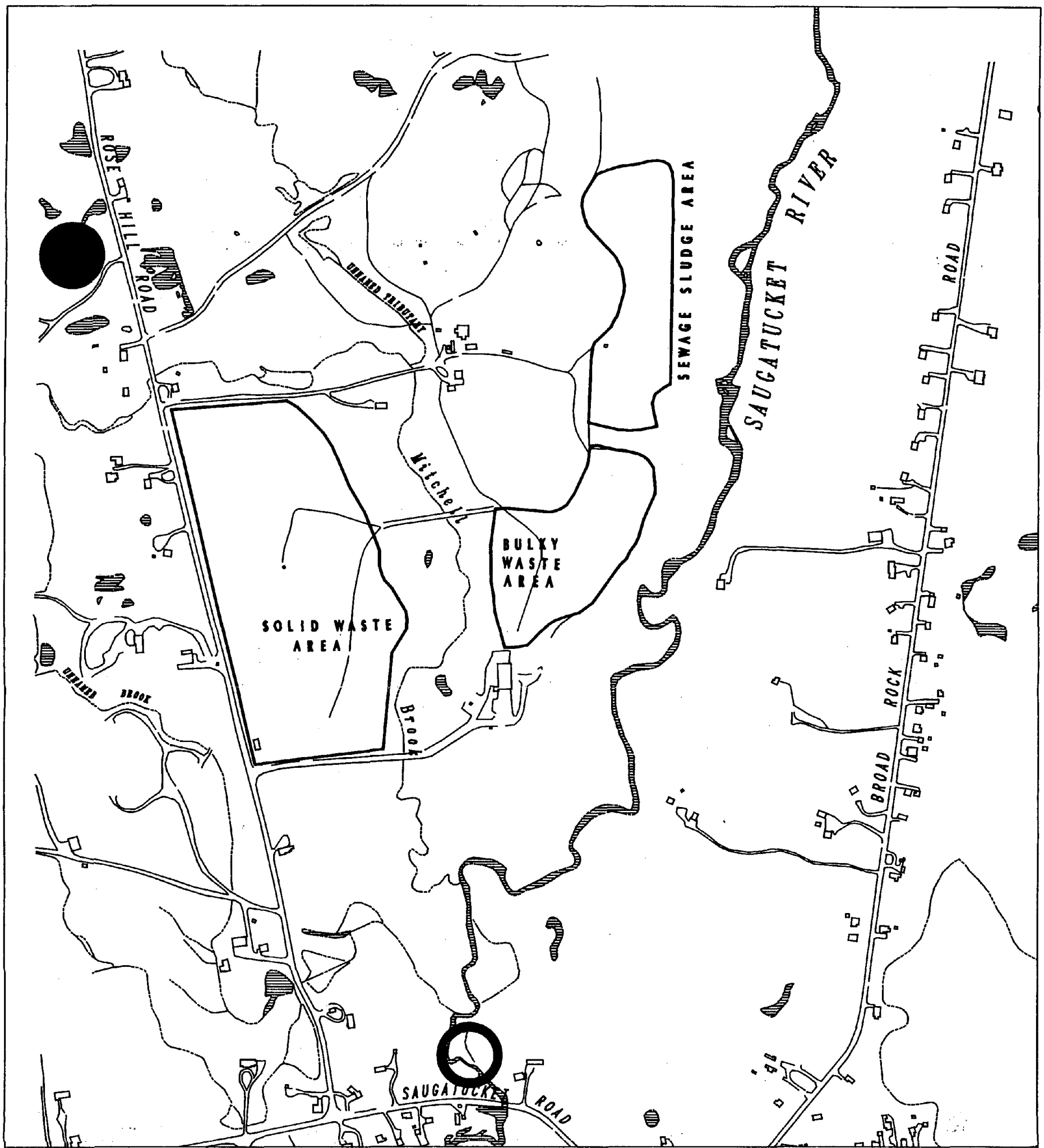


FIGURE 3-22.
STREAM VOLUMETRIC FLOW:
SEASONAL TRENDS AND PRINCIPAL
GROUNDWATER DISCHARGE AND
RECHARGE LOCATIONS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Tickseed sunflower (Bidens coronata) Species of State Interest (RIDEM 1991)

Bloodroot (Sanguinaria canadensis) Species of State Concern (RIDEM 1991)

SCALE IN FEET

500 0 100 500

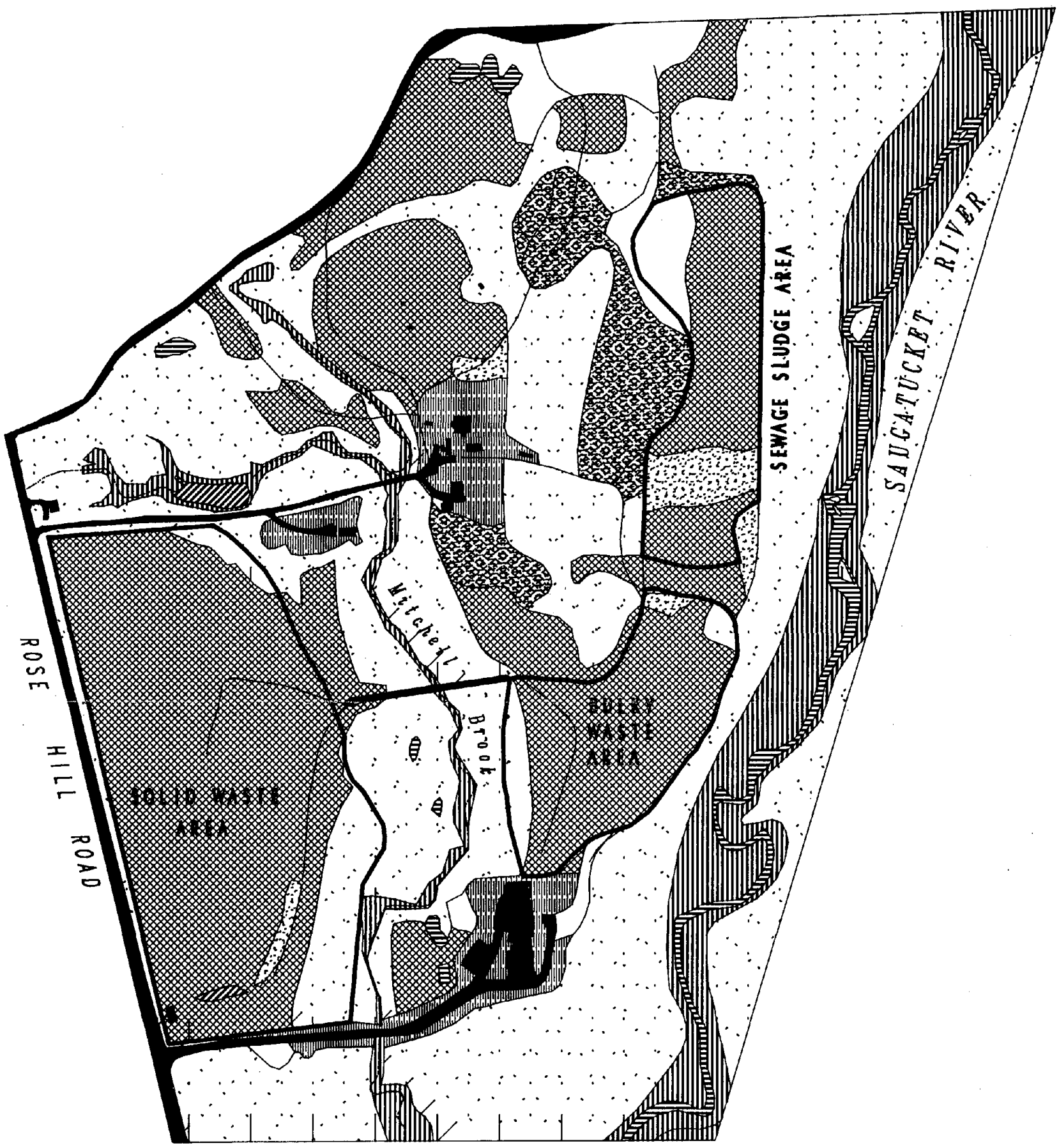
FIGURE 3-23

PROTECTED SPECIES IDENTIFIED IN THE SITE STUDY AREA

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



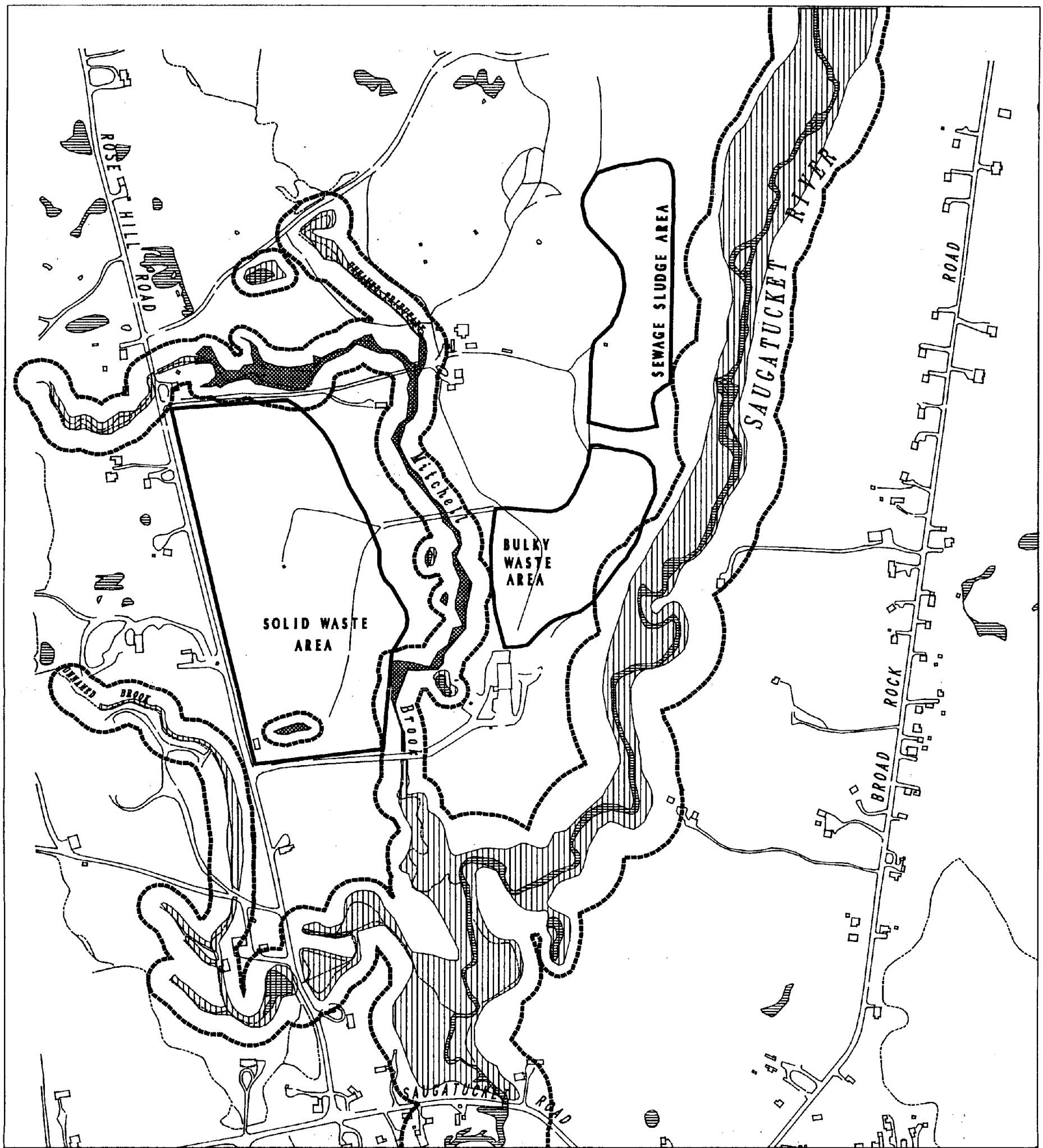
Stream or Brook
Dirt Road
Landfill Area
Structures- 0.4 acres and Paved/Gravel Roads- 5.9 acres
Palustrine Emergent Wetland- 0.5 acres
Palustrine Forested Wetland- 19.3 acres
Palustrine Open Water- 3.6 acres
Deciduous Forest- 86.2 acres
Successional Old Field- 57.7 acres
Successional Shrubland- 2.7 acres
Bare Ground- 5.6 acres
Mowed Lawn- 5.8 acres
Scrub (Mix of Shrub, Herbaceous, and Small Trees)- 7.8 acres

SCALE IN FEET
400 0 100 400

FIGURE 3-24
HABITAT TYPES

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Boundary of Area Protected Under RI Freshwater Wetlands Act

Landfill Area

Lake, Pond or River

Field-Verified Wetland

Wetland as Indicated by Available Literature

SCALE IN FEET

500 0 100 500

FIGURE 3-25

WETLAND RESOURCE AREAS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

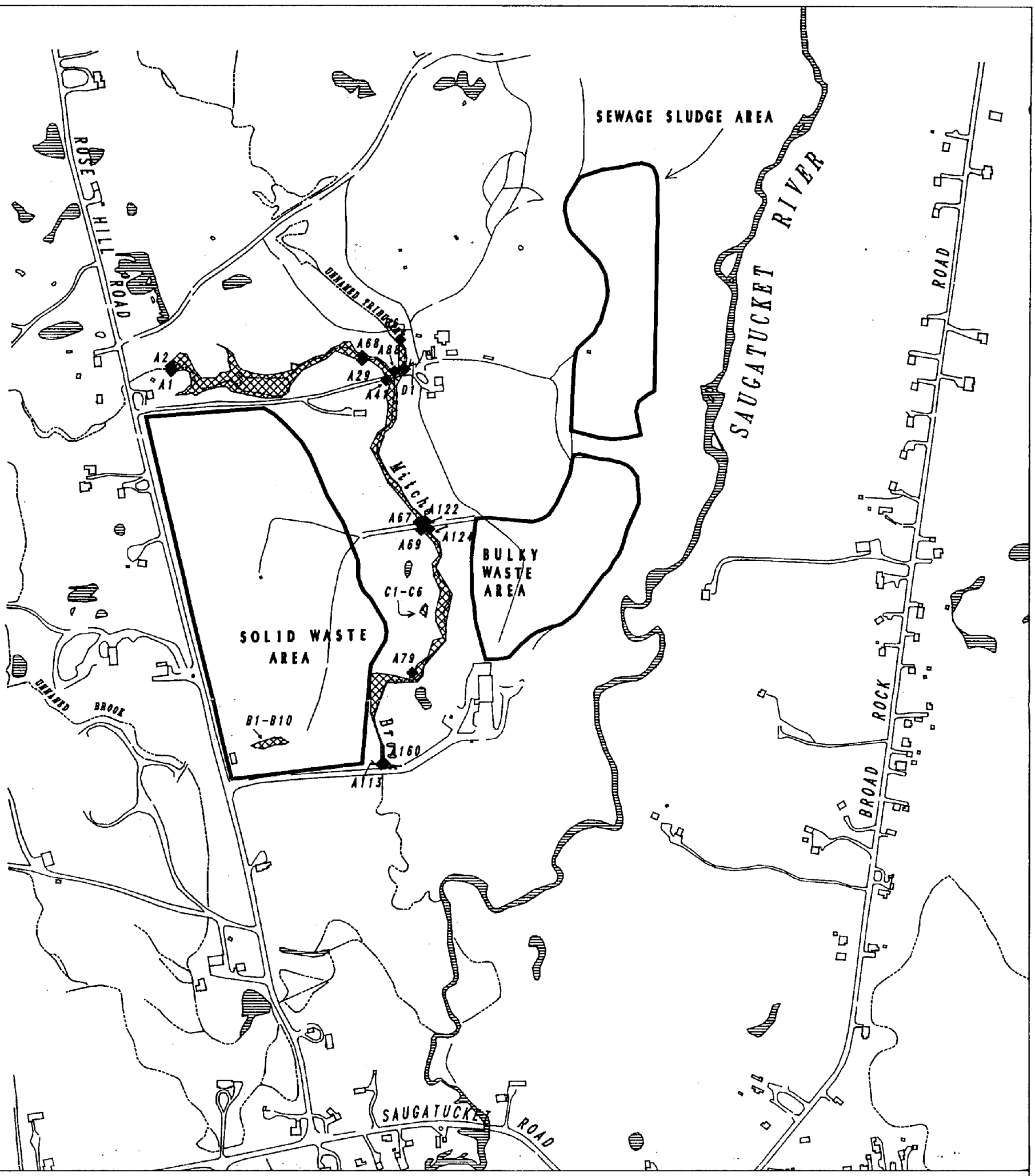


FIGURE 3-26

WETLAND FLAG LOCATIONS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

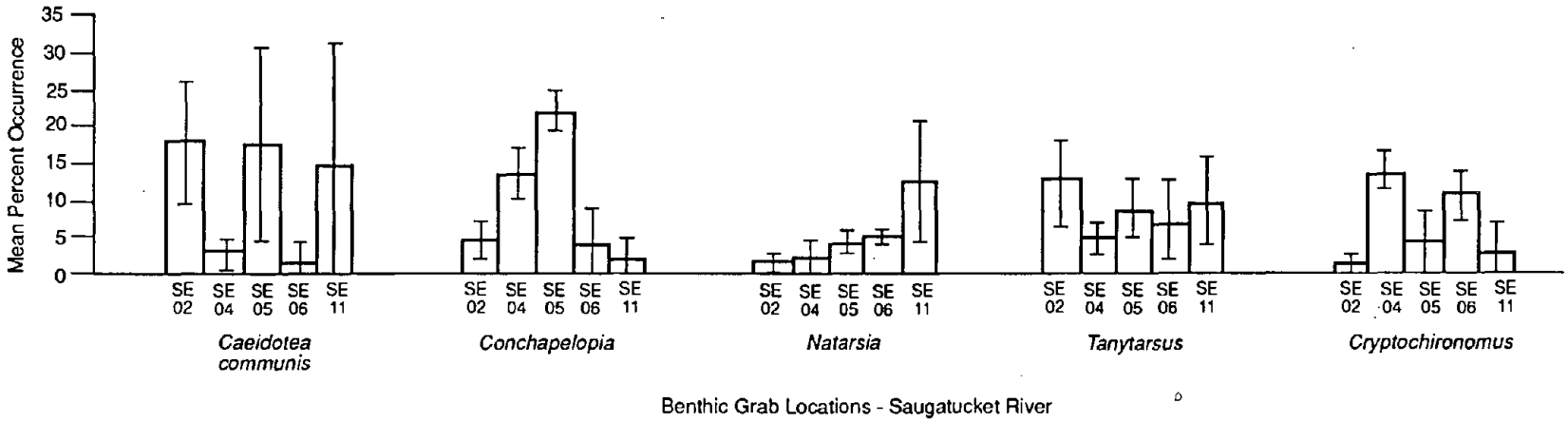


FIGURE 3-27. MEAN RELATIVE PERCENT OCCURRENCE AND STANDARD DEVIATIONS OF COMMONLY OCCURRING SPECIES IN BENTHIC GRAB SAMPLES IN THE SAUGATUCKET RIVER

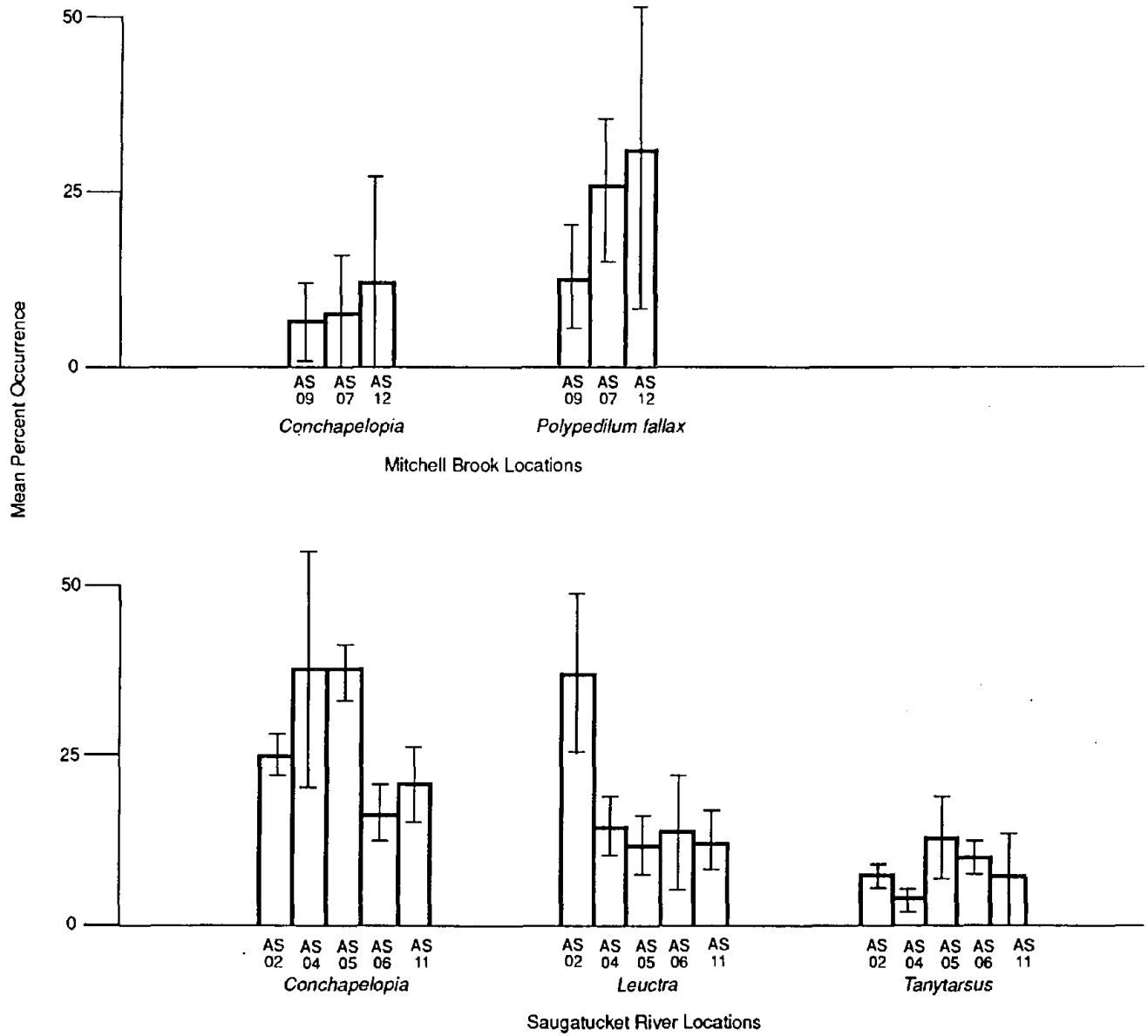


FIGURE 3-28. MEAN RELATIVE PERCENT OCCURRENCE AND STANDARD DEVIATIONS OF COMMONLY OCCURRING SPECIES IN ARTIFICIAL SUBSTRATE SAMPLES

2747JP/94B

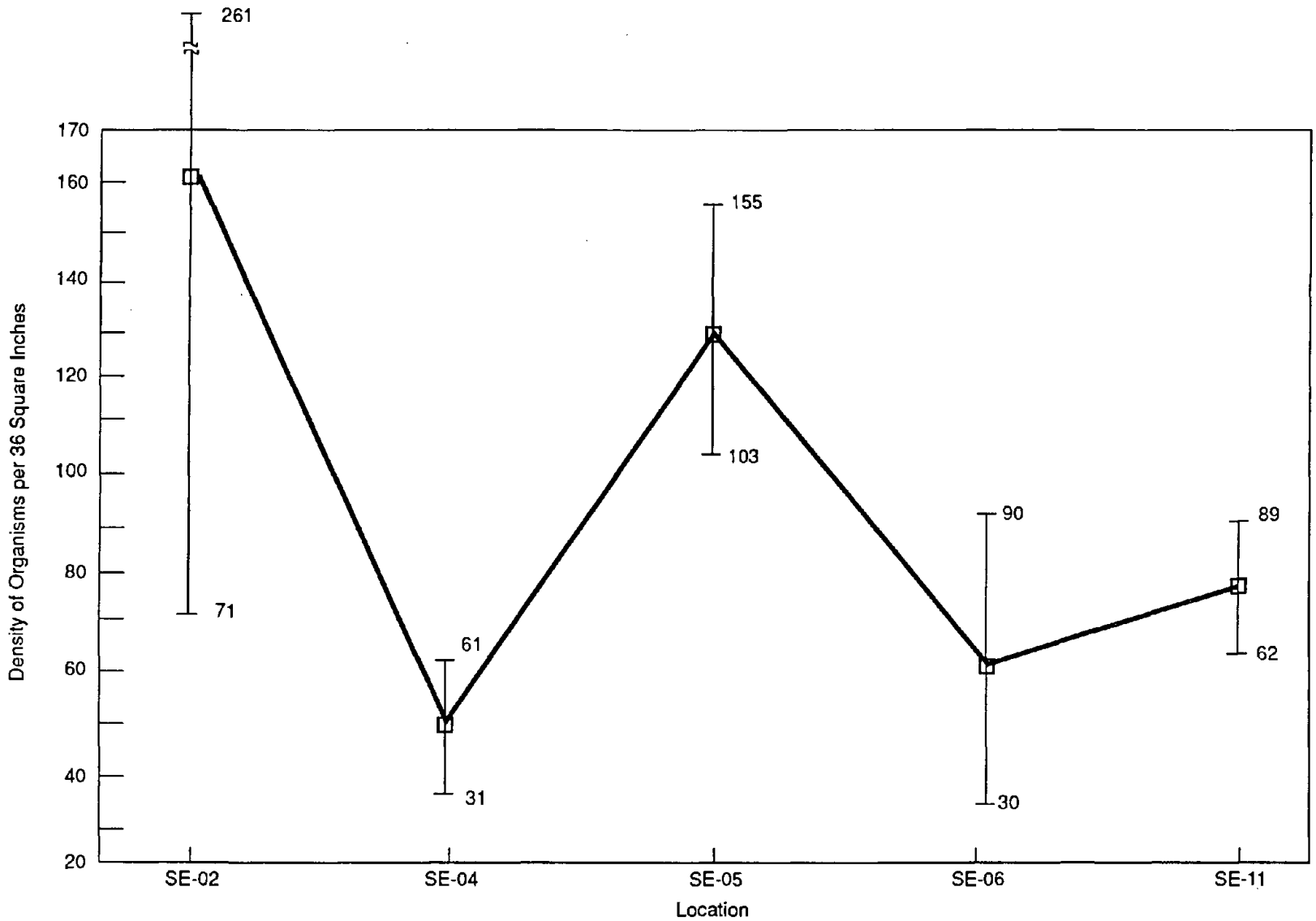


FIGURE 3-29. MEAN DENSITY OF ORGANISMS AND STANDARD DEVIATION BARS IN SAUGATUCKET RIVER GRAB SAMPLES

2747JP/94E

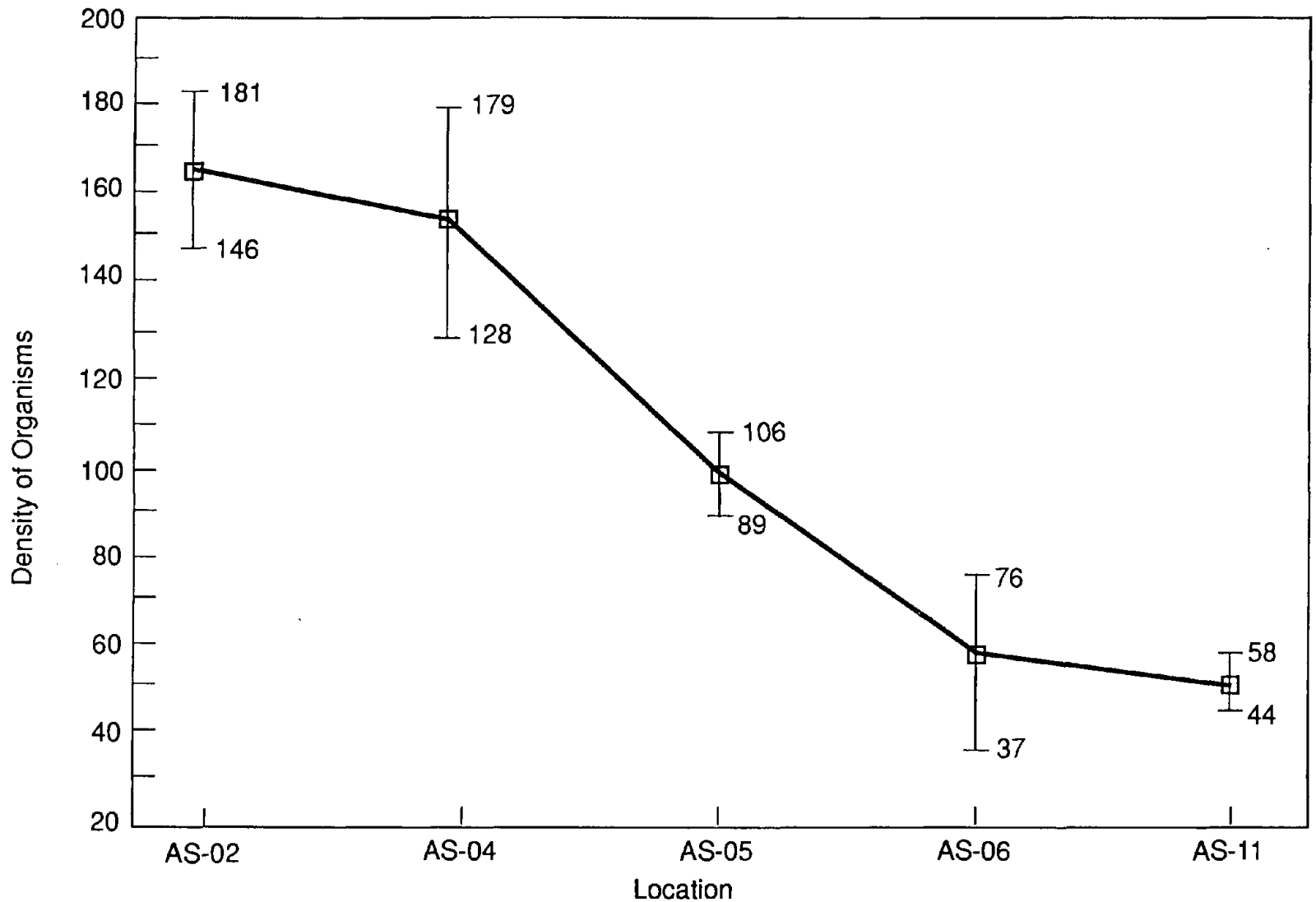


FIGURE 3-30. MEAN DENSITY OF ORGANISMS AND STANDARD DEVIATION BARS IN SAUGATUCKET RIVER ARTIFICIAL SUBSTRATE SAMPLES

2747jp

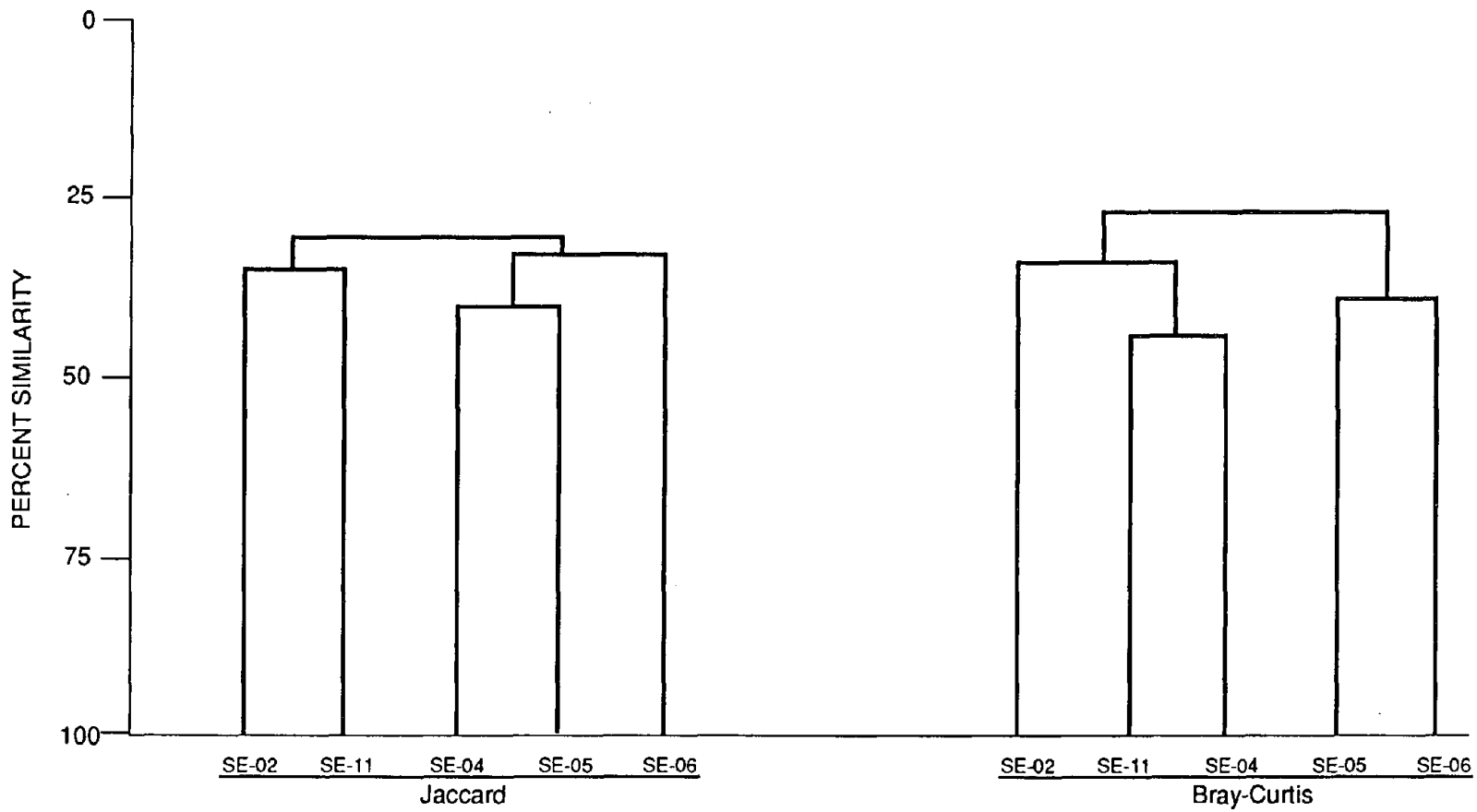


FIGURE 3-31. CLUSTERING OF BENTHIC GRAB SAMPLES IN THE SAUGATUCKET RIVER USING JACCARD AND BRAY-CURTIS SIMILARITY INDICES WITH UNWEIGHTED PAIR GROUP METHOD AND ARITHMETIC AVERAGES

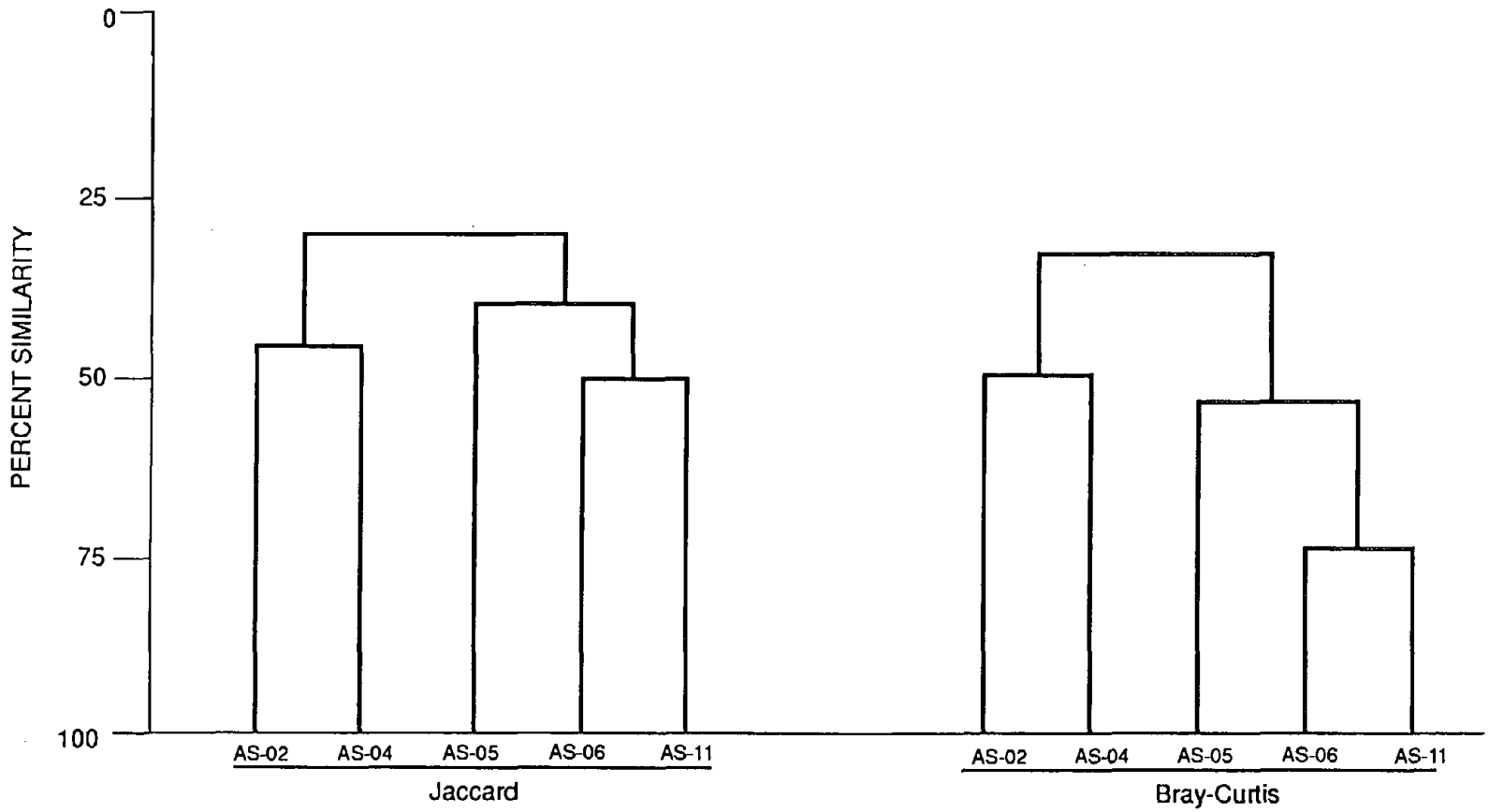


FIGURE 3-32. CLUSTERING OF ARTIFICIAL SUBSTRATE SAMPLES IN THE SAUGATUCKET RIVER USING JACCARD AND BRAY-CURTIS SIMILARITY INDICES WITH UNWEIGHTED PAIR GROUP METHOD AND ARITHMETIC AVERAGES

2747JP/94E

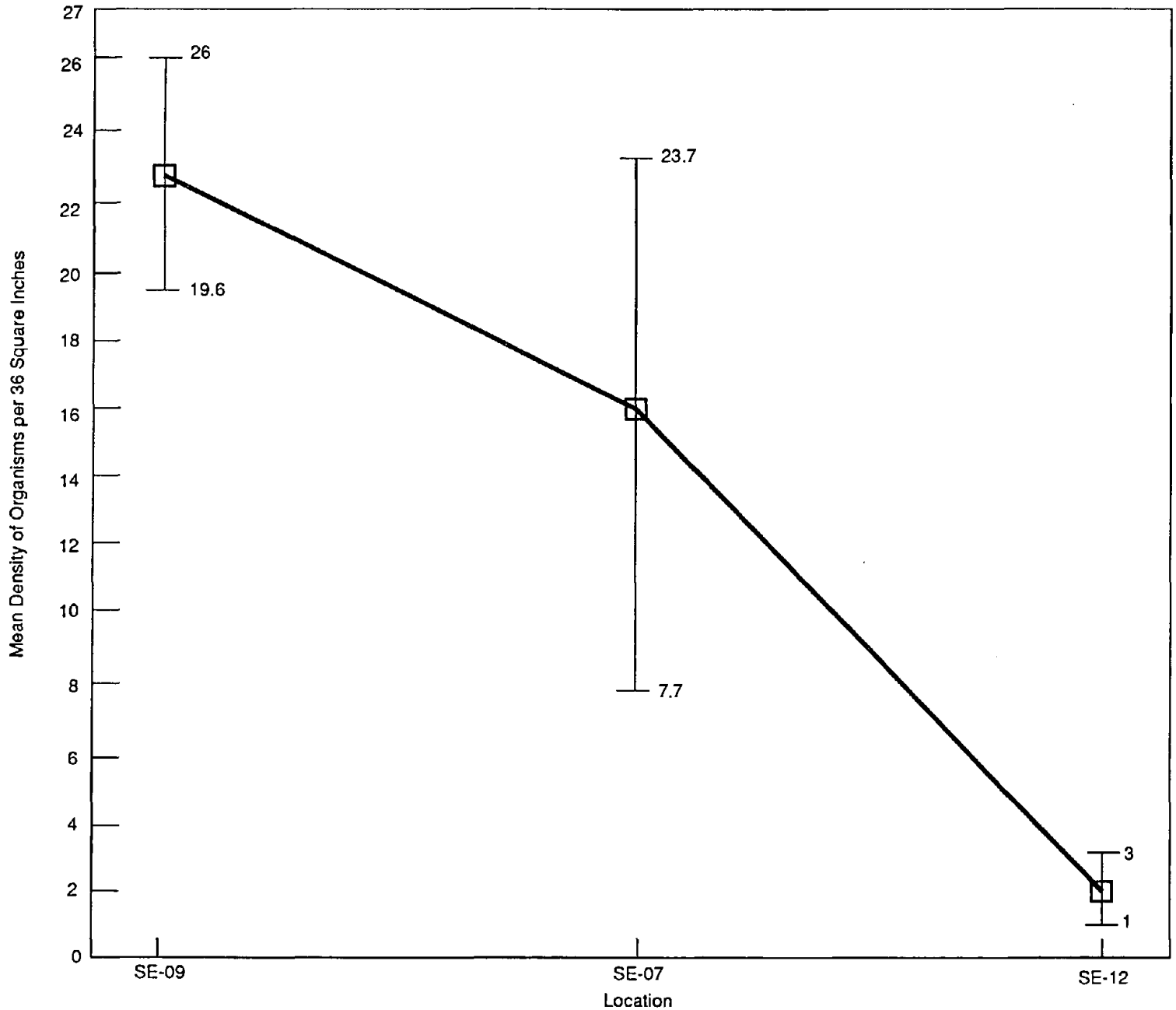


FIGURE 3-33. MEAN DENSITIES OF ORGANISMS AND STANDARD DEVIATION BARS IN MITCHELL BROOK GRAB SAMPLES

2747JP

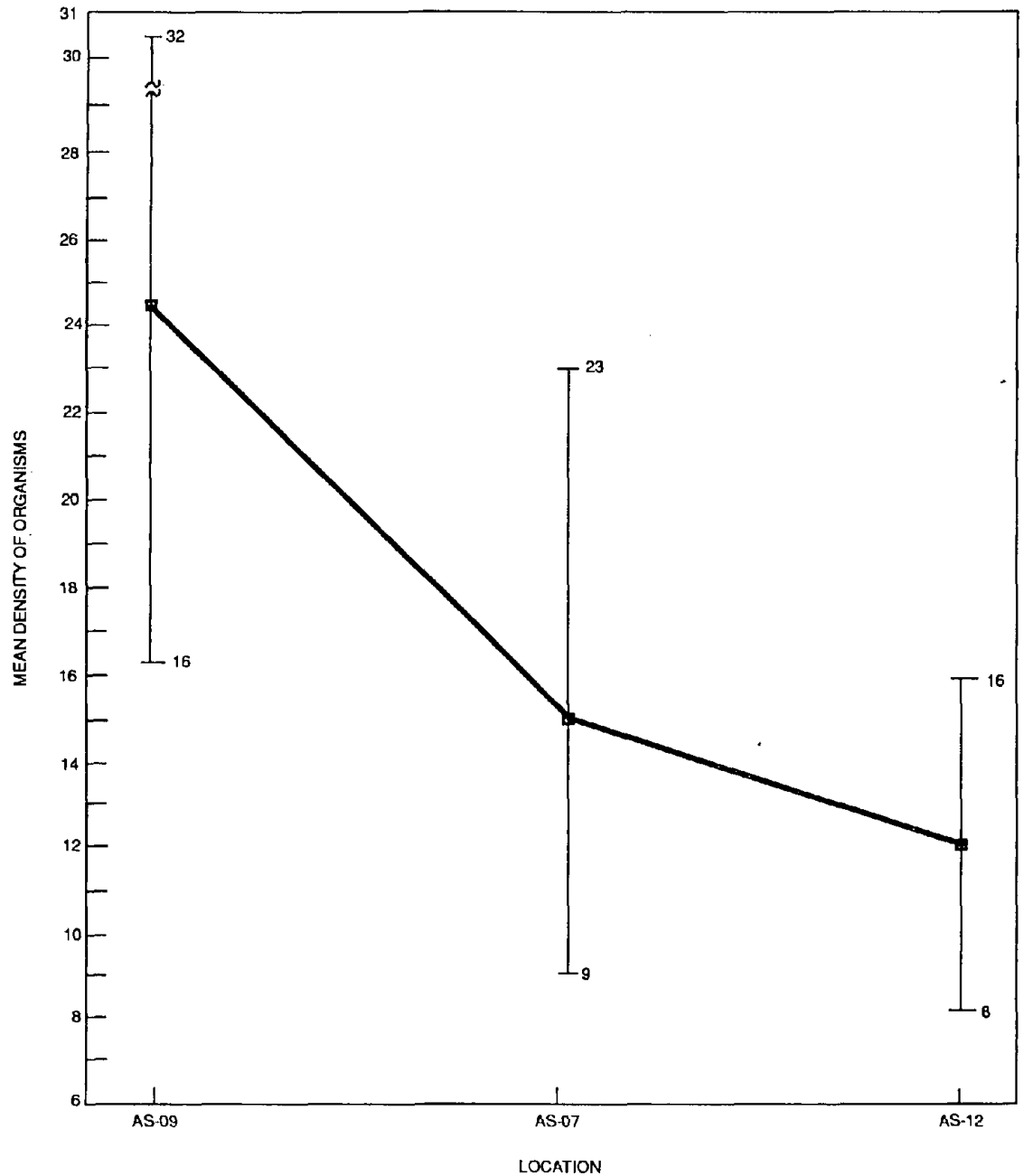


FIGURE 3-34. MEAN DENSITIES OF ORGANISMS AND STANDARD DEVIATION BARS IN MITCHELL BROOK ARTIFICIAL SUBSTRATE SAMPLES

2747in

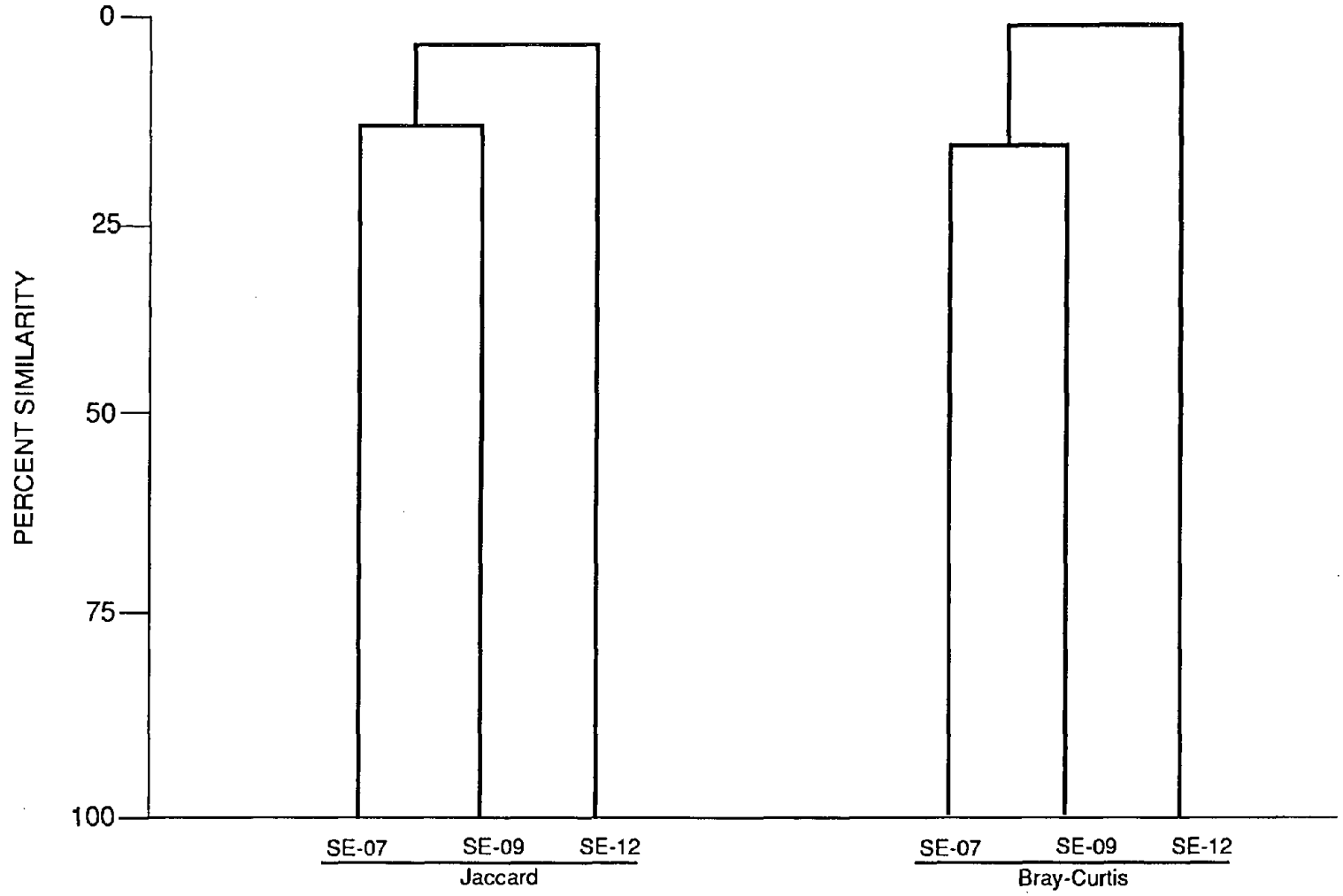


FIGURE 3-35. CLUSTERING OF BENTHIC GRAB SAMPLES IN MITCHELL BROOK USING JACCARD AND BRAY-CURTIS SIMILARITY INDICES WITH UNWEIGHTED PAIR GROUP METHOD AND ARITHMETIC AVERAGES

2747JP/94E

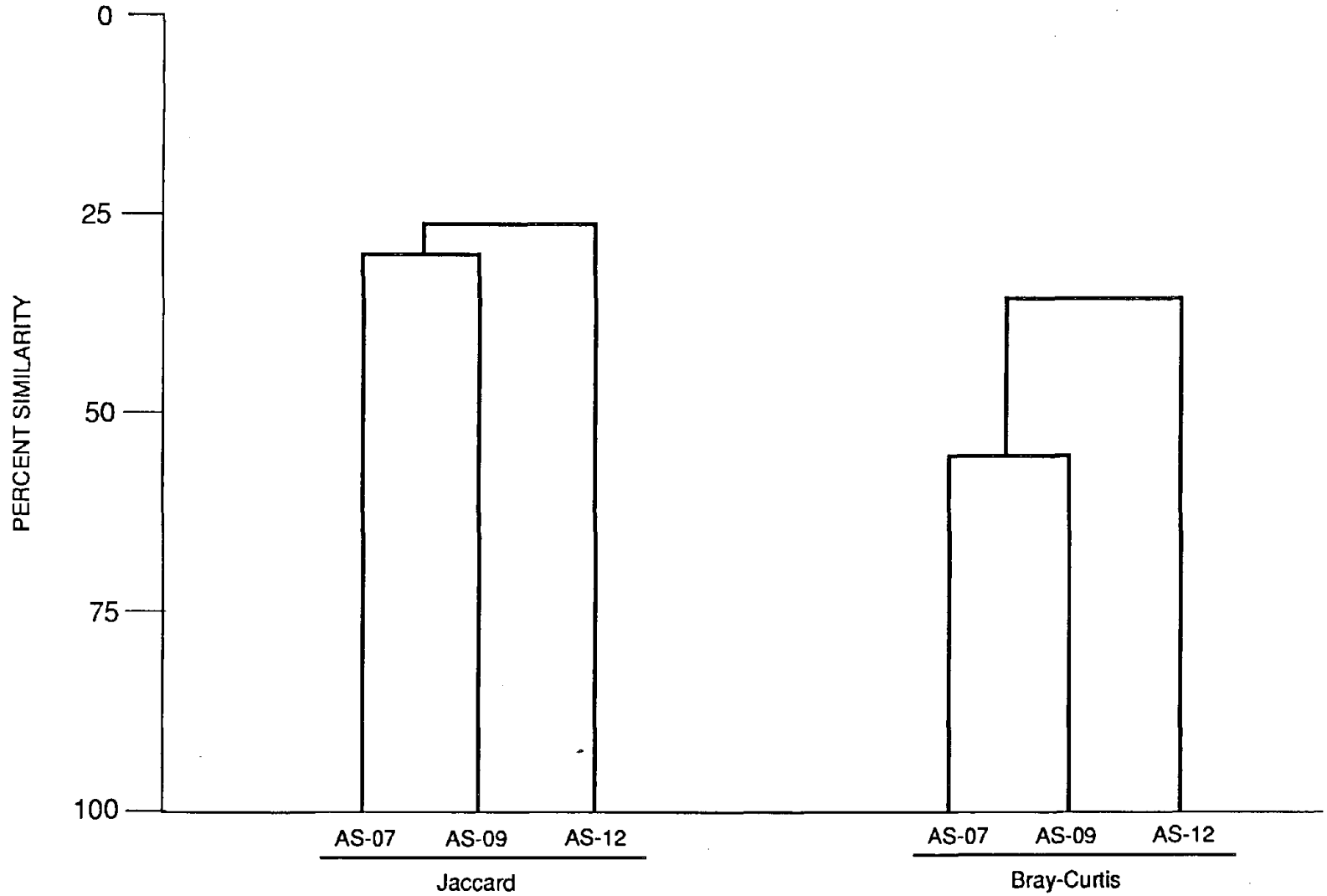
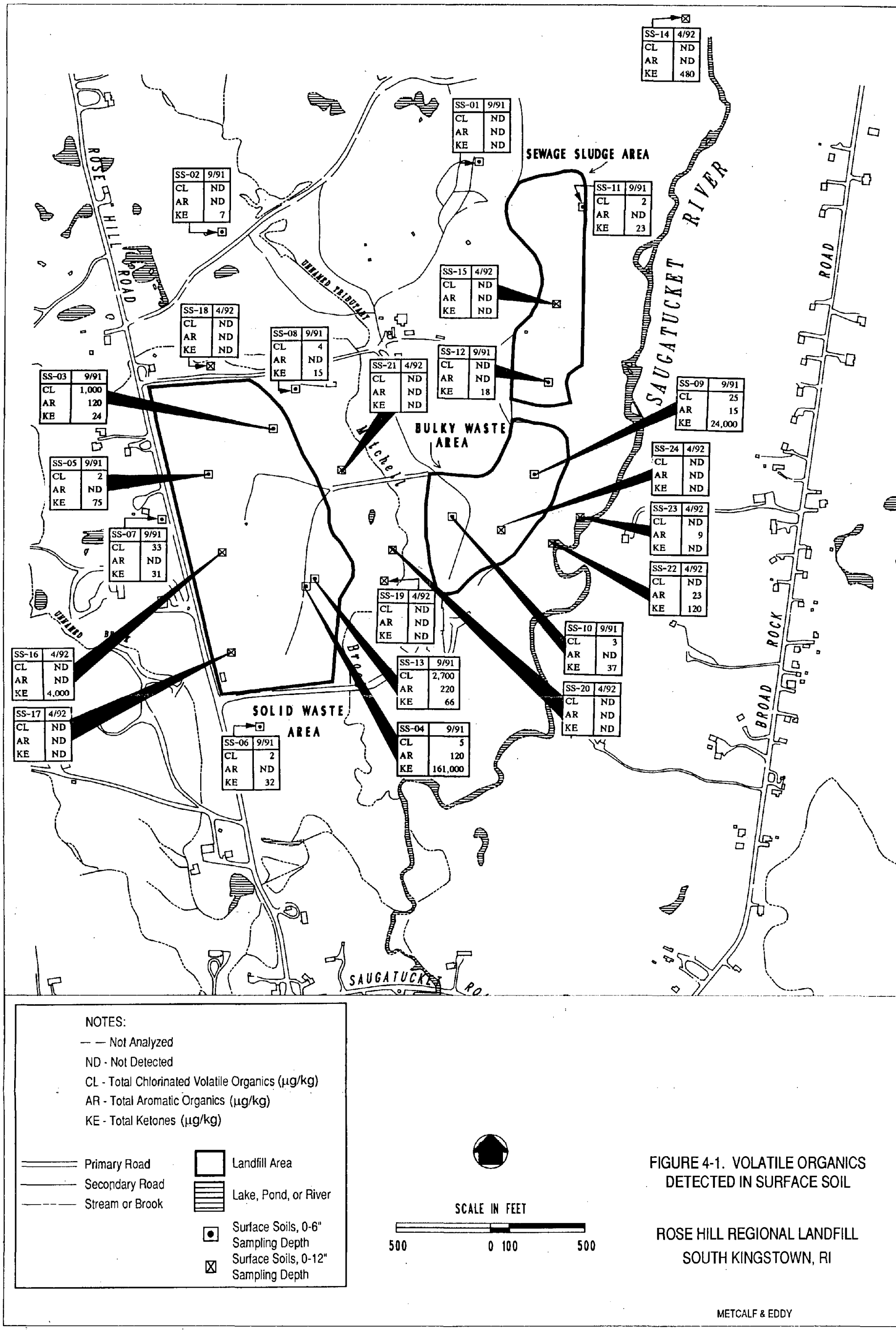


FIGURE 3-36. CLUSTERING OF ARTIFICIAL SUBSTRATE SAMPLES IN MITCHELL BROOK USING JACCARD AND BRAY-CURTIS SIMILARITY INDICES WITH UNWEIGHTED PAIR GROUP METHOD AND ARITHMETIC AVERAGES

Z747JP/94E

Section Four



NOTES:

— — Not Analyzed

ND - Not Detected

CL - Total Chlorinated Volatile Organics (µg/kg)

AR - Total Aromatic Organics (µg/kg)

KE - Total Ketones (µg/kg)

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Surface Soils, 0-6" Sampling Depth

Surface Soils, 0-12" Sampling Depth

SCALE IN FEET

500 0 100 500

FIGURE 4-1. VOLATILE ORGANICS DETECTED IN SURFACE SOIL

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

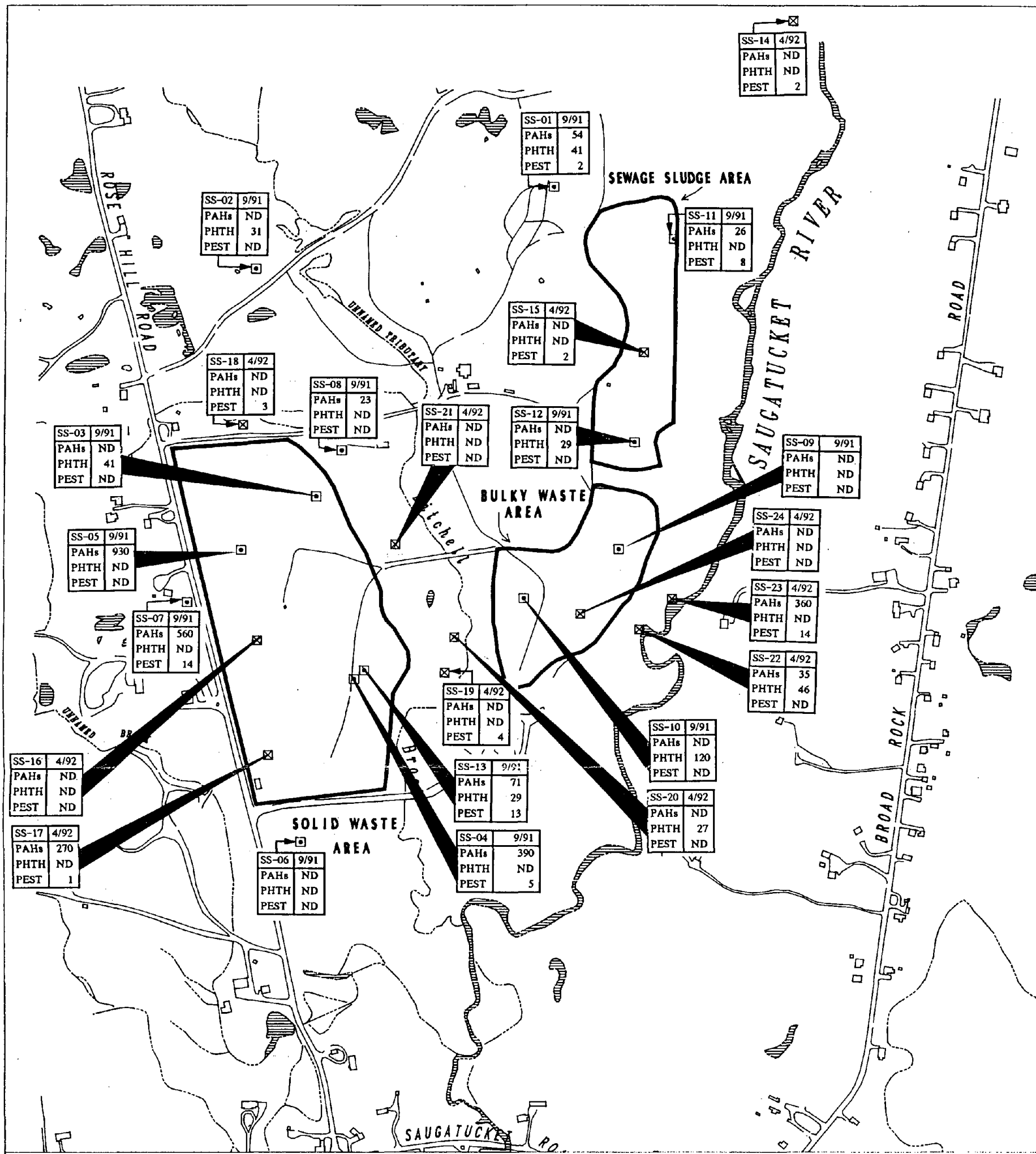
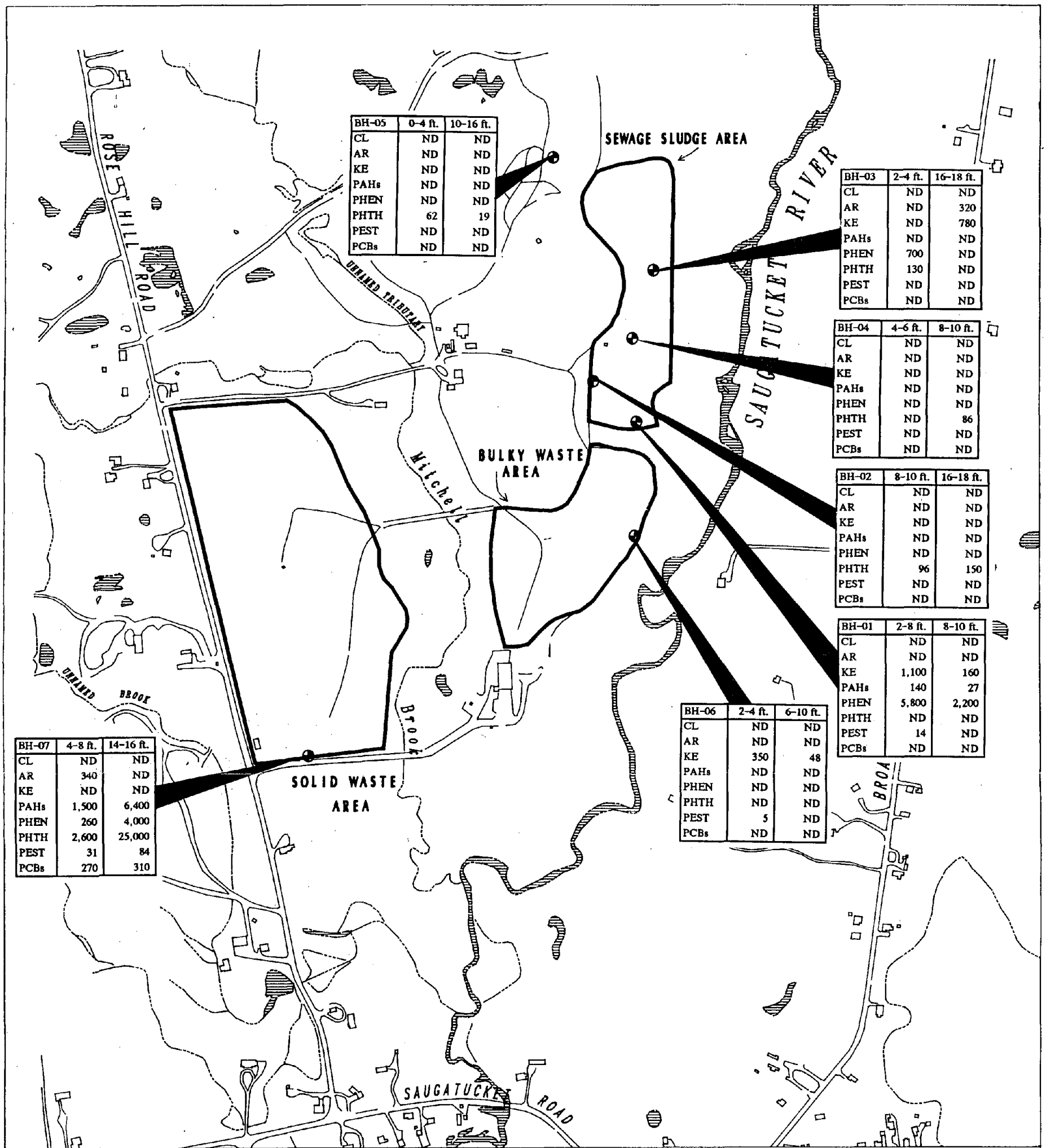


FIGURE 4-2. SEMIVOLATILE ORGANICS, PESTICIDES, AND PCBs DETECTED IN SURFACE SOIL

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



BH-05	0-4 ft.	10-16 ft.
CL	ND	ND
AR	ND	ND
KE	ND	ND
PAHs	ND	ND
PHEN	ND	ND
PHTH	62	19
PEST	ND	ND
PCBs	ND	ND

BH-03	2-4 ft.	16-18 ft.
CL	ND	ND
AR	ND	320
KE	ND	780
PAHs	ND	ND
PHEN	700	ND
PHTH	130	ND
PEST	ND	ND
PCBs	ND	ND

BH-04	4-6 ft.	8-10 ft.
CL	ND	ND
AR	ND	ND
KE	ND	ND
PAHs	ND	ND
PHEN	ND	ND
PHTH	ND	86
PEST	ND	ND
PCBs	ND	ND

BH-02	8-10 ft.	16-18 ft.
CL	ND	ND
AR	ND	ND
KE	ND	ND
PAHs	ND	ND
PHEN	ND	ND
PHTH	96	150
PEST	ND	ND
PCBs	ND	ND

BH-01	2-8 ft.	8-10 ft.
CL	ND	ND
AR	ND	ND
KE	1,100	160
PAHs	140	27
PHEN	5,800	2,200
PHTH	ND	ND
PEST	14	ND
PCBs	ND	ND

BH-06	2-4 ft.	6-10 ft.
CL	ND	ND
AR	ND	ND
KE	350	48
PAHs	ND	ND
PHEN	ND	ND
PHTH	ND	ND
PEST	5	ND
PCBs	ND	ND

BH-07	4-8 ft.	14-16 ft.
CL	ND	ND
AR	340	ND
KE	ND	ND
PAHs	1,500	6,400
PHEN	260	4,000
PHTH	2,600	25,000
PEST	31	84
PCBs	270	310

NOTES: Except for volatile analysis, samples werecomposited when split-spoon recovery was insufficient.

– – Not Analyzed
ND - Not Detected
CL - Total Chlorinated Organics (µg/kg)
AR - Total Aromatic Organics (µg/kg)
KE - Total Ketones (µg/kg)
PAHs - Total Polycyclic Aromatic Hydrocarbons (µg/kg)
PHEN - Total Phenols (µg/kg)
PEST - Total Pesticides (µg/kg)
PCBs - Total Polychlorinated Biphenyls (µg/kg)

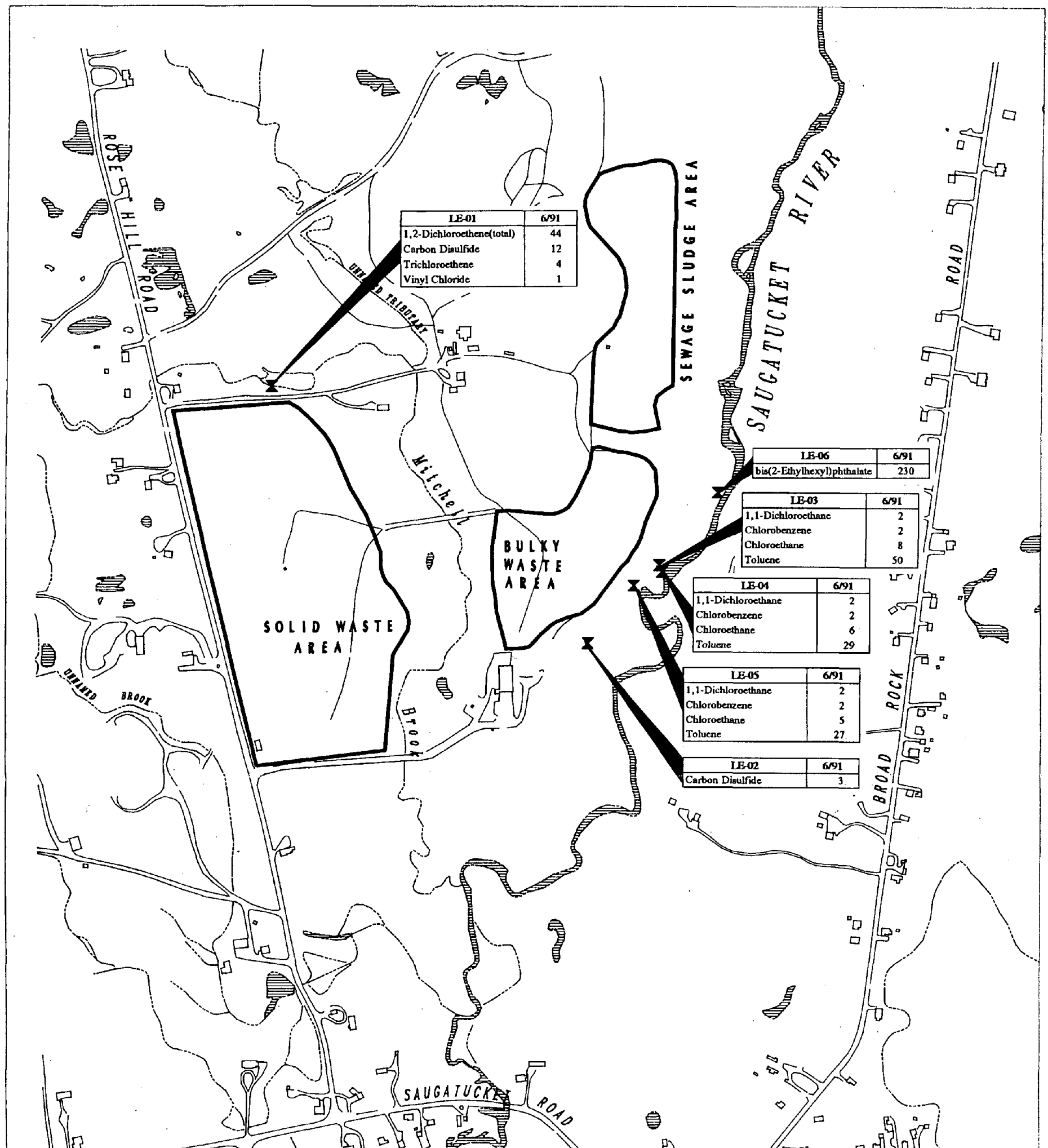
Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
Landfill Analytical Soil Boring

SCALE IN FEET
500 0 100 500

FIGURE 4-3. ORGANIC COMPOUNDS DETECED IN SUBSURFACE SOIL

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTES:

All concentrations presented in µg/L

— — Not Analyzed

ND - Not Detected

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Leachate Sampling Location

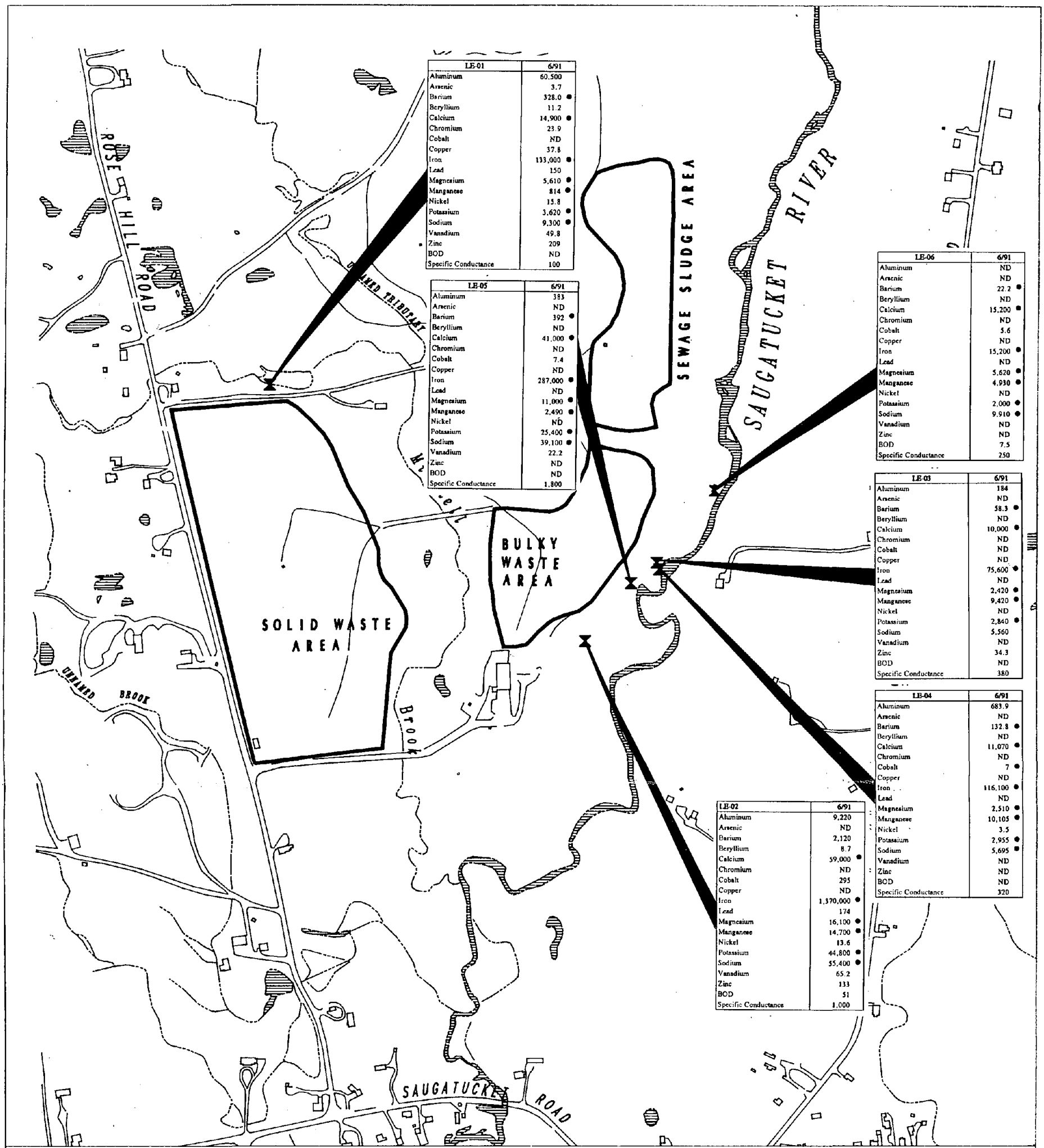
SCALE IN FEET

500 0 100 500

FIGURE 4-4. ORGANIC COMPOUNDS DETECTED IN LEACHATE

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTES: Unfiltered metal concentrations and BOD (biochemical oxygen demand) are presented in µg/L. Specific conductance is presented in µmhos/cm

— — Not Analyzed

ND - Not Detected

• Also Detected in Filtered Sample

Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
Leachate Sampling Location

SCALE IN FEET
500 0 100 500

FIGURE 4-5. INORGANICS DETECTED IN LEACHATE

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

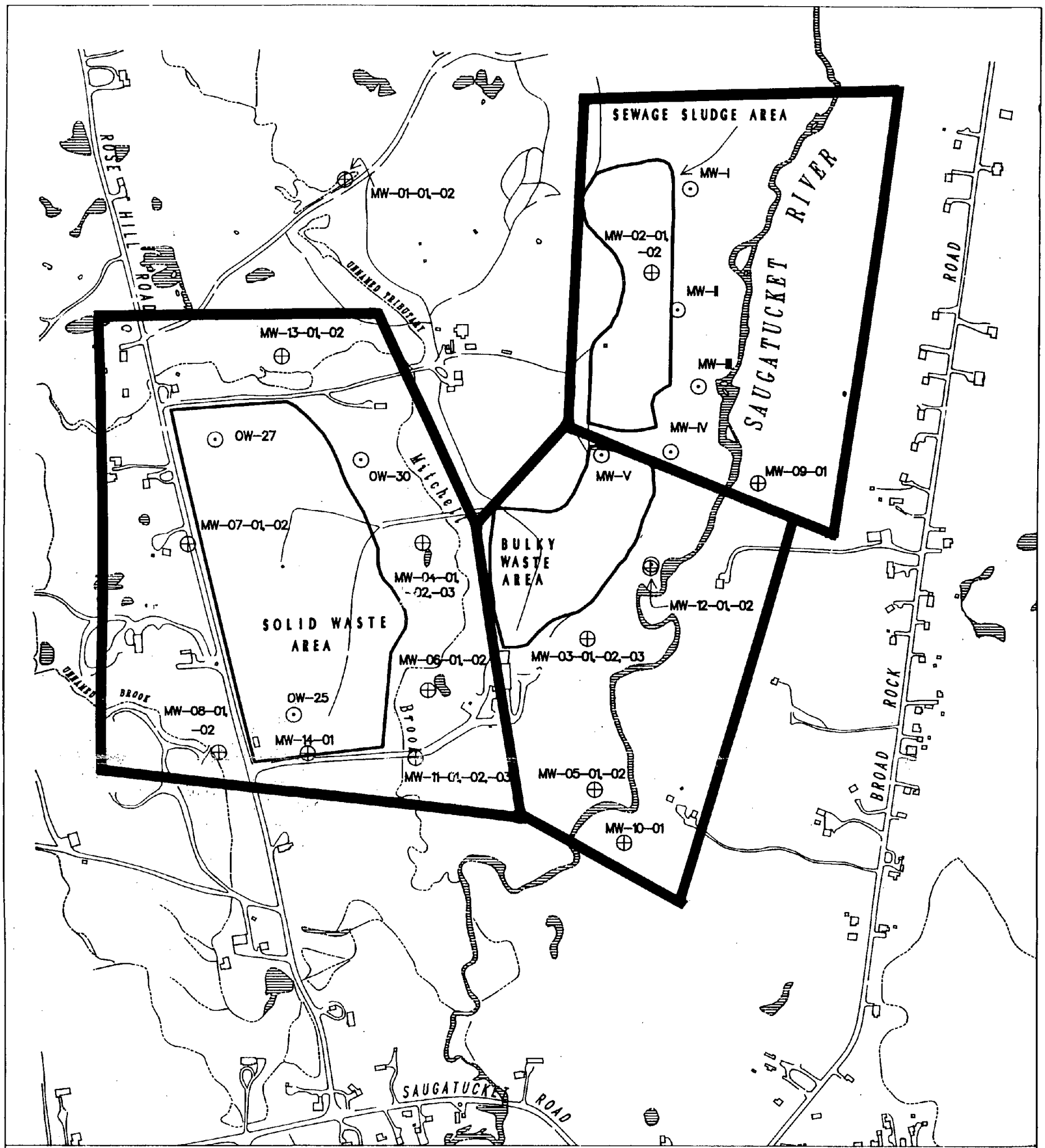


FIGURE 4-6. MONITORING WELLS GROUPED BY PREDOMINANT FLOWPATHS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

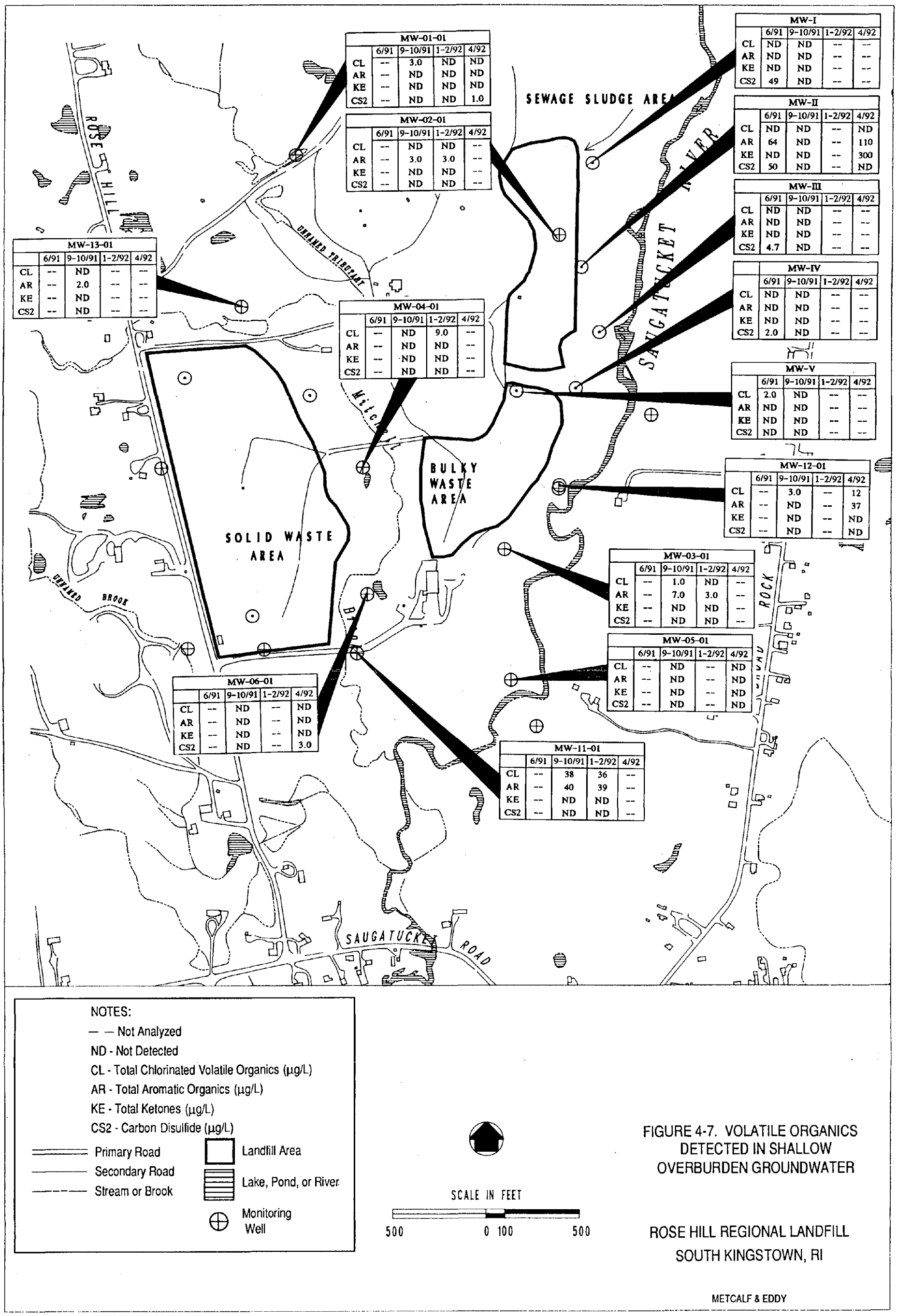
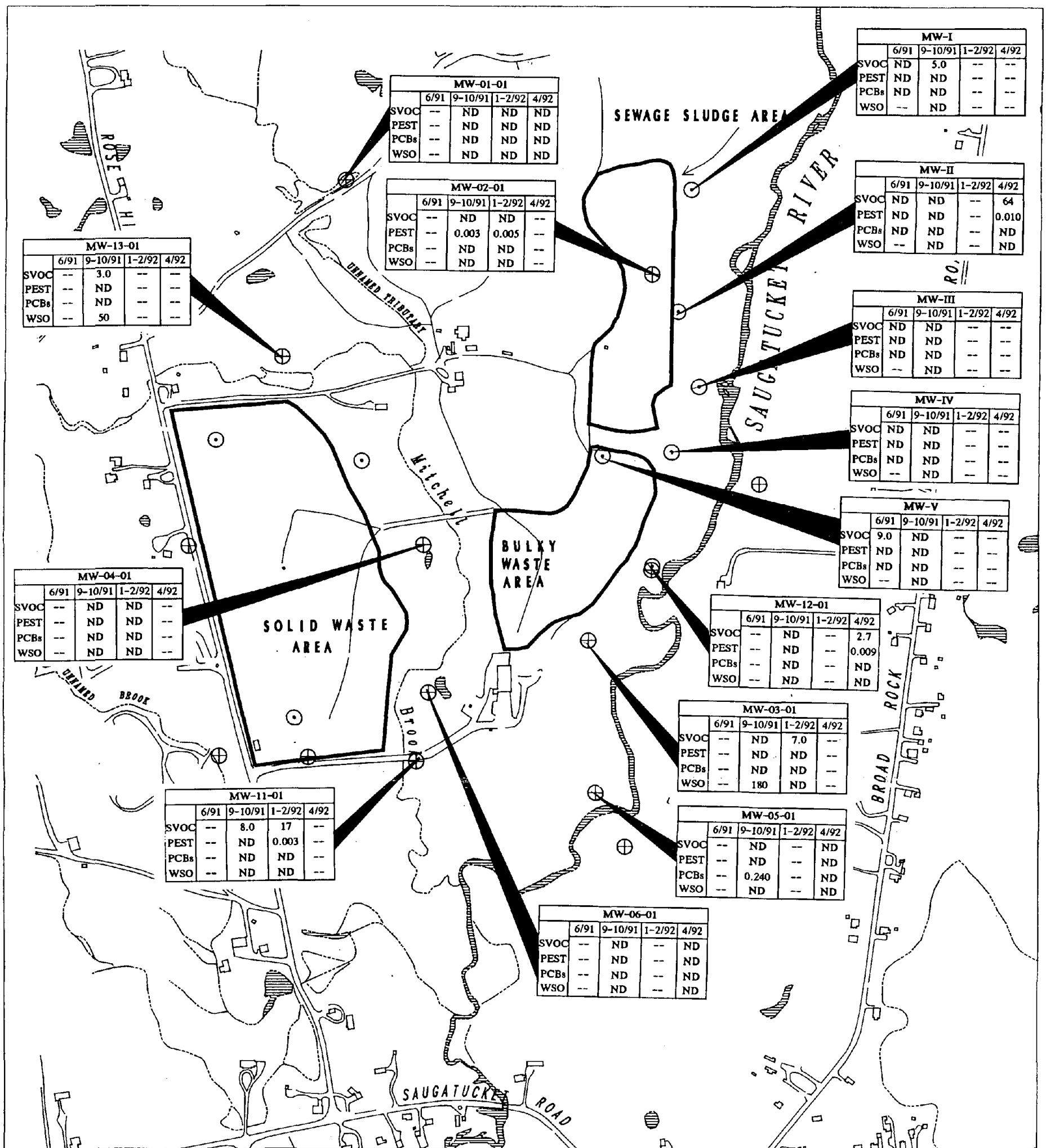


FIGURE 4-7. VOLATILE ORGANICS DETECTED IN SHALLOW OVERBURDEN GROUNDWATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



MW-01-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	ND	ND	ND
PEST	--	ND	ND	ND
PCBs	--	ND	ND	ND
WSO	--	ND	ND	ND

MW-02-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	ND	ND	--
PEST	--	0.003	0.005	--
PCBs	--	ND	ND	--
WSO	--	ND	ND	--

MW-13-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	3.0	--	--
PEST	--	ND	--	--
PCBs	--	ND	--	--
WSO	--	50	--	--

MW-I	6/91	9-10/91	1-2/92	4/92
SVOC	ND	5.0	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--
WSO	--	ND	--	--

MW-II	6/91	9-10/91	1-2/92	4/92
SVOC	ND	ND	--	64
PEST	ND	ND	--	0.010
PCBs	ND	ND	--	ND
WSO	--	ND	--	ND

MW-III	6/91	9-10/91	1-2/92	4/92
SVOC	ND	ND	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--
WSO	--	ND	--	--

MW-IV	6/91	9-10/91	1-2/92	4/92
SVOC	ND	ND	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--
WSO	--	ND	--	--

MW-V	6/91	9-10/91	1-2/92	4/92
SVOC	9.0	ND	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--
WSO	--	ND	--	--

MW-04-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	ND	ND	--
PEST	--	ND	ND	--
PCBs	--	ND	ND	--
WSO	--	ND	ND	--

MW-12-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	ND	--	2.7
PEST	--	ND	--	0.009
PCBs	--	ND	--	ND
WSO	--	ND	--	ND

MW-03-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	ND	7.0	--
PEST	--	ND	ND	--
PCBs	--	ND	ND	--
WSO	--	180	ND	--

MW-11-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	8.0	17	--
PEST	--	ND	0.003	--
PCBs	--	ND	ND	--
WSO	--	ND	ND	--

MW-05-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	ND	--	ND
PEST	--	ND	--	ND
PCBs	--	0.240	--	ND
WSO	--	ND	--	ND

MW-06-01	6/91	9-10/91	1-2/92	4/92
SVOC	--	ND	--	ND
PEST	--	ND	--	ND
PCBs	--	ND	--	ND
WSO	--	ND	--	ND

NOTES:

-- Not Analyzed

ND - Not Detected

SVOC - Total Semivolatile Organics (µg/L)

PEST - Total Pesticides (µg/L)

PCBs - Total Polychlorinated Biphenyls (µg/L)

WSO - Total Water Soluble Organics (µg/L)

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Monitoring Well

SCALE IN FEET

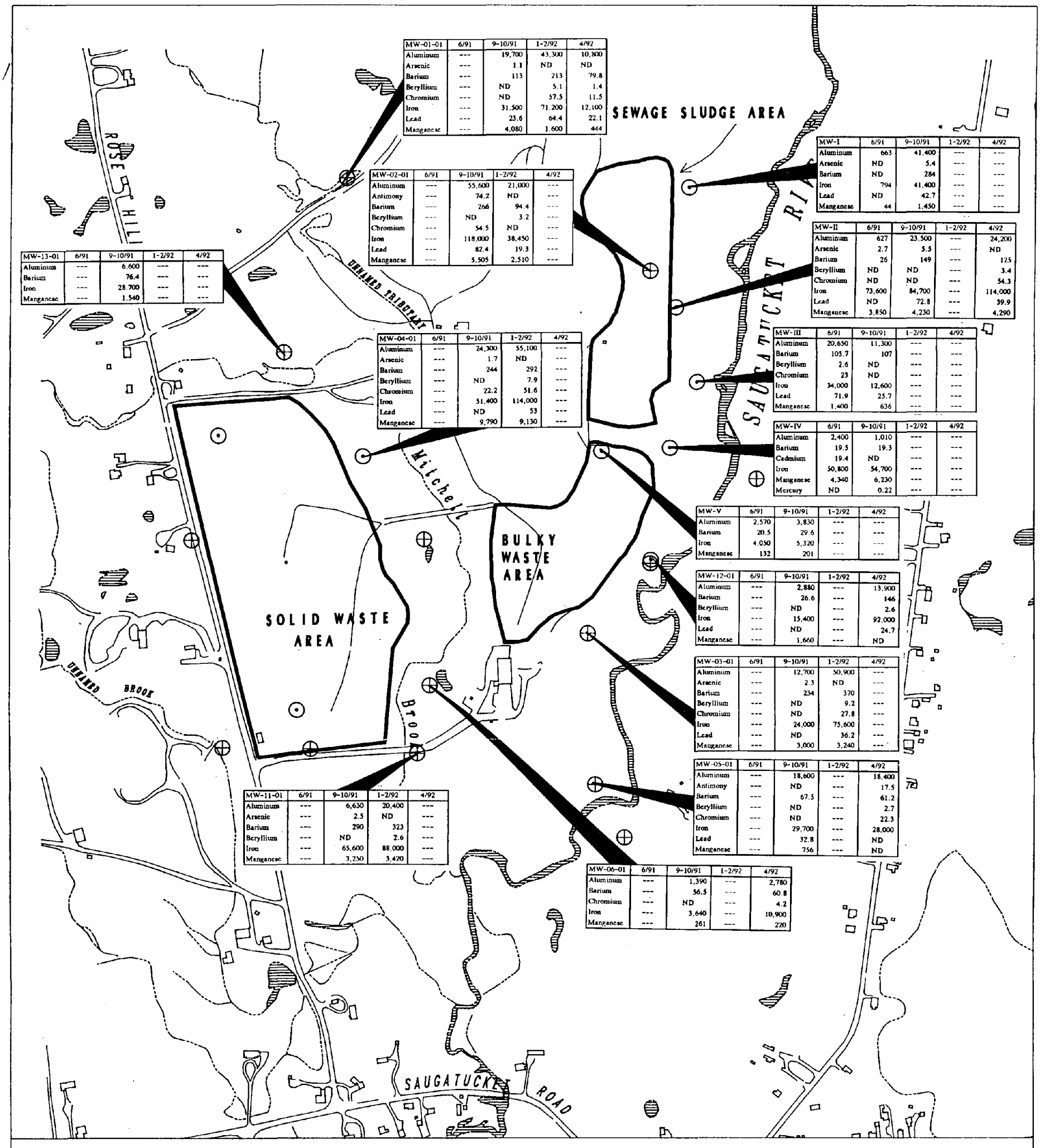
500 0 100 500

FIGURE 4-8. SEMIVOLATILE ORGANICS, PESTICIDES, PCBs, AND WATER SOLUBLE ORGANICS DETECTED IN SHALLOW OVERBURDEN GROUNDWATER

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



MW-01-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	19,700	43,300	10,800
Arsenic	---	1.1	ND	ND
Barium	---	113	213	79.8
Beryllium	---	ND	5.1	1.4
Chromium	---	ND	57.5	11.5
Iron	---	31,500	71,200	12,100
Lead	---	23.6	64.4	22.1
Manganese	---	4,080	1,600	444

MW-02-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	55,600	21,000	---
Antimony	---	74.2	ND	---
Barium	---	266	94.4	---
Beryllium	---	ND	3.2	---
Chromium	---	54.5	ND	---
Iron	---	118,000	38,450	---
Lead	---	82.4	19.3	---
Manganese	---	5,505	2,510	---

MW-13-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	6,600	---	---
Barium	---	76.4	---	---
Iron	---	28,700	---	---
Manganese	---	1,540	---	---

MW-04-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	24,300	55,100	---
Arsenic	---	1.7	ND	---
Barium	---	244	292	---
Beryllium	---	ND	7.9	---
Chromium	---	22.2	51.6	---
Iron	---	51,400	114,000	---
Lead	---	ND	53	---
Manganese	---	9,790	9,130	---

MW-I	6/91	9-10/91	1-2/92	4/92
Aluminum	663	41,400	---	---
Arsenic	ND	5.4	---	---
Barium	ND	284	---	---
Iron	794	41,400	---	---
Lead	ND	42.7	---	---
Manganese	44	1,450	---	---

MW-II	6/91	9-10/91	1-2/92	4/92
Aluminum	627	23,500	---	24,200
Arsenic	2.7	5.5	---	ND
Barium	26	149	---	125
Beryllium	ND	ND	---	3.4
Chromium	ND	ND	---	54.3
Iron	73,600	84,700	---	114,000
Lead	ND	72.8	---	39.9
Manganese	3,850	4,230	---	4,290

MW-III	6/91	9-10/91	1-2/92	4/92
Aluminum	20,650	11,300	---	---
Barium	105.7	107	---	---
Beryllium	2.6	ND	---	---
Chromium	23	ND	---	---
Iron	34,000	12,600	---	---
Lead	71.9	25.7	---	---
Manganese	1,400	636	---	---

MW-IV	6/91	9-10/91	1-2/92	4/92
Aluminum	2,400	1,010	---	---
Barium	19.5	19.3	---	---
Cadmium	19.4	ND	---	---
Iron	50,800	54,700	---	---
Manganese	4,340	6,230	---	---
Mercury	ND	0.22	---	---

MW-V	6/91	9-10/91	1-2/92	4/92
Aluminum	2,570	3,830	---	---
Barium	20.5	29.6	---	---
Iron	4,050	5,320	---	---
Manganese	132	201	---	---

MW-12-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	2,880	---	13,900
Barium	---	26.6	---	146
Beryllium	---	ND	---	2.6
Iron	---	15,400	---	92,000
Lead	---	ND	---	24.7
Manganese	---	1,660	---	ND

MW-03-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	12,700	50,900	---
Arsenic	---	2.3	ND	---
Barium	---	234	370	---
Beryllium	---	ND	9.2	---
Chromium	---	ND	27.8	---
Iron	---	24,000	75,600	---
Lead	---	ND	36.2	---
Manganese	---	3,000	3,240	---

MW-05-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	18,600	---	18,400
Antimony	---	ND	---	17.5
Barium	---	67.5	---	61.2
Beryllium	---	ND	---	2.7
Chromium	---	ND	---	22.3
Iron	---	29,700	---	28,000
Lead	---	32.8	---	ND
Manganese	---	756	---	ND

MW-11-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	6,630	20,400	---
Arsenic	---	2.5	ND	---
Barium	---	290	323	---
Beryllium	---	ND	2.6	---
Iron	---	65,600	88,000	---
Manganese	---	3,250	3,420	---

MW-06-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	1,390	---	2,780
Barium	---	56.5	---	60.8
Chromium	---	ND	---	4.2
Iron	---	3,640	---	10,900
Manganese	---	261	---	220

NOTES: All concentrations presented in µg/L for unfiltered samples.

— — Not Analyzed

ND - Not Detected

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Monitoring Well

SCALE IN FEET

500 0 100 500

FIGURE 4-9.
METALS DETECTED IN SHALLOW OVERBURDEN GROUNDWATER (UNFILTERED)

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

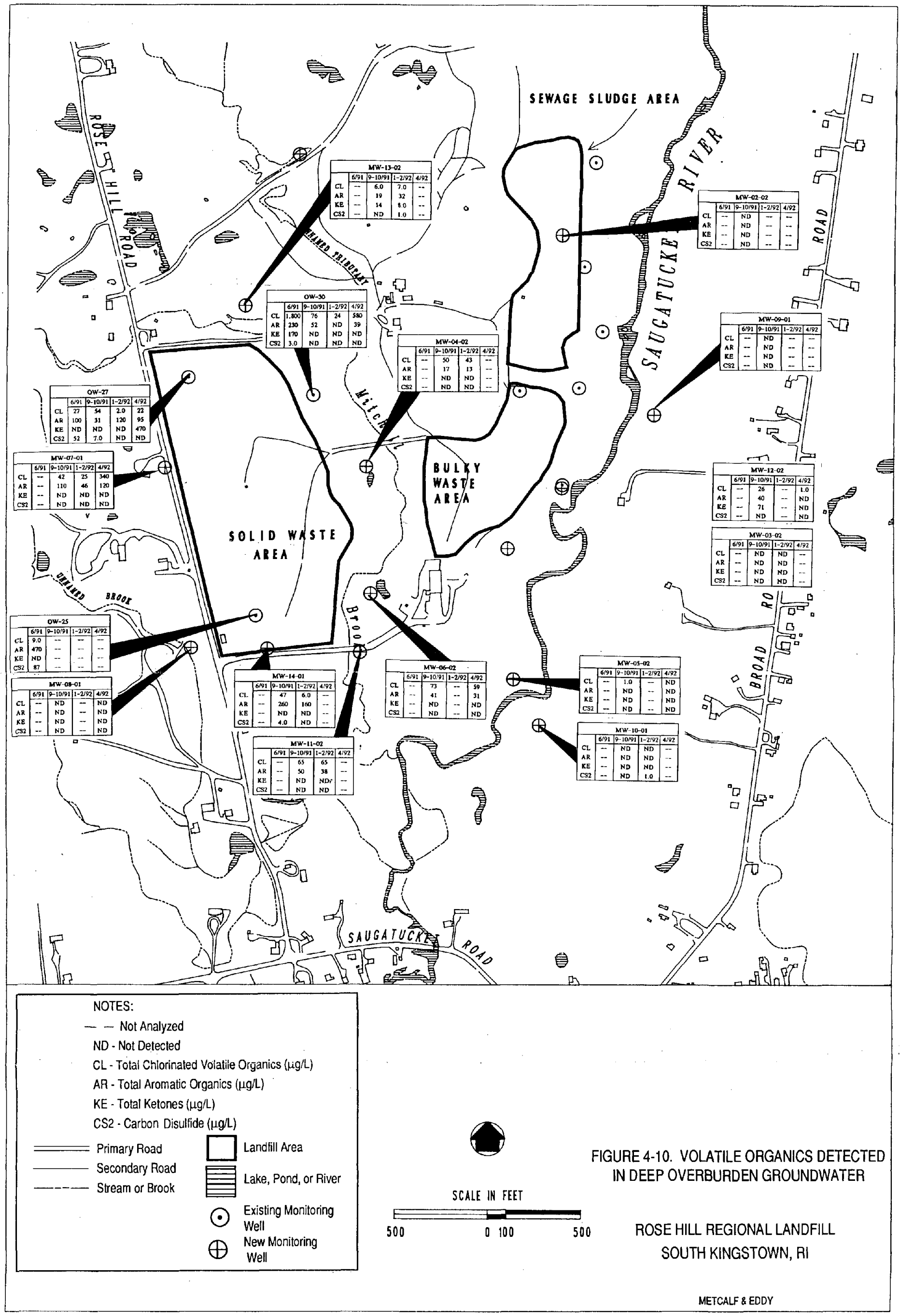


FIGURE 4-10. VOLATILE ORGANICS DETECTED IN DEEP OVERBURDEN GROUNDWATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

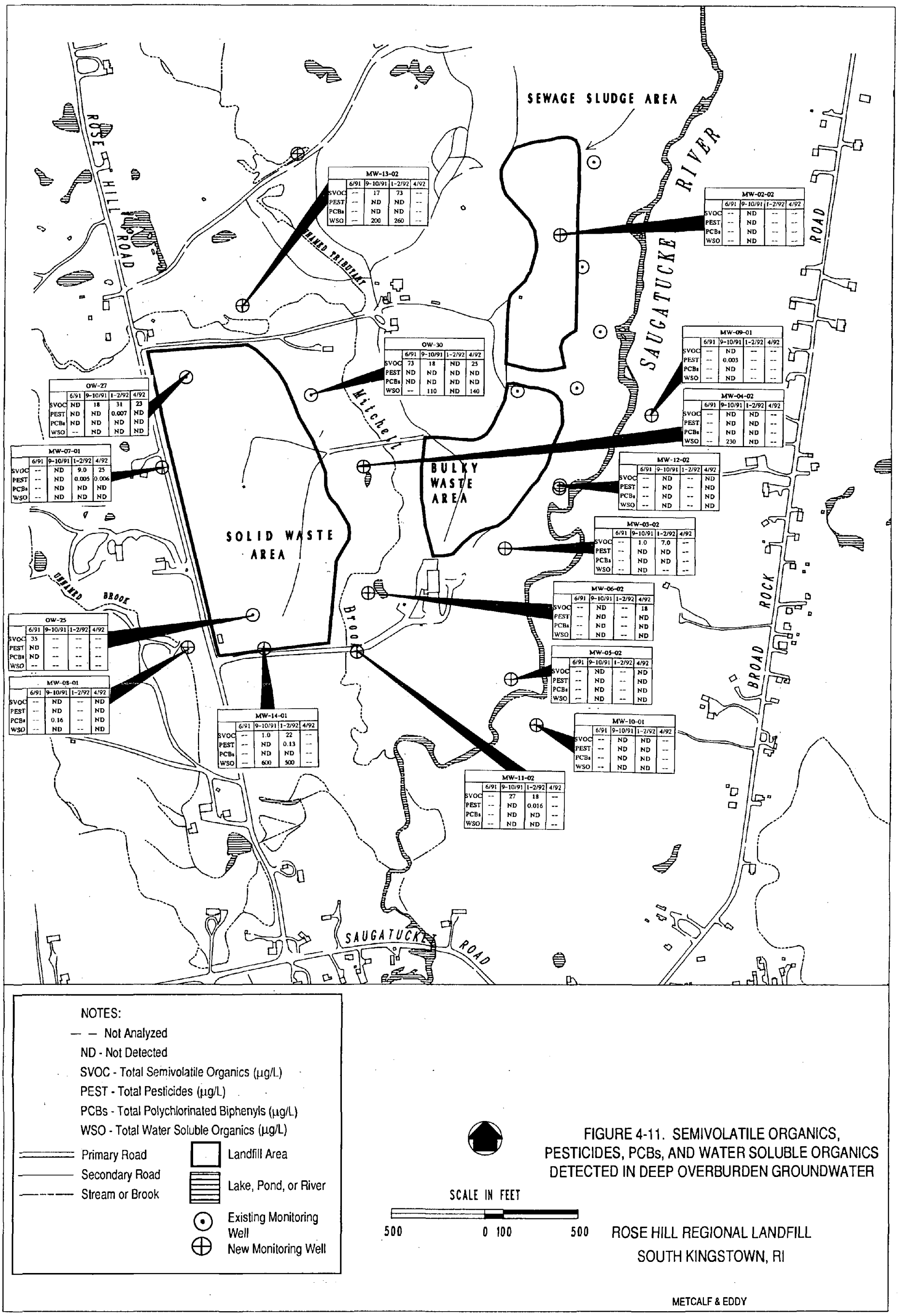
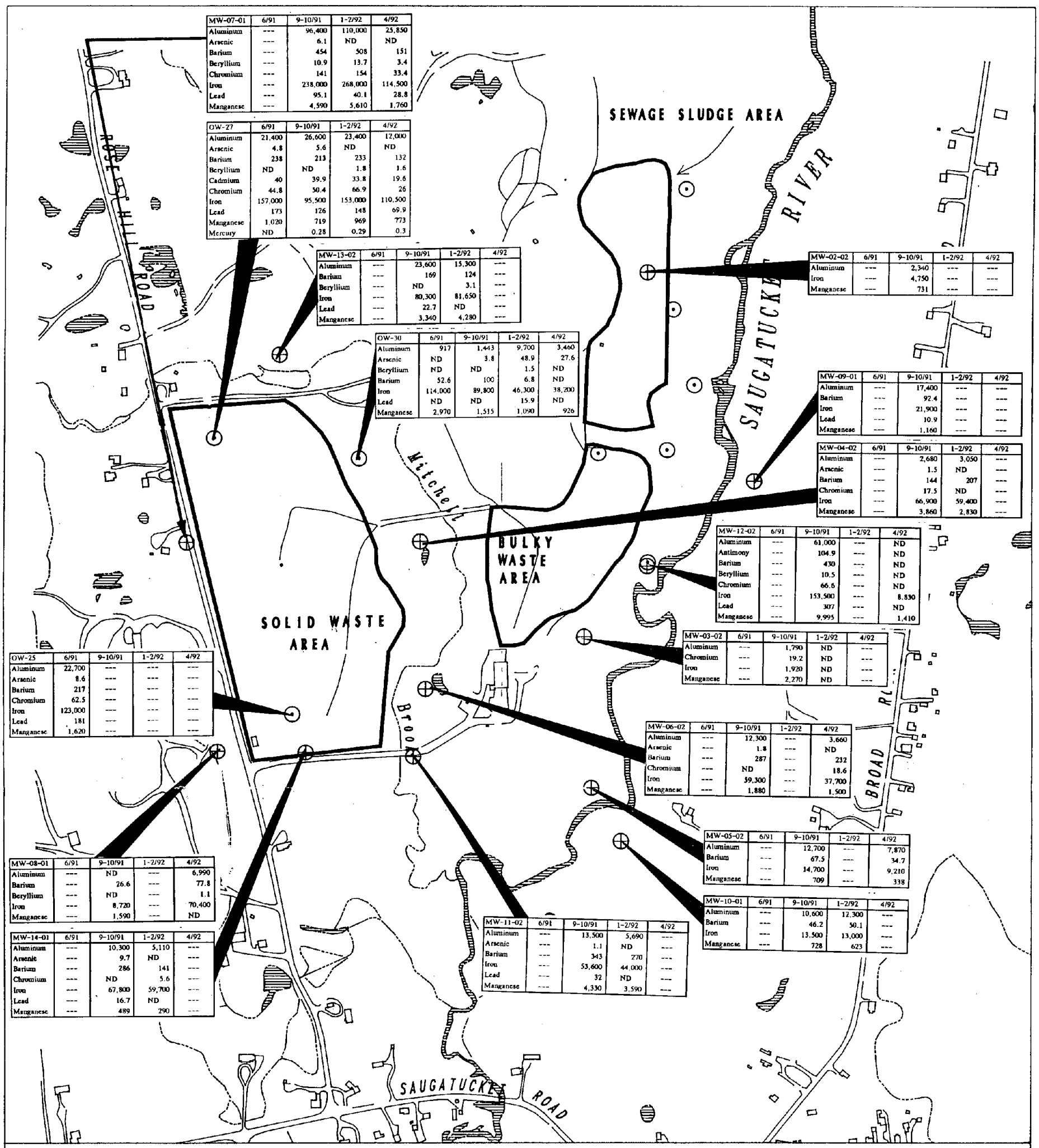


FIGURE 4-11. SEMIVOLATILE ORGANICS, PESTICIDES, PCBs, AND WATER SOLUBLE ORGANICS DETECTED IN DEEP OVERBURDEN GROUNDWATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



MW-07-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	96,400	110,000	25,850
Arsenic	---	6.1	ND	ND
Barium	---	454	508	151
Beryllium	---	10.9	13.7	3.4
Chromium	---	141	154	33.4
Iron	---	238,000	268,000	114,500
Lead	---	95.1	40.1	28.8
Manganese	---	4,590	5,610	1,760

OW-27	6/91	9-10/91	1-2/92	4/92
Aluminum	21,400	26,600	23,400	12,000
Arsenic	4.8	5.6	ND	ND
Barium	238	213	233	132
Beryllium	ND	ND	1.8	1.6
Cadmium	40	39.9	33.8	19.6
Chromium	44.8	50.4	66.9	26
Iron	157,000	95,500	153,000	110,500
Lead	173	126	148	69.9
Manganese	1,020	719	969	773
Mercury	ND	0.28	0.29	0.3

MW-13-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	23,600	15,300	---
Barium	---	169	124	---
Beryllium	---	ND	3.1	---
Iron	---	80,300	81,650	---
Lead	---	22.7	ND	---
Manganese	---	3,340	4,280	---

OW-30	6/91	9-10/91	1-2/92	4/92
Aluminum	917	1,443	9,700	3,460
Arsenic	ND	3.8	48.9	27.6
Beryllium	ND	ND	1.5	ND
Barium	52.6	100	6.8	ND
Iron	114,000	89,800	46,300	38,200
Lead	ND	ND	15.9	ND
Manganese	2,970	1,515	1,090	926

MW-02-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	2,340	---	---
Iron	---	4,750	---	---
Manganese	---	731	---	---

MW-09-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	17,400	---	---
Barium	---	92.4	---	---
Iron	---	21,900	---	---
Lead	---	10.9	---	---
Manganese	---	1,160	---	---

MW-04-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	2,680	3,050	---
Arsenic	---	1.5	ND	---
Barium	---	144	207	---
Chromium	---	17.5	ND	---
Iron	---	66,900	59,400	---
Manganese	---	3,860	2,830	---

MW-12-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	61,000	---	ND
Antimony	---	104.9	---	ND
Barium	---	430	---	ND
Beryllium	---	10.5	---	ND
Chromium	---	66.6	---	ND
Iron	---	153,500	---	8,830
Lead	---	307	---	ND
Manganese	---	9,995	---	1,410

MW-03-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	1,790	ND	---
Chromium	---	19.2	ND	---
Iron	---	1,920	ND	---
Manganese	---	2,270	ND	---

OW-25	6/91	9-10/91	1-2/92	4/92
Aluminum	22,700	---	---	---
Arsenic	8.6	---	---	---
Barium	217	---	---	---
Chromium	62.5	---	---	---
Iron	123,000	---	---	---
Lead	181	---	---	---
Manganese	1,620	---	---	---

MW-06-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	12,300	---	3,660
Arsenic	---	1.8	---	ND
Barium	---	287	---	232
Chromium	---	ND	---	18.6
Iron	---	59,300	---	37,700
Manganese	---	1,880	---	1,500

MW-05-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	12,700	---	7,870
Barium	---	67.5	---	34.7
Iron	---	14,700	---	9,210
Manganese	---	709	---	338

MW-08-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	ND	---	6,990
Barium	---	26.6	---	77.8
Beryllium	---	ND	---	1.1
Iron	---	8,720	---	70,400
Manganese	---	1,590	---	ND

MW-10-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	10,600	12,300	---
Barium	---	46.2	50.1	---
Iron	---	13,500	13,000	---
Manganese	---	728	623	---

MW-11-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	13,500	5,690	---
Arsenic	---	1.1	ND	---
Barium	---	343	270	---
Iron	---	53,600	44,000	---
Lead	---	32	ND	---
Manganese	---	4,330	3,590	---

MW-14-01	6/91	9-10/91	1-2/92	4/92
Aluminum	---	10,300	5,110	---
Arsenic	---	9.7	ND	---
Barium	---	286	141	---
Chromium	---	ND	5.6	---
Iron	---	67,800	59,700	---
Lead	---	16.7	ND	---
Manganese	---	489	290	---

NOTES: Concentrations are in µg/L.

— — Not Analyzed
ND - Not Detected

Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
Existing Monitoring Well
New Monitoring Well

SCALE IN FEET
500 0 100 500

FIGURE 4-12.
METALS DETECTED IN DEEP OVERBURDEN GROUNDWATER (UNFILTERED)

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

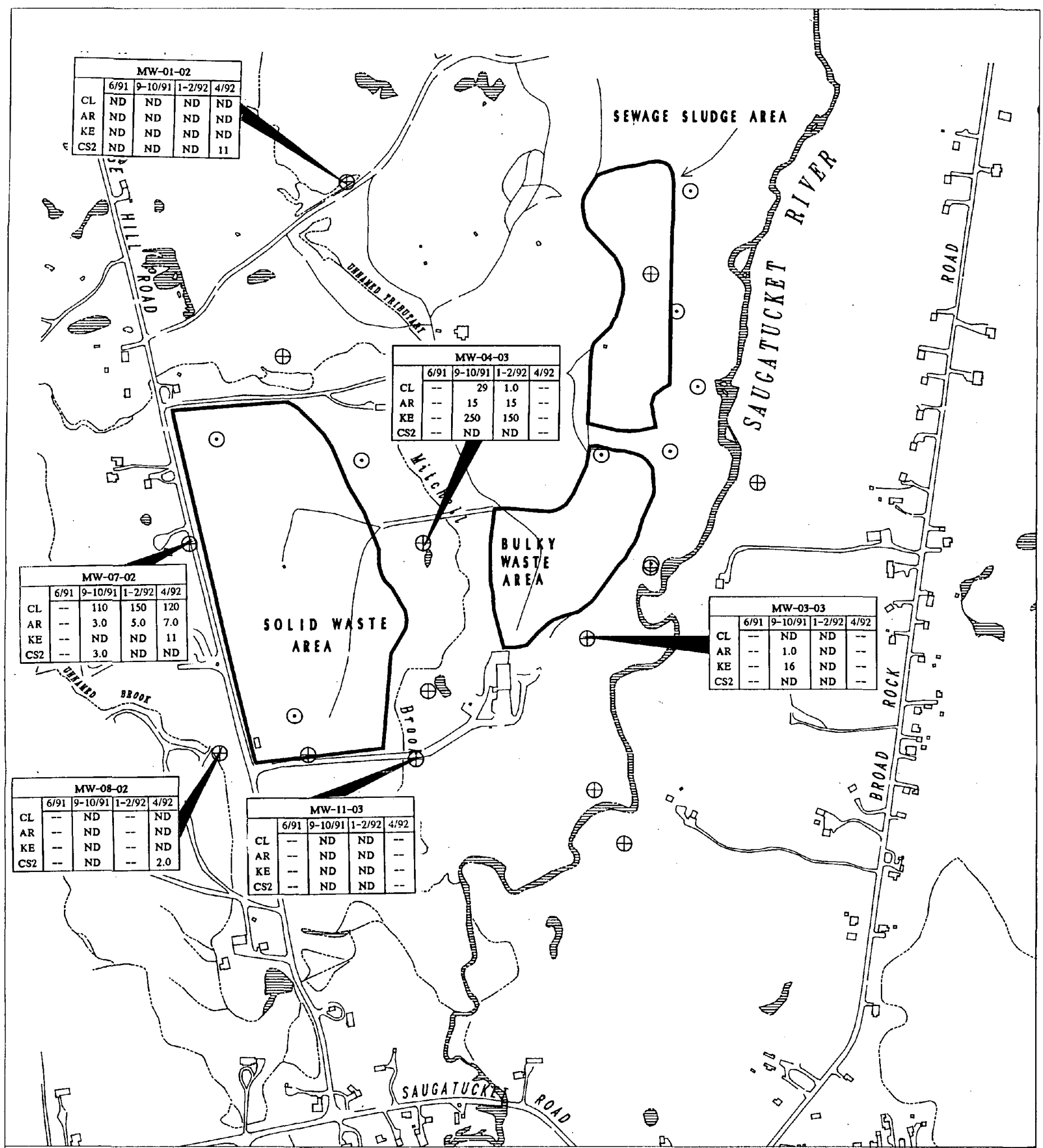
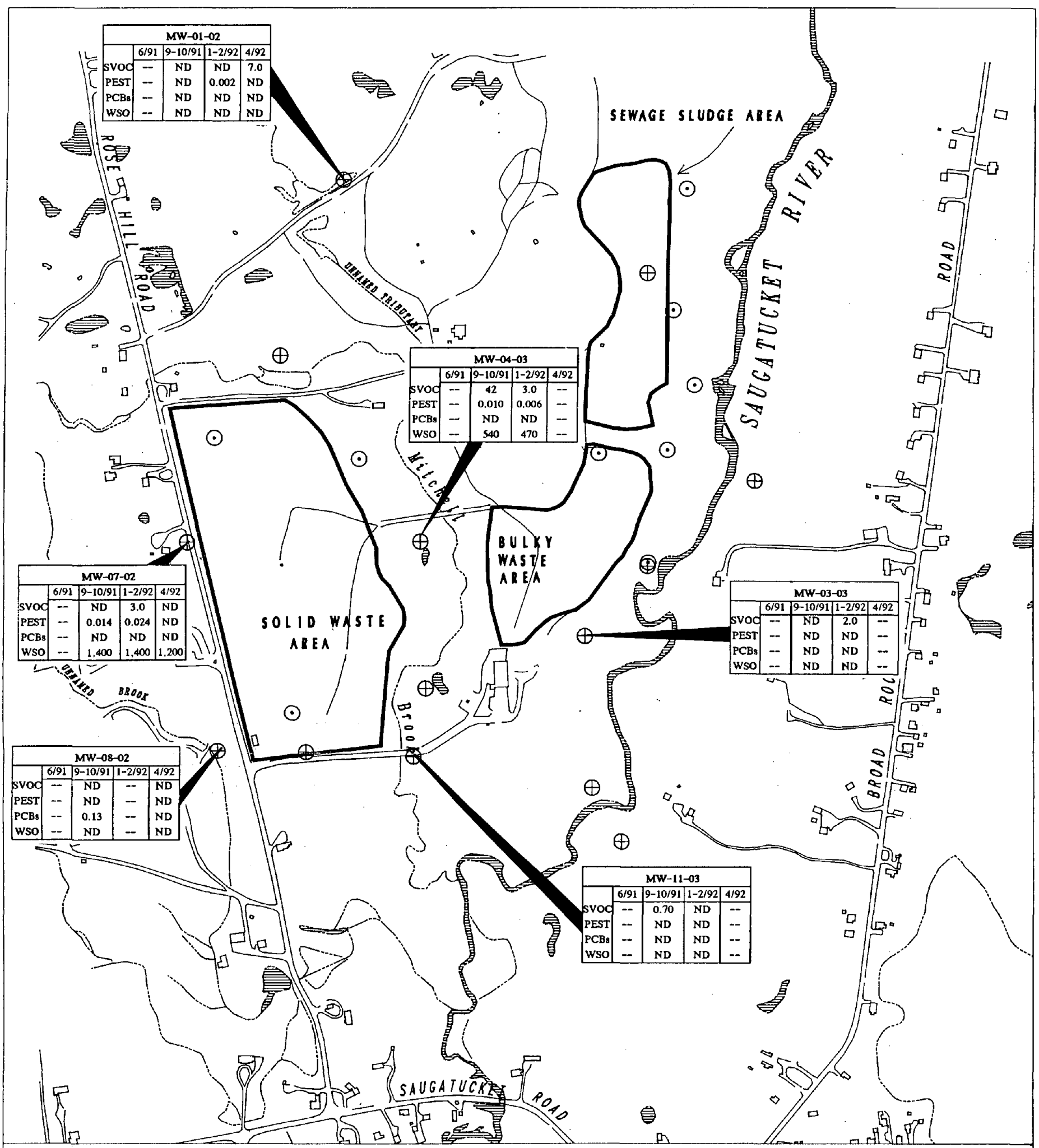


FIGURE 4-13. VOLATILE ORGANICS DETECTED IN BEDROCK GROUNDWATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



NOTES:

— — Not Analyzed

ND - Not Detected

SVOC - Total Semivolatile Organics (µg/L)

PEST - Total Pesticides (µg/L)

PCBs - Total Polychlorinated Biphenyls (µg/L)

WSO - Total Water Soluble Organics (µg/L)

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Existing Monitoring Well

New Monitoring Well

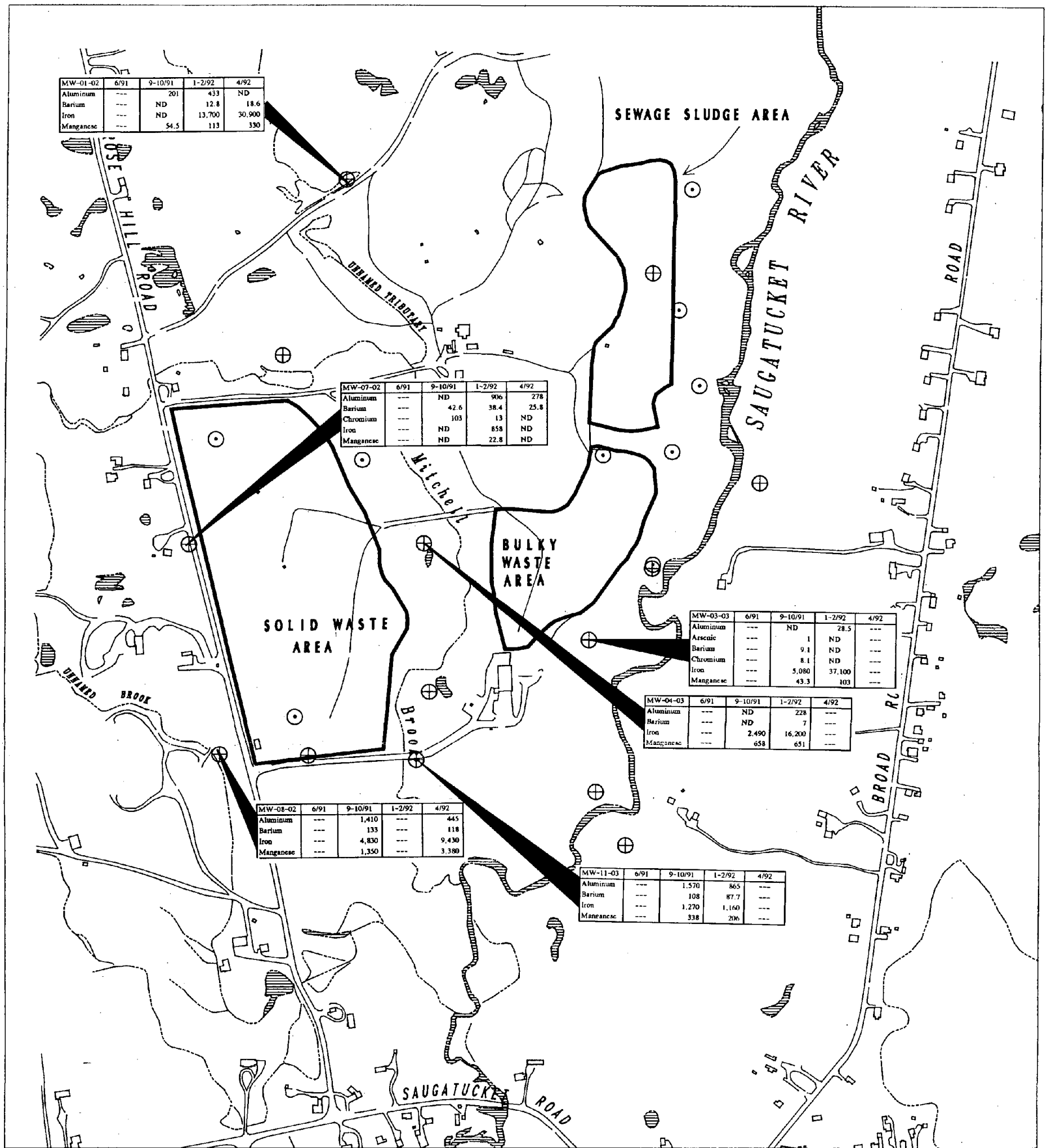
SCALE IN FEET

500 0 100 500

FIGURE 4-14. SEMIVOLATILE ORGANICS, PCBs, AND WATER SOLUBLE ORGANICS DETECTED IN BEDROCK GROUNDWATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



MW-01-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	201	433	ND
Barium	---	ND	12.8	18.6
Iron	---	ND	13,700	30,900
Manganese	---	54.5	113	330

MW-07-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	ND	906	278
Barium	---	42.6	38.4	25.8
Chromium	---	103	13	ND
Iron	---	ND	858	ND
Manganese	---	ND	22.8	ND

MW-03-03	6/91	9-10/91	1-2/92	4/92
Aluminum	---	ND	28.5	---
Arsenic	---	1	ND	---
Barium	---	9.1	ND	---
Chromium	---	8.1	ND	---
Iron	---	5,080	37,100	---
Manganese	---	43.3	103	---

MW-04-03	6/91	9-10/91	1-2/92	4/92
Aluminum	---	ND	228	---
Barium	---	ND	7	---
Iron	---	2,490	16,200	---
Manganese	---	658	651	---

MW-08-02	6/91	9-10/91	1-2/92	4/92
Aluminum	---	1,410	---	445
Barium	---	133	---	118
Iron	---	4,830	---	9,430
Manganese	---	1,350	---	3,380

MW-11-03	6/91	9-10/91	1-2/92	4/92
Aluminum	---	1,570	865	---
Barium	---	108	87.7	---
Iron	---	1,270	1,160	---
Manganese	---	338	206	---

NOTES: All concentrations presented in µg/L for unfiltered samples.

— — Not Analyzed

ND - Not Detected

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Existing Monitoring Well

New Monitoring Well

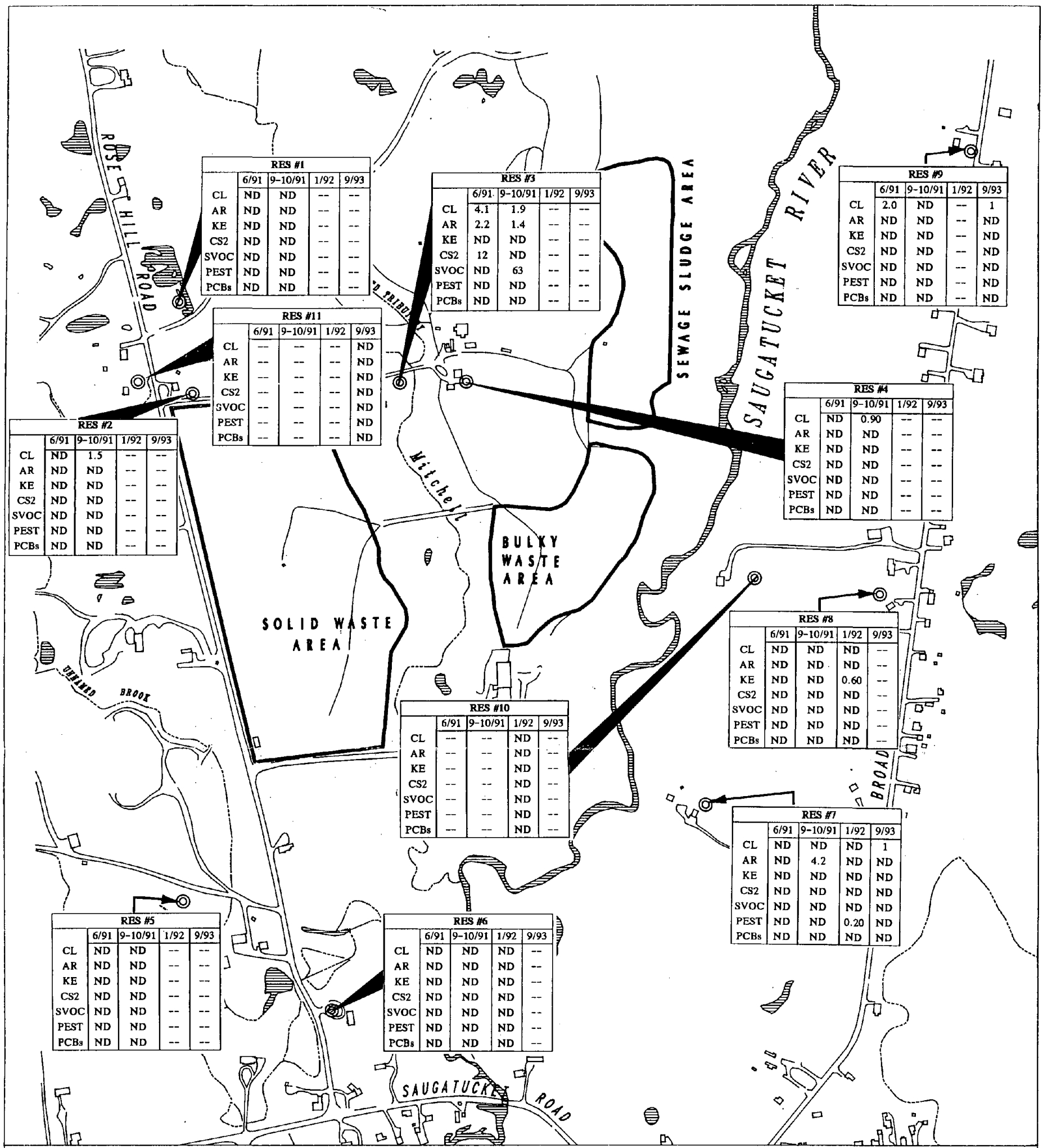
SCALE IN FEET

500 0 100 500

FIGURE 4-15.
METALS DETECTED IN BEDROCK GROUNDWATER (UNFILTERED)

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



RES #1

	6/91	9-10/91	1/92	9/93
CL	ND	ND	--	--
AR	ND	ND	--	--
KE	ND	ND	--	--
CS2	ND	ND	--	--
SVOC	ND	ND	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--

RES #2

	6/91	9-10/91	1/92	9/93
CL	ND	1.5	--	--
AR	ND	ND	--	--
KE	ND	ND	--	--
CS2	ND	ND	--	--
SVOC	ND	ND	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--

RES #3

	6/91	9-10/91	1/92	9/93
CL	4.1	1.9	--	--
AR	2.2	1.4	--	--
KE	ND	ND	--	--
CS2	12	ND	--	--
SVOC	ND	63	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--

RES #4

	6/91	9-10/91	1/92	9/93
CL	ND	0.90	--	--
AR	ND	ND	--	--
KE	ND	ND	--	--
CS2	ND	ND	--	--
SVOC	ND	ND	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--

RES #5

	6/91	9-10/91	1/92	9/93
CL	ND	ND	--	--
AR	ND	ND	--	--
KE	ND	ND	--	--
CS2	ND	ND	--	--
SVOC	ND	ND	--	--
PEST	ND	ND	--	--
PCBs	ND	ND	--	--

RES #6

	6/91	9-10/91	1/92	9/93
CL	ND	ND	ND	--
AR	ND	ND	ND	--
KE	ND	ND	ND	--
CS2	ND	ND	ND	--
SVOC	ND	ND	ND	--
PEST	ND	ND	ND	--
PCBs	ND	ND	ND	--

RES #7

	6/91	9-10/91	1/92	9/93
CL	ND	ND	ND	1
AR	ND	4.2	ND	ND
KE	ND	ND	ND	ND
CS2	ND	ND	ND	ND
SVOC	ND	ND	ND	ND
PEST	ND	ND	0.20	ND
PCBs	ND	ND	ND	ND

RES #8

	6/91	9-10/91	1/92	9/93
CL	ND	ND	ND	--
AR	ND	ND	ND	--
KE	ND	ND	0.60	--
CS2	ND	ND	ND	--
SVOC	ND	ND	ND	--
PEST	ND	ND	ND	--
PCBs	ND	ND	ND	--

RES #9

	6/91	9-10/91	1/92	9/93
CL	2.0	ND	--	1
AR	ND	ND	--	ND
KE	ND	ND	--	ND
CS2	ND	ND	--	ND
SVOC	ND	ND	--	ND
PEST	ND	ND	--	ND
PCBs	ND	ND	--	ND

RES #10

	6/91	9-10/91	1/92	9/93
CL	--	--	ND	--
AR	--	--	ND	--
KE	--	--	ND	--
CS2	--	--	ND	--
SVOC	--	--	ND	--
PEST	--	--	ND	--
PCBs	--	--	ND	--

RES #11

	6/91	9-10/91	1/92	9/93
CL	--	--	--	ND
AR	--	--	--	ND
KE	--	--	--	ND
CS2	--	--	--	ND
SVOC	--	--	--	ND
PEST	--	--	--	ND
PCBs	--	--	--	ND

NOTES:

— — Not Analyzed

ND - Not Detected

CL - Total Chlorinated Organics (µg/L)

AR - Total Aromatic Organics (µg/L)

KE - Total Ketones (µg/L)

CS2 - Carbon Disulfide (µg/L)

SVOC - Total Semivolatile Compounds (µg/L)

PEST - Total Pesticides (µg/L)

PCBs - Total Polychlorinated Biphenyls (µg/L)

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Residential Well

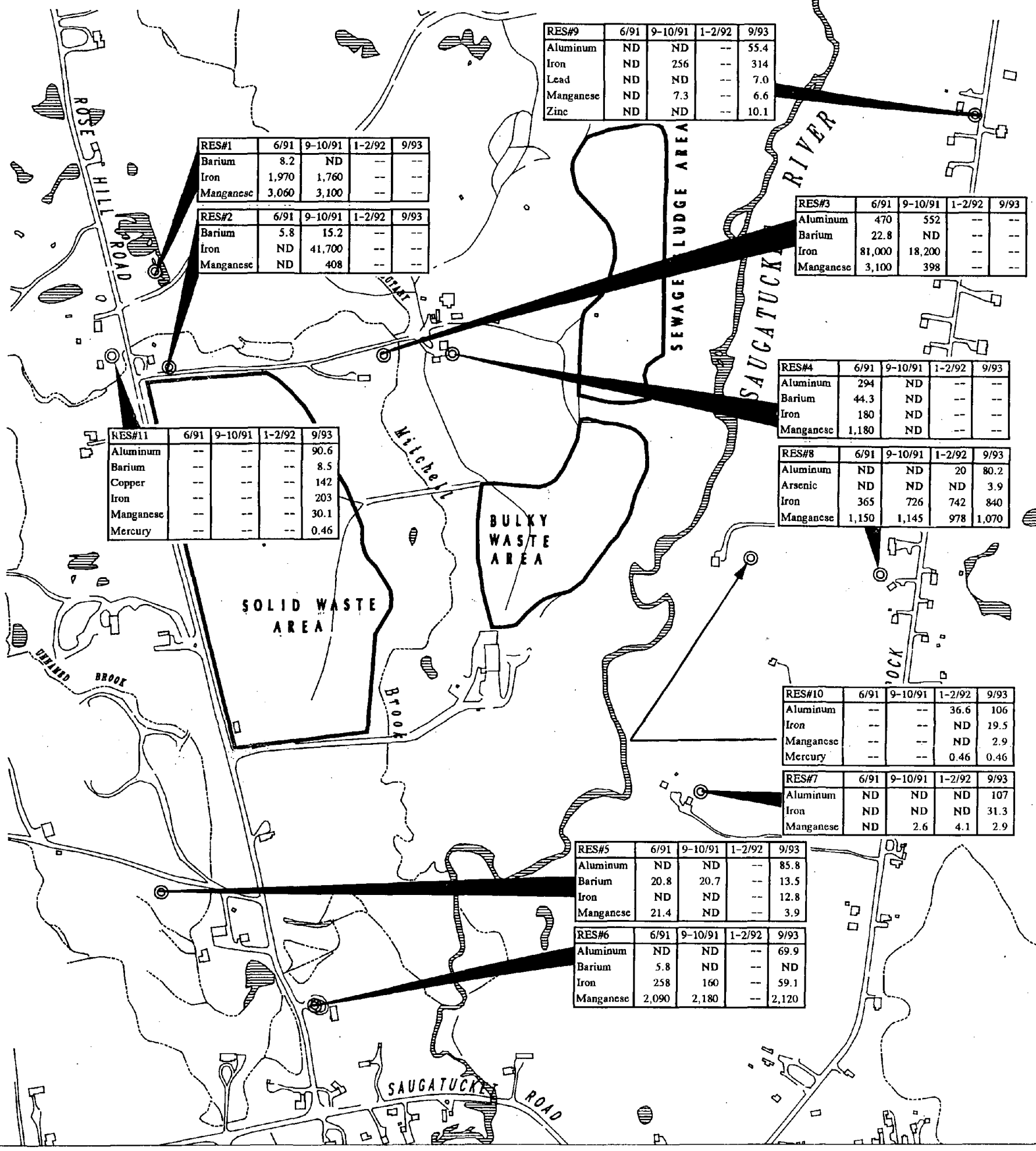
SCALE IN FEET

500 0 100 500

FIGURE 4-16. ORGANIC COMPOUNDS DETECTED IN RESIDENTIAL WELLS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



RES#9	6/91	9-10/91	1-2/92	9/93
Aluminum	ND	ND	--	55.4
Iron	ND	256	--	314
Lead	ND	ND	--	7.0
Manganese	ND	7.3	--	6.6
Zinc	ND	ND	--	10.1

RES#1	6/91	9-10/91	1-2/92	9/93
Barium	8.2	ND	--	--
Iron	1,970	1,760	--	--
Manganese	3,060	3,100	--	--

RES#2	6/91	9-10/91	1-2/92	9/93
Barium	5.8	15.2	--	--
Iron	ND	41,700	--	--
Manganese	ND	408	--	--

RES#3	6/91	9-10/91	1-2/92	9/93
Aluminum	470	552	--	--
Barium	22.8	ND	--	--
Iron	81,000	18,200	--	--
Manganese	3,100	398	--	--

RES#4	6/91	9-10/91	1-2/92	9/93
Aluminum	294	ND	--	--
Barium	44.3	ND	--	--
Iron	180	ND	--	--
Manganese	1,180	ND	--	--

RES#11	6/91	9-10/91	1-2/92	9/93
Aluminum	--	--	--	90.6
Barium	--	--	--	8.5
Copper	--	--	--	142
Iron	--	--	--	203
Manganese	--	--	--	30.1
Mercury	--	--	--	0.46

RES#8	6/91	9-10/91	1-2/92	9/93
Aluminum	ND	ND	20	80.2
Arsenic	ND	ND	ND	3.9
Iron	365	726	742	840
Manganese	1,150	1,145	978	1,070

RES#10	6/91	9-10/91	1-2/92	9/93
Aluminum	--	--	36.6	106
Iron	--	--	ND	19.5
Manganese	--	--	ND	2.9
Mercury	--	--	0.46	0.46

RES#7	6/91	9-10/91	1-2/92	9/93
Aluminum	ND	ND	ND	107
Iron	ND	ND	ND	31.3
Manganese	ND	2.6	4.1	2.9

RES#5	6/91	9-10/91	1-2/92	9/93
Aluminum	ND	ND	--	85.8
Barium	20.8	20.7	--	13.5
Iron	ND	ND	--	12.8
Manganese	21.4	ND	--	3.9

RES#6	6/91	9-10/91	1-2/92	9/93
Aluminum	ND	ND	--	69.9
Barium	5.8	ND	--	ND
Iron	258	160	--	59.1
Manganese	2,090	2,180	--	2,120

NOTES: All concentrations presented in µg/L for unfiltered samples.

— — Not Analyzed

ND - Not Detected

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Residential Well

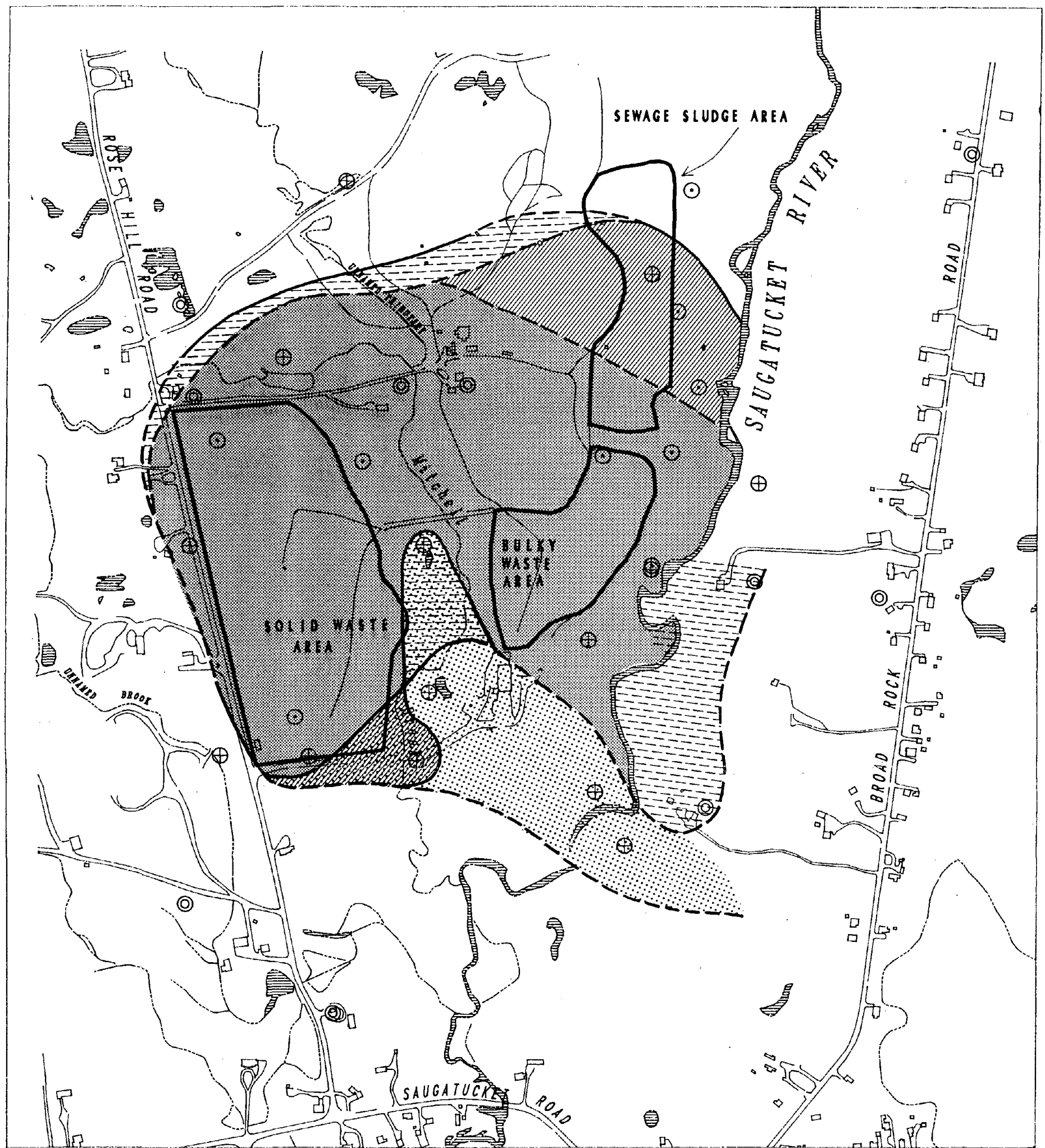
SCALE IN FEET

500 0 100 500

FIGURE 4-17.
METALS DETECTED IN RESIDENTIAL WELLS (UNFILTERED)

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTE: Extent is based on presence or absence of chlorinated or aromatic volatiles in on-site monitoring wells. Presence was noted if volatile organics were detected at least once during the study period. Bedrock is shown using bedrock residential wells.

- Shallow Overburden Flow Zone
- Deep Overburden Flow Zone
- Bedrock Flow Zone
- All Three Flow Zones
- Primary Road
- Secondary Road
- Stream or Brook
- Landfill Area
- Lake, Pond, or River
- Existing Monitoring Well
- New Monitoring Well
- Residential Well

SCALE IN FEET

500 0 100 500

FIGURE 4-18. ESTIMATED AERIAL EXTENT OF VOLATILE ORGANICS IN GROUNDWATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

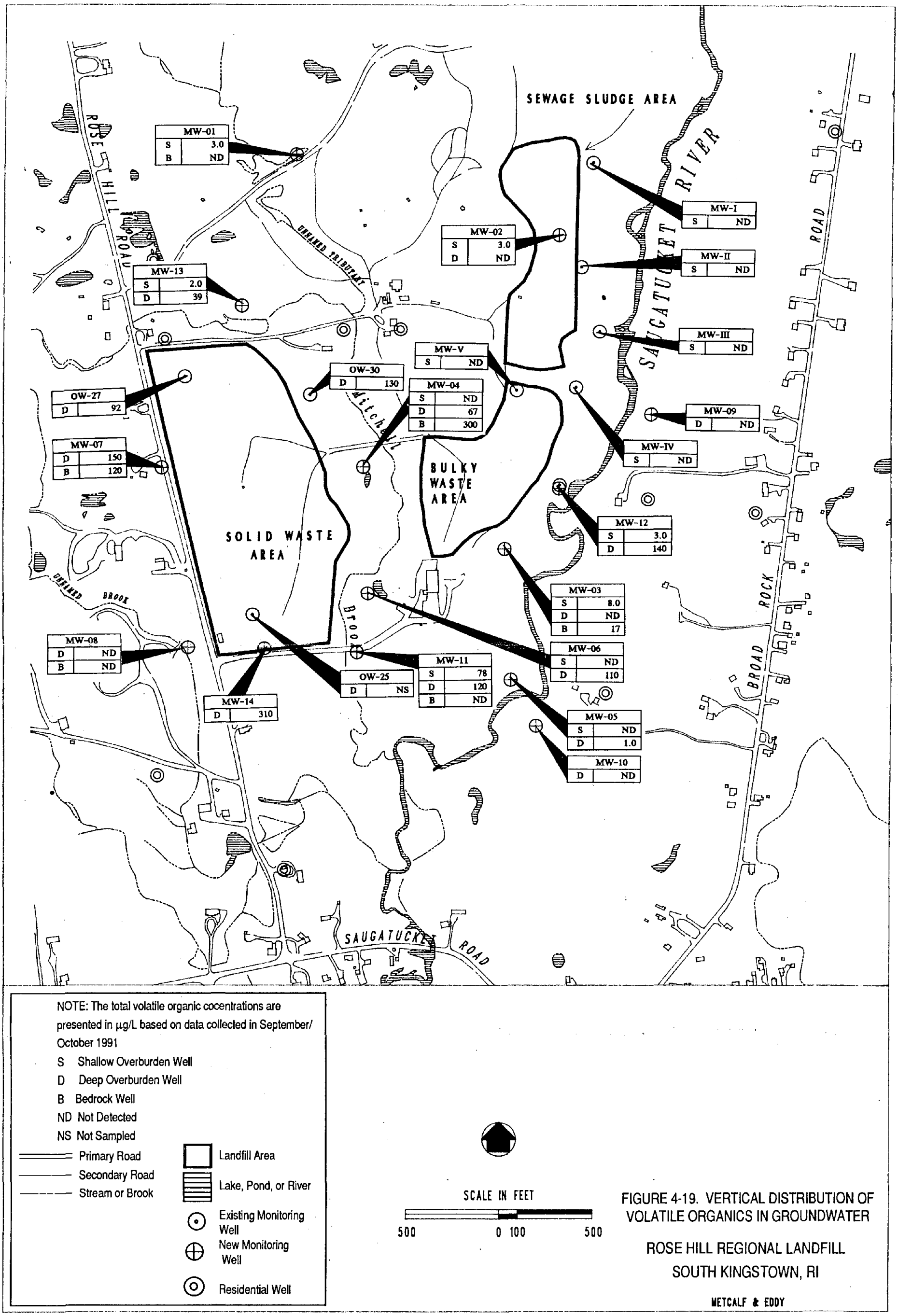
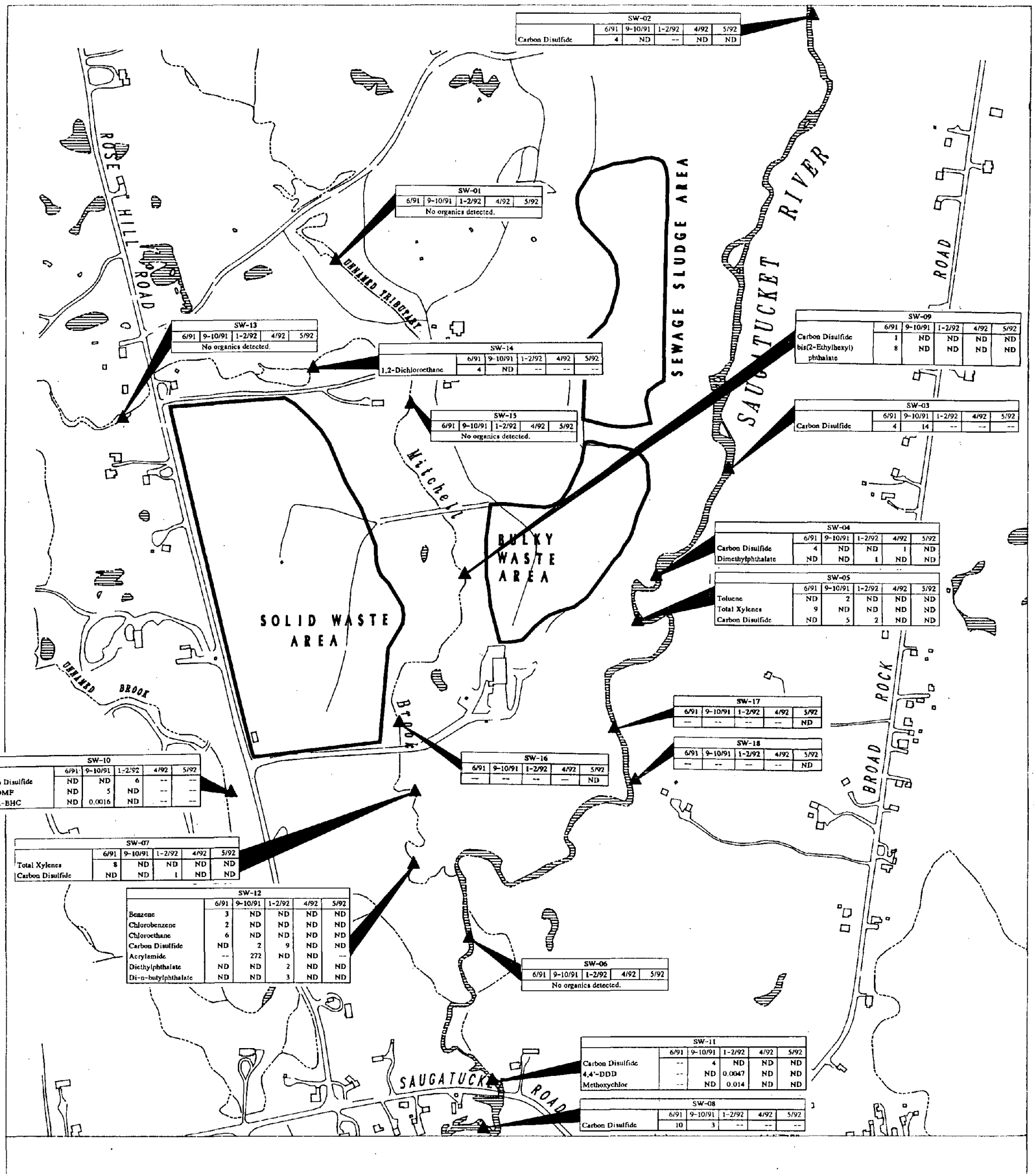


FIGURE 4-19. VERTICAL DISTRIBUTION OF VOLATILE ORGANICS IN GROUNDWATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



SW-02	6/91	9-10/91	1-2/92	4/92	5/92
Carbon Disulfide	4	ND	--	ND	ND

SW-01	6/91	9-10/91	1-2/92	4/92	5/92
No organics detected.					

SW-13	6/91	9-10/91	1-2/92	4/92	5/92
No organics detected.					

SW-14	6/91	9-10/91	1-2/92	4/92	5/92
1,2-Dichloroethane	4	ND	--	--	--

SW-15	6/91	9-10/91	1-2/92	4/92	5/92
No organics detected.					

SW-09	6/91	9-10/91	1-2/92	4/92	5/92
Carbon Disulfide	1	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	8	ND	ND	ND	ND

SW-03	6/91	9-10/91	1-2/92	4/92	5/92
Carbon Disulfide	4	14	--	--	--

SW-04	6/91	9-10/91	1-2/92	4/92	5/92
Carbon Disulfide	4	ND	ND	1	ND
Dimethylphthalate	ND	ND	1	ND	ND

SW-05	6/91	9-10/91	1-2/92	4/92	5/92
Toluene	ND	2	ND	ND	ND
Total Xylenes	9	ND	ND	ND	ND
Carbon Disulfide	ND	5	2	ND	ND

SW-17	6/91	9-10/91	1-2/92	4/92	5/92
	--	--	--	--	ND

SW-18	6/91	9-10/91	1-2/92	4/92	5/92
	--	--	--	--	ND

SW-16	6/91	9-10/91	1-2/92	4/92	5/92
	--	--	--	--	ND

SW-10	6/91	9-10/91	1-2/92	4/92	5/92
Carbon Disulfide	ND	ND	6	--	--
N,N-DMF	ND	5	ND	--	--
gamma-BHC	ND	0.0016	ND	--	--

SW-07	6/91	9-10/91	1-2/92	4/92	5/92
Total Xylenes	8	ND	ND	ND	ND
Carbon Disulfide	ND	ND	1	ND	ND

SW-12	6/91	9-10/91	1-2/92	4/92	5/92
Benzene	3	ND	ND	ND	ND
Chlorobenzene	2	ND	ND	ND	ND
Chloroethane	6	ND	ND	ND	ND
Carbon Disulfide	ND	2	9	ND	ND
Acrylamide	--	272	ND	ND	--
Diethylphthalate	ND	ND	2	ND	ND
Di-n-butylphthalate	ND	ND	3	ND	ND

SW-06	6/91	9-10/91	1-2/92	4/92	5/92
No organics detected.					

SW-11	6/91	9-10/91	1-2/92	4/92	5/92
Carbon Disulfide	--	4	ND	ND	ND
4,4'-DDD	--	ND	0.0047	ND	ND
Methoxychlor	--	ND	0.014	ND	ND

SW-08	6/91	9-10/91	1-2/92	4/92	5/92
Carbon Disulfide	10	3	--	--	--

NOTES: Concentrations are in µg/L.

-- Not Analyzed
ND - Not Detected

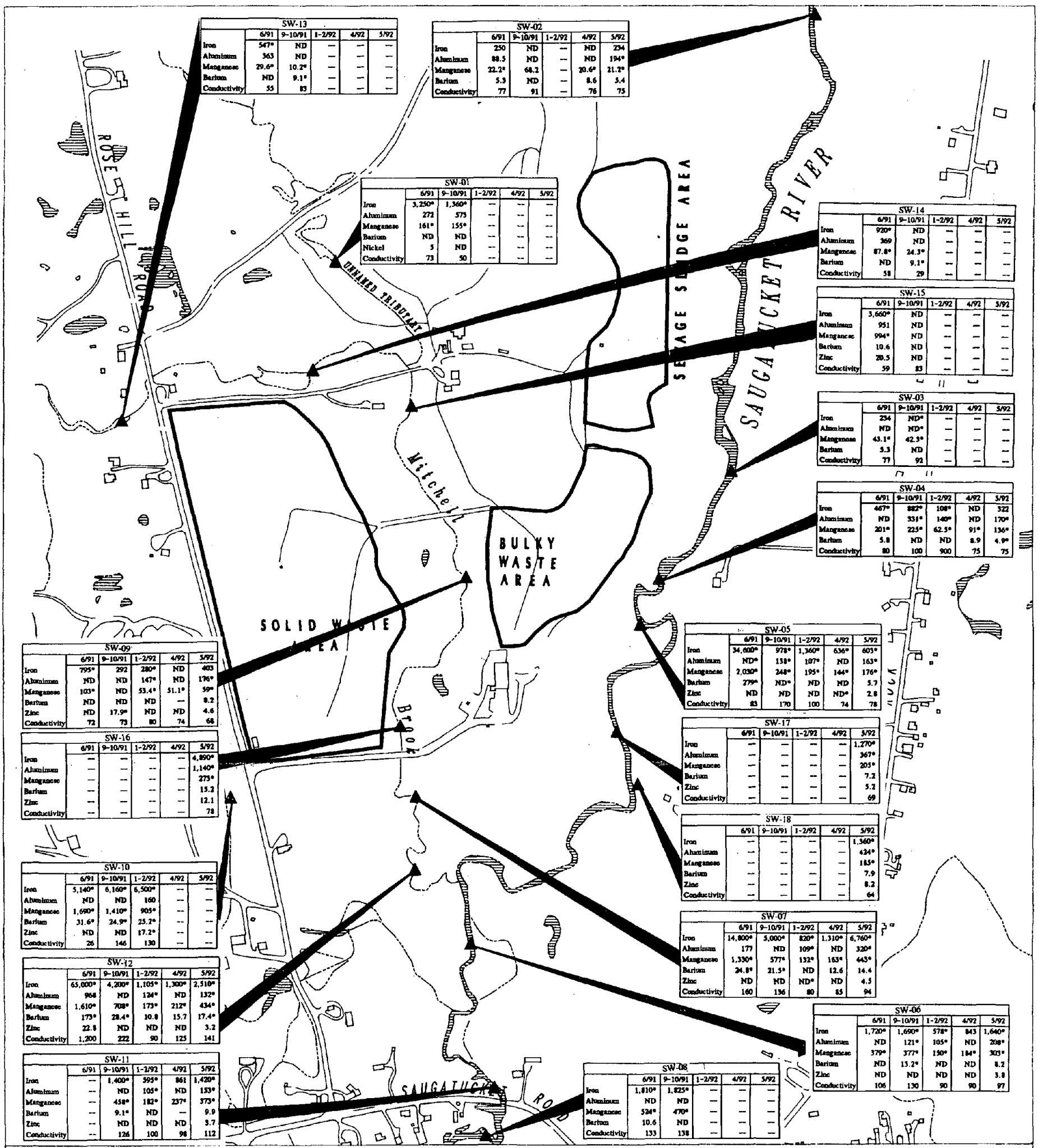
Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
Surface Water/ Sediment Sampling Location

SCALE IN FEET
500 0 100 500

FIGURE 4-20. ORGANIC COMPOUNDS DETECTED IN SURFACE WATER

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



SW-13	6/91	9-10/91	1-2/92	4/92	5/92
Iron	547*	ND	—	—	—
Aluminum	363	ND	—	—	—
Manganese	29.6*	10.2*	—	—	—
Barium	ND	9.1*	—	—	—
Conductivity	55	83	—	—	—

SW-02	6/91	9-10/91	1-2/92	4/92	5/92
Iron	250	ND	—	ND	234
Aluminum	88.5	ND	—	ND	194*
Manganese	22.2*	68.2	—	20.6*	21.2*
Barium	5.3	ND	—	8.6	5.4
Conductivity	77	91	—	76	75

SW-01	6/91	9-10/91	1-2/92	4/92	5/92
Iron	3,250*	1,360*	—	—	—
Aluminum	272	573	—	—	—
Manganese	161*	155*	—	—	—
Barium	ND	ND	—	—	—
Nickel	5	ND	—	—	—
Conductivity	73	50	—	—	—

SW-14	6/91	9-10/91	1-2/92	4/92	5/92
Iron	920*	ND	—	—	—
Aluminum	369	ND	—	—	—
Manganese	87.8*	24.3*	—	—	—
Barium	ND	9.1*	—	—	—
Conductivity	58	29	—	—	—

SW-15	6/91	9-10/91	1-2/92	4/92	5/92
Iron	3,660*	ND	—	—	—
Aluminum	951	ND	—	—	—
Manganese	994*	ND	—	—	—
Barium	10.6	ND	—	—	—
Zinc	20.5	ND	—	—	—
Conductivity	59	83	—	—	—

SW-03	6/91	9-10/91	1-2/92	4/92	5/92
Iron	234	ND*	—	—	—
Aluminum	ND	ND*	—	—	—
Manganese	43.1*	42.3*	—	—	—
Barium	5.3	ND	—	—	—
Conductivity	77	92	—	—	—

SW-04	6/91	9-10/91	1-2/92	4/92	5/92
Iron	467*	882*	108*	ND	322
Aluminum	ND	531*	140*	ND	170*
Manganese	201*	225*	62.5*	91*	136*
Barium	5.8	ND	ND	8.9	4.9*
Conductivity	80	100	900	75	75

SW-05	6/91	9-10/91	1-2/92	4/92	5/92
Iron	34,600*	978*	1,360*	636*	603*
Aluminum	ND*	158*	107*	ND	163*
Manganese	2,030*	248*	195*	144*	176*
Barium	279*	ND*	ND	ND	5.7
Zinc	ND	ND	ND	ND*	2.8
Conductivity	83	170	100	74	78

SW-09	6/91	9-10/91	1-2/92	4/92	5/92
Iron	795*	292	280*	ND	403
Aluminum	ND	ND	147*	ND	176*
Manganese	103*	ND	53.4*	51.1*	59*
Barium	ND	ND	ND	—	8.2
Zinc	ND	17.9*	ND	ND	4.6
Conductivity	72	73	80	74	68

SW-16	6/91	9-10/91	1-2/92	4/92	5/92
Iron	—	—	—	—	4,890*
Aluminum	—	—	—	—	1,140*
Manganese	—	—	—	—	273*
Barium	—	—	—	—	15.2
Zinc	—	—	—	—	12.1
Conductivity	—	—	—	—	78

SW-17	6/91	9-10/91	1-2/92	4/92	5/92
Iron	—	—	—	—	1,270*
Aluminum	—	—	—	—	367*
Manganese	—	—	—	—	205*
Barium	—	—	—	—	7.2
Zinc	—	—	—	—	5.2
Conductivity	—	—	—	—	69

SW-18	6/91	9-10/91	1-2/92	4/92	5/92
Iron	—	—	—	—	1,360*
Aluminum	—	—	—	—	424*
Manganese	—	—	—	—	185*
Barium	—	—	—	—	7.9
Zinc	—	—	—	—	8.2
Conductivity	—	—	—	—	64

SW-10	6/91	9-10/91	1-2/92	4/92	5/92
Iron	5,140*	6,160*	6,500*	—	—
Aluminum	ND	ND	160	—	—
Manganese	1,690*	1,410*	905*	—	—
Barium	31.6*	24.9*	25.2*	—	—
Zinc	ND	ND	17.2*	—	—
Conductivity	26	146	130	—	—

SW-07	6/91	9-10/91	1-2/92	4/92	5/92
Iron	14,800*	5,000*	820*	1,310*	6,760*
Aluminum	177	ND	109*	ND	320*
Manganese	1,330*	577*	132*	163*	443*
Barium	24.8*	21.5*	ND	12.6	14.4
Zinc	ND	ND	ND*	ND	4.5
Conductivity	160	136	80	85	94

SW-12	6/91	9-10/91	1-2/92	4/92	5/92
Iron	65,000*	4,200*	1,105*	1,300*	2,510*
Aluminum	968	ND	124*	ND	132*
Manganese	1,610*	708*	173*	212*	434*
Barium	173*	28.4*	10.8	15.7	17.4*
Zinc	22.8	ND	ND	ND	3.2
Conductivity	1,200	222	90	125	141

SW-06	6/91	9-10/91	1-2/92	4/92	5/92
Iron	1,720*	1,690*	578*	843	1,640*
Aluminum	ND	121*	105*	ND	208*
Manganese	379*	377*	150*	184*	303*
Barium	ND	13.2*	ND	ND	8.2
Zinc	ND	ND	ND	ND	3.8
Conductivity	106	130	90	90	97

SW-11	6/91	9-10/91	1-2/92	4/92	5/92
Iron	—	1,400*	595*	861	1,420*
Aluminum	—	ND	105*	ND	153*
Manganese	—	458*	182*	237*	373*
Barium	—	9.1*	ND	—	9.9
Zinc	—	ND	ND	ND	3.7
Conductivity	—	126	100	98	112

SW-08	6/91	9-10/91	1-2/92	4/92	5/92
Iron	1,810*	1,825*	—	—	—
Aluminum	ND	ND	—	—	—
Manganese	524*	470*	—	—	—
Barium	10.6	ND	—	—	—
Conductivity	133	138	—	—	—

NOTES: Metal concentrations provided for unfiltered samples in µg/L and specific conductance in µmhos/cm

— — Not Analyzed

ND - Not Detected

• Also Detected in Filtered Sample

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Surface Water/ Sediment Sampling Location

SCALE IN FEET

500 0 100 500

FIGURE 4-21. INORGANICS DETECTED IN SURFACE WATER (UNFILTERED)

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

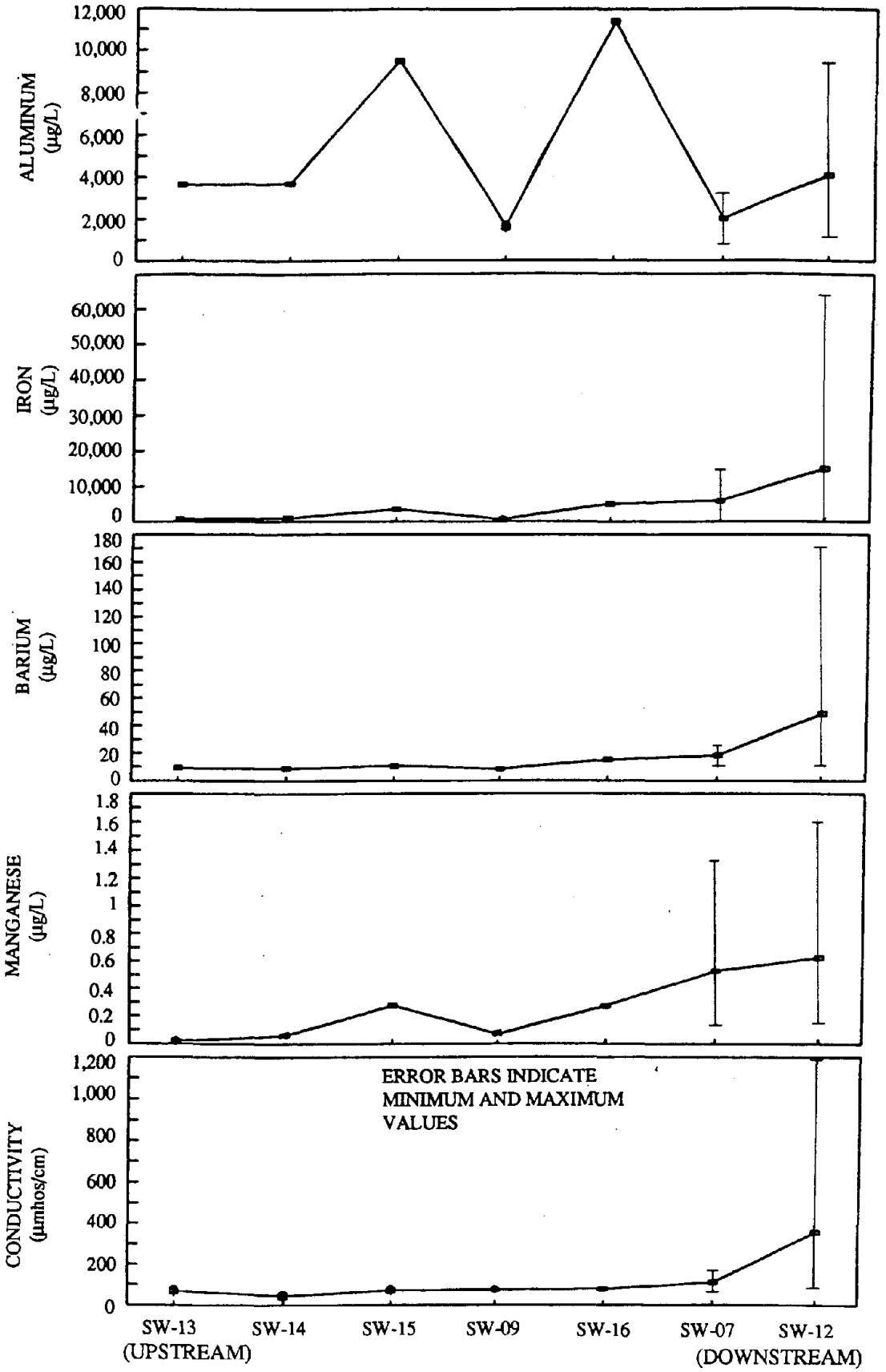


FIGURE 4-22.
METAL TRENDS IN MITCHELL BROOK SURFACE WATER

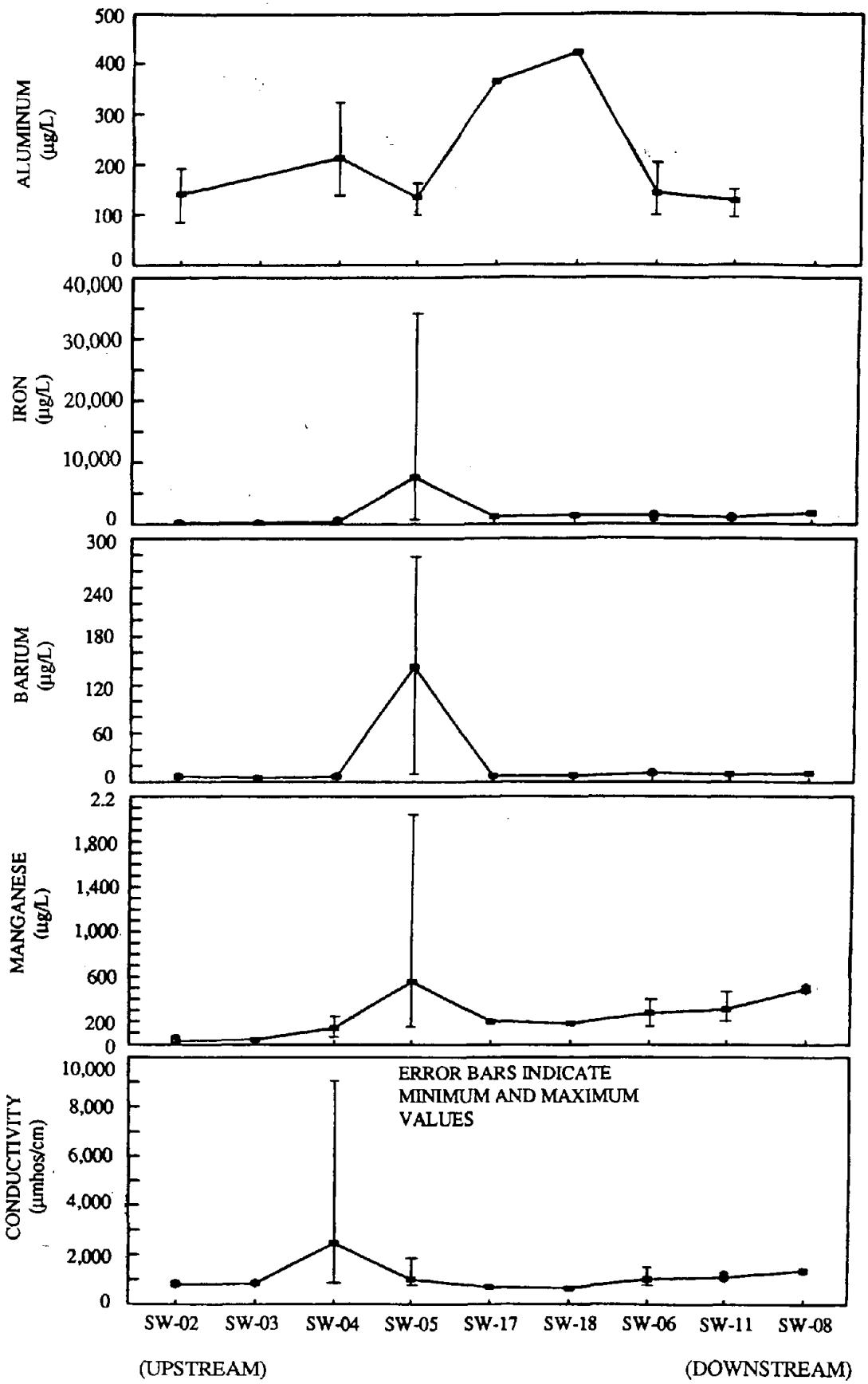


FIGURE 4-23.
METAL TRENDS IN SAUGATUCKET RIVER SURFACE WATER

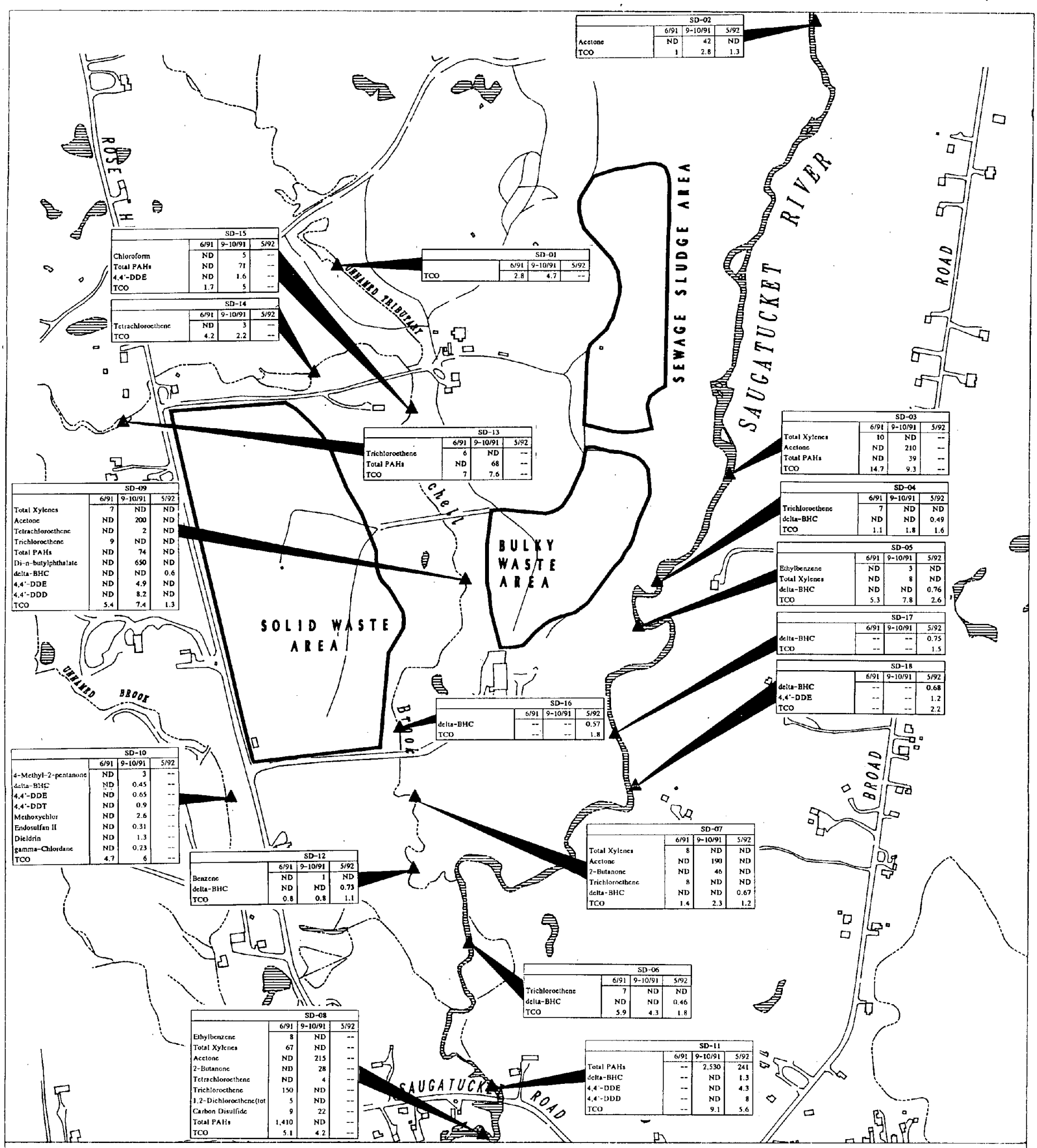
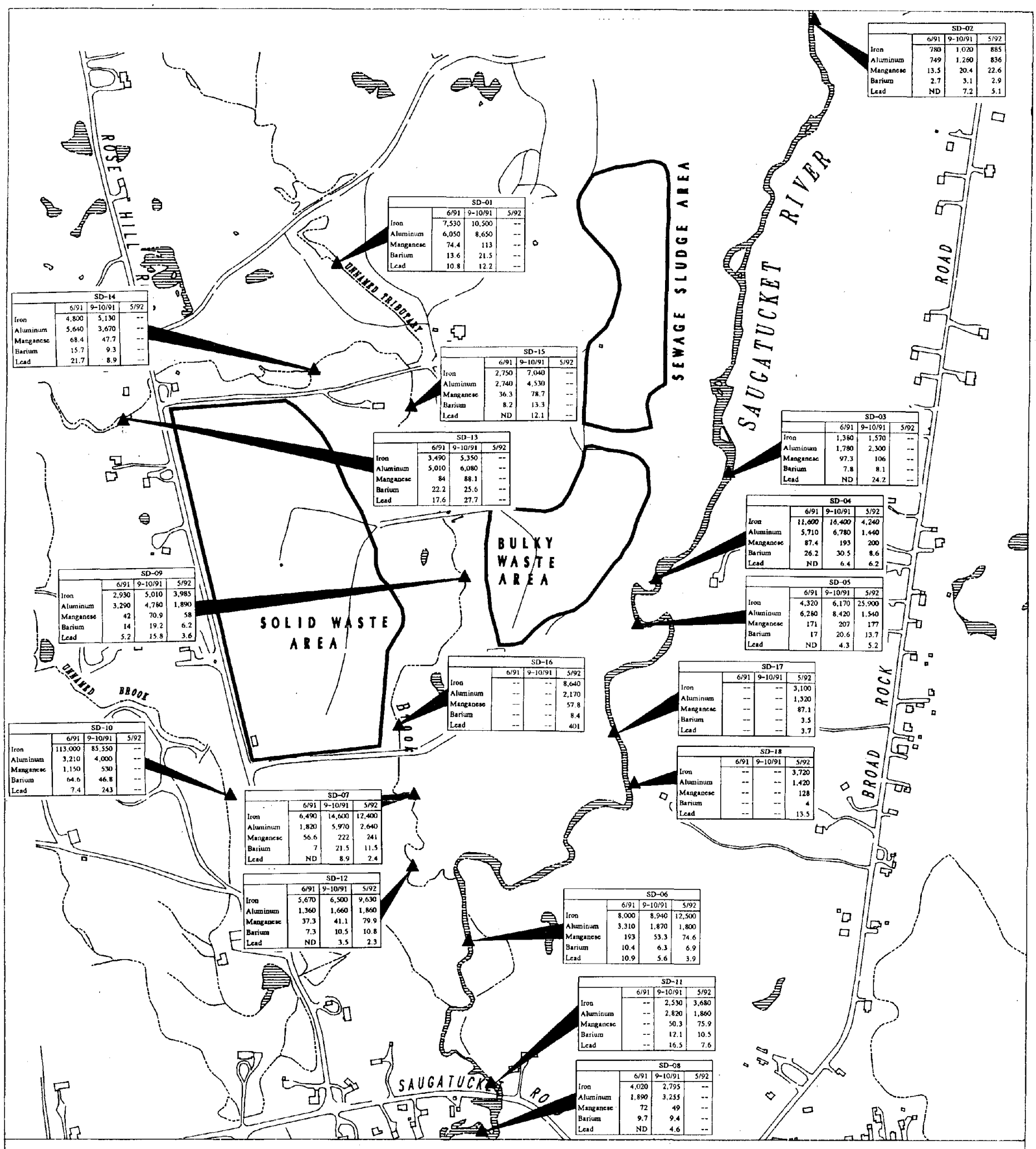


FIGURE 4-24. ORGANIC COMPOUNDS DETECTED IN SEDIMENT

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

METCALF & EDDY



SD-01	6/91	9-10/91	5/92
Iron	7,530	10,500	--
Aluminum	6,050	8,650	--
Manganese	74.4	113	--
Barium	13.6	21.5	--
Lead	10.8	12.2	--

SD-02	6/91	9-10/91	5/92
Iron	780	1,020	885
Aluminum	749	1,260	836
Manganese	13.5	20.4	22.6
Barium	2.7	3.1	2.9
Lead	ND	7.2	5.1

SD-03	6/91	9-10/91	5/92
Iron	1,380	1,570	--
Aluminum	1,780	2,300	--
Manganese	97.3	106	--
Barium	7.8	8.1	--
Lead	ND	24.2	--

SD-04	6/91	9-10/91	5/92
Iron	11,600	16,400	4,240
Aluminum	5,710	6,780	1,440
Manganese	87.4	193	200
Barium	26.2	30.5	8.6
Lead	ND	6.4	6.2

SD-05	6/91	9-10/91	5/92
Iron	4,320	6,170	25,900
Aluminum	6,280	8,420	1,540
Manganese	171	207	177
Barium	17	20.6	13.7
Lead	ND	4.3	5.2

SD-06	6/91	9-10/91	5/92
Iron	8,000	8,940	12,500
Aluminum	3,310	1,870	1,800
Manganese	193	53.3	74.6
Barium	10.4	6.3	6.9
Lead	10.9	5.6	3.9

SD-07	6/91	9-10/91	5/92
Iron	6,490	14,600	12,400
Aluminum	1,820	5,970	2,640
Manganese	56.6	222	241
Barium	7	21.5	11.5
Lead	ND	8.9	2.4

SD-08	6/91	9-10/91	5/92
Iron	4,020	2,795	--
Aluminum	1,890	3,255	--
Manganese	72	49	--
Barium	9.7	9.4	--
Lead	ND	4.6	--

SD-09	6/91	9-10/91	5/92
Iron	2,930	5,010	3,985
Aluminum	3,290	4,780	1,890
Manganese	42	70.9	58
Barium	14	19.2	6.2
Lead	5.2	15.8	3.6

SD-10	6/91	9-10/91	5/92
Iron	113,000	85,550	--
Aluminum	3,210	4,000	--
Manganese	1,150	530	--
Barium	64.6	46.8	--
Lead	7.4	243	--

SD-11	6/91	9-10/91	5/92
Iron	--	2,530	3,680
Aluminum	--	2,820	1,860
Manganese	--	50.3	75.9
Barium	--	12.1	10.5
Lead	--	16.5	7.6

SD-12	6/91	9-10/91	5/92
Iron	5,670	6,500	9,630
Aluminum	1,360	1,660	1,860
Manganese	37.3	41.1	79.9
Barium	7.3	10.5	10.8
Lead	ND	3.5	2.3

SD-13	6/91	9-10/91	5/92
Iron	3,490	5,350	--
Aluminum	5,010	6,080	--
Manganese	84	88.1	--
Barium	22.2	25.6	--
Lead	17.6	27.7	--

SD-14	6/91	9-10/91	5/92
Iron	4,800	5,130	--
Aluminum	5,640	3,670	--
Manganese	68.4	47.7	--
Barium	15.7	9.3	--
Lead	21.7	8.9	--

SD-15	6/91	9-10/91	5/92
Iron	2,750	7,040	--
Aluminum	2,740	4,530	--
Manganese	36.3	78.7	--
Barium	8.2	13.3	--
Lead	ND	12.1	--

SD-16	6/91	9-10/91	5/92
Iron	--	--	8,640
Aluminum	--	--	2,170
Manganese	--	--	57.8
Barium	--	--	8.4
Lead	--	--	401

SD-17	6/91	9-10/91	5/92
Iron	--	--	3,100
Aluminum	--	--	1,320
Manganese	--	--	87.1
Barium	--	--	3.5
Lead	--	--	3.7

SD-18	6/91	9-10/91	5/92
Iron	--	--	3,720
Aluminum	--	--	1,420
Manganese	--	--	128
Barium	--	--	4
Lead	--	--	13.5

NOTES: All metals are in mg/kg

-- Not Analyzed

ND - Not Detected

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Surface Water/ Sediment Sampling Location

SCALE IN FEET

500 0 100 500

FIGURE 4-25. INORGANICS DETECTED IN SEDIMENT

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

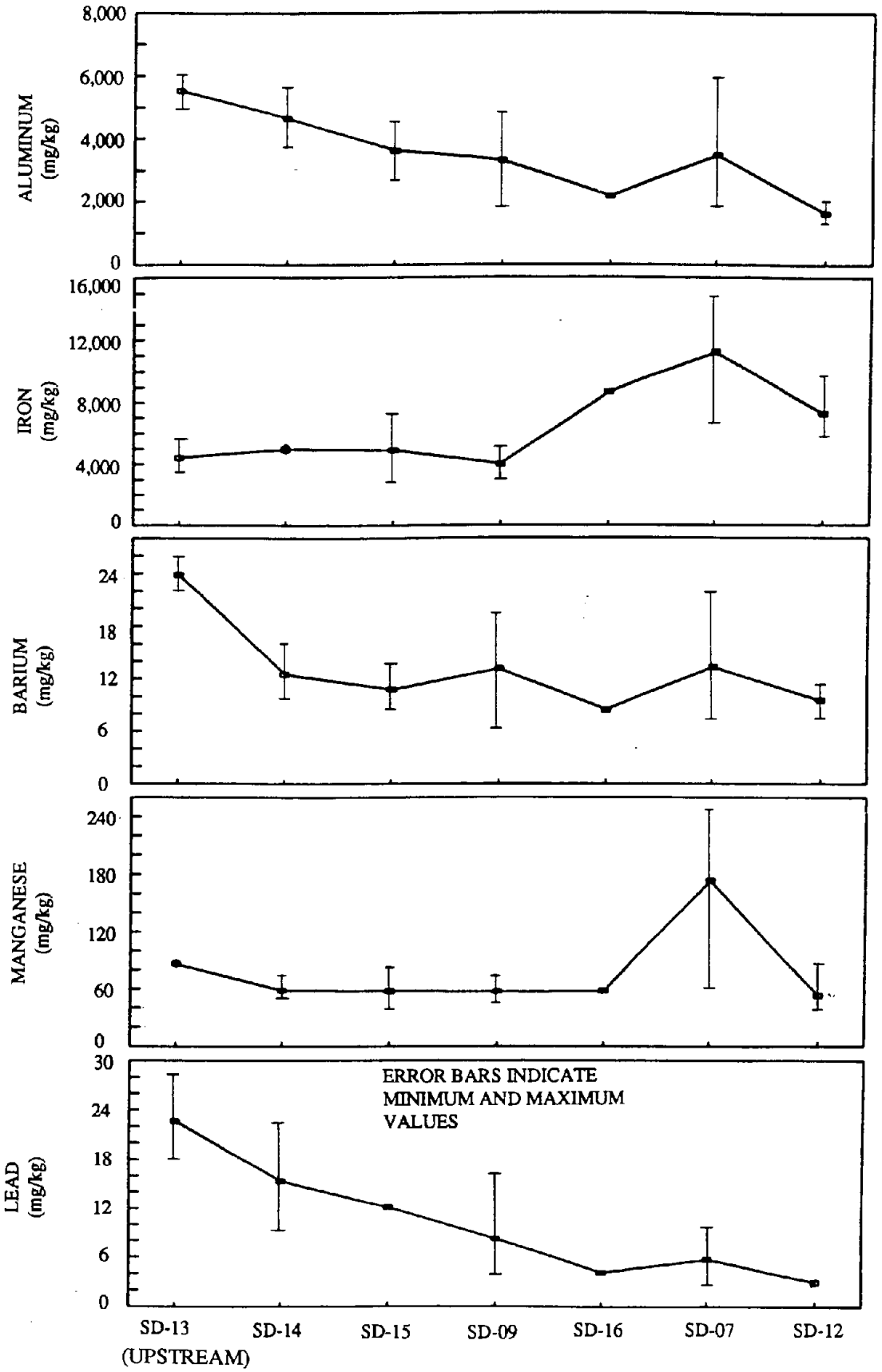


FIGURE 4-26.
METAL TRENDS IN MITCHELL BROOK SEDIMENT

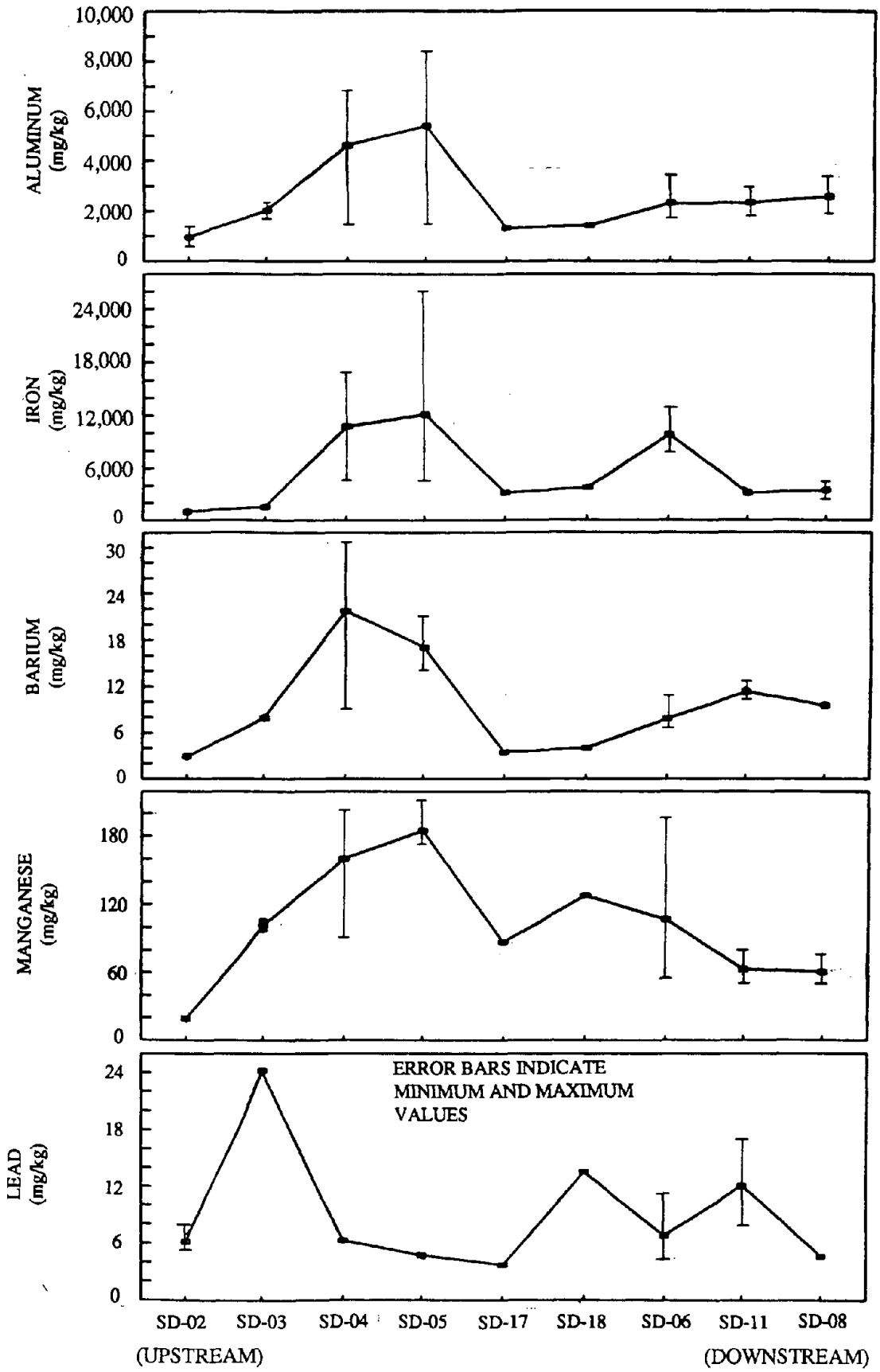


FIGURE 4-27.
METAL TRENDS IN SAUGATUCKET RIVER SEDIMENT

FIGURE 4-28.
TEMPORARY LANDFILL GAS SAMPLING LOCATIONS SAMPLED IN JUNE, 1991

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

NOTES: LFG - Permanent points.
TP - Temporary points sampled only in December, 1991.
Some points have both an LFG and a TP label. These points were first sampled as temporary points and then installed as permanent sampling locations.

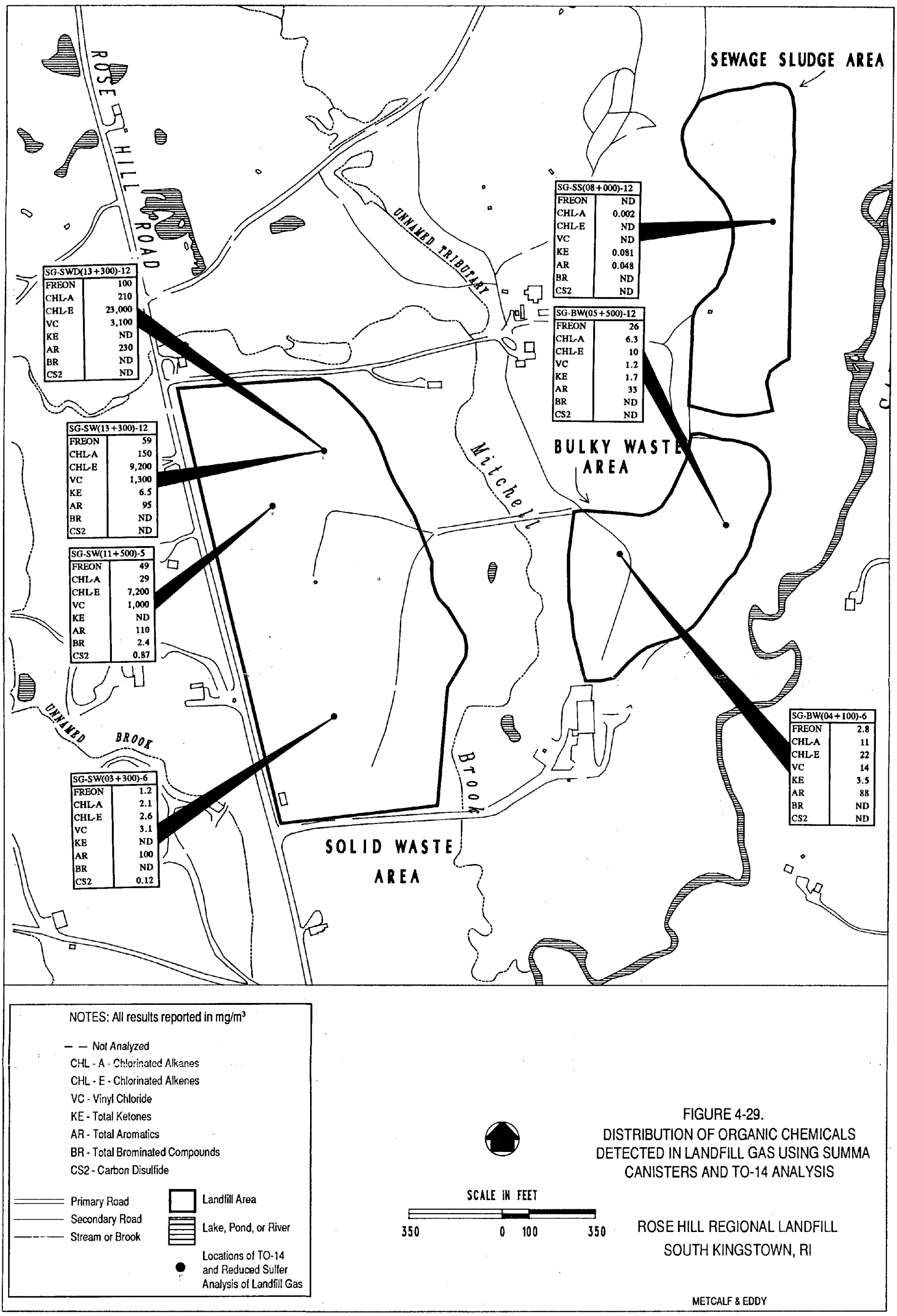
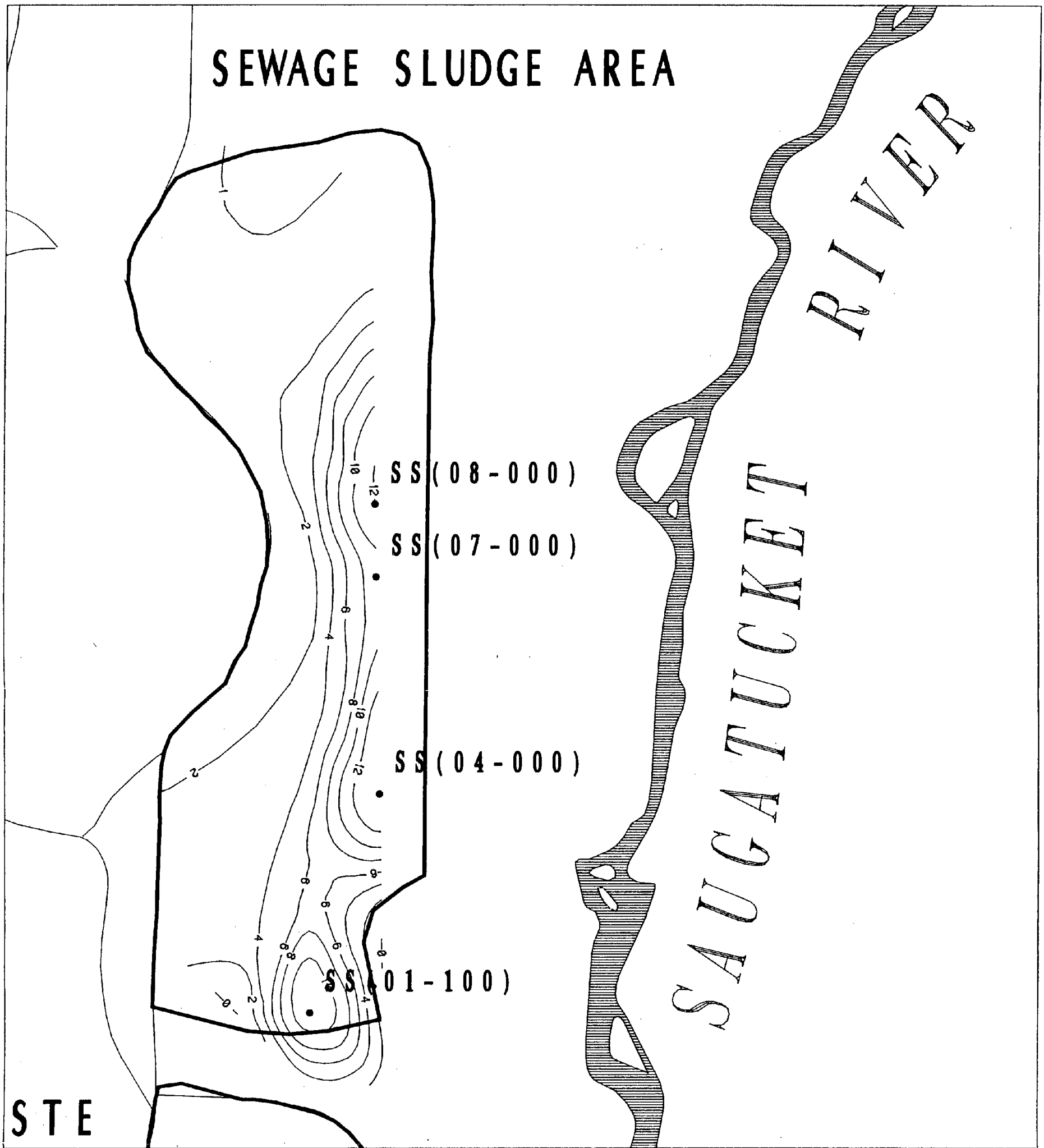


FIGURE 4-29.
DISTRIBUTION OF ORGANIC CHEMICALS DETECTED IN LANDFILL GAS USING SUMMA CANISTERS AND TO-14 ANALYSIS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



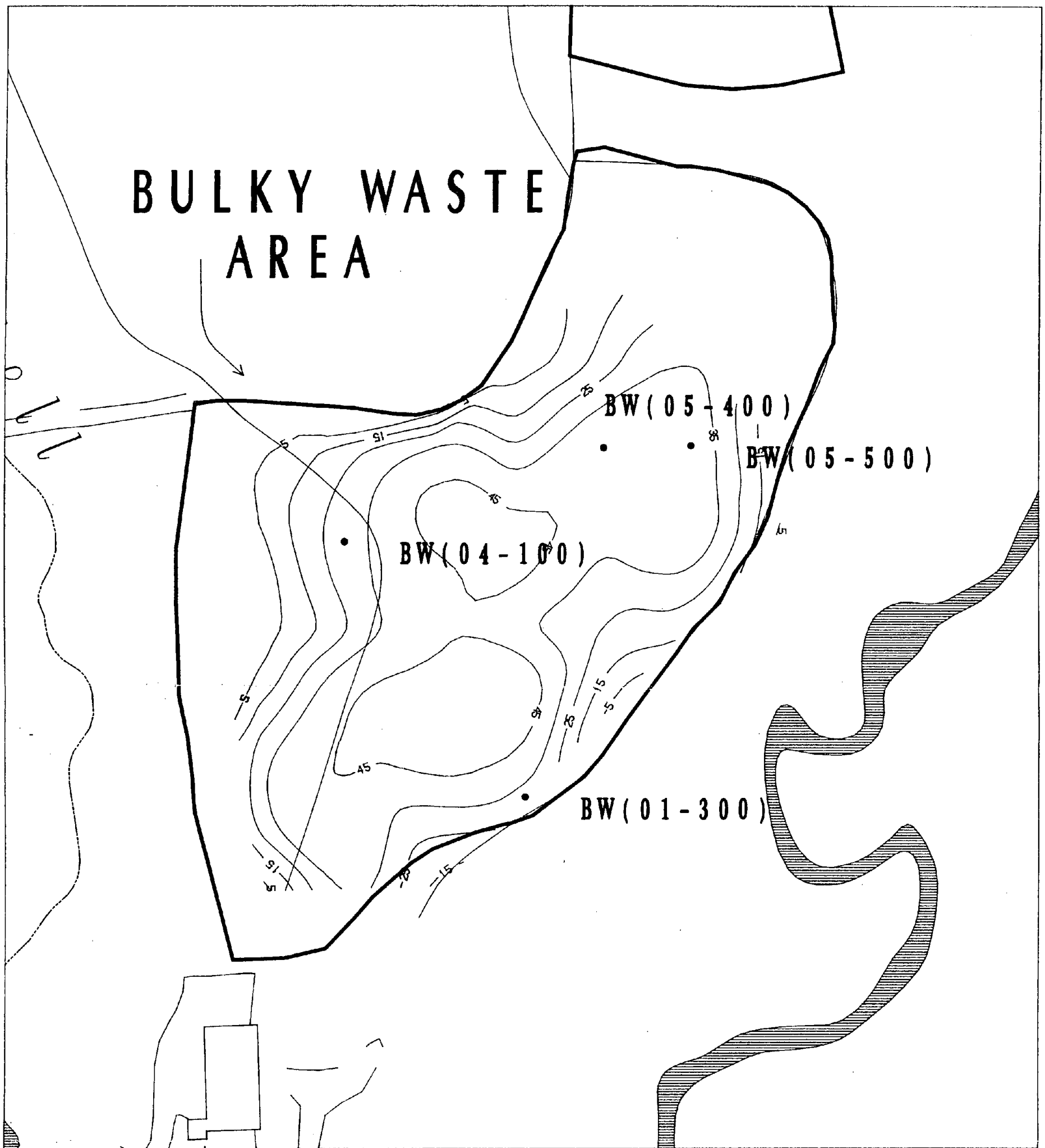
NOTE: Contour units are percent by volume.

FIGURE 4-30

Carbon Dioxide Concentrations in Landfill Gas in the Sewage Sludge Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

125 0 50 100 125

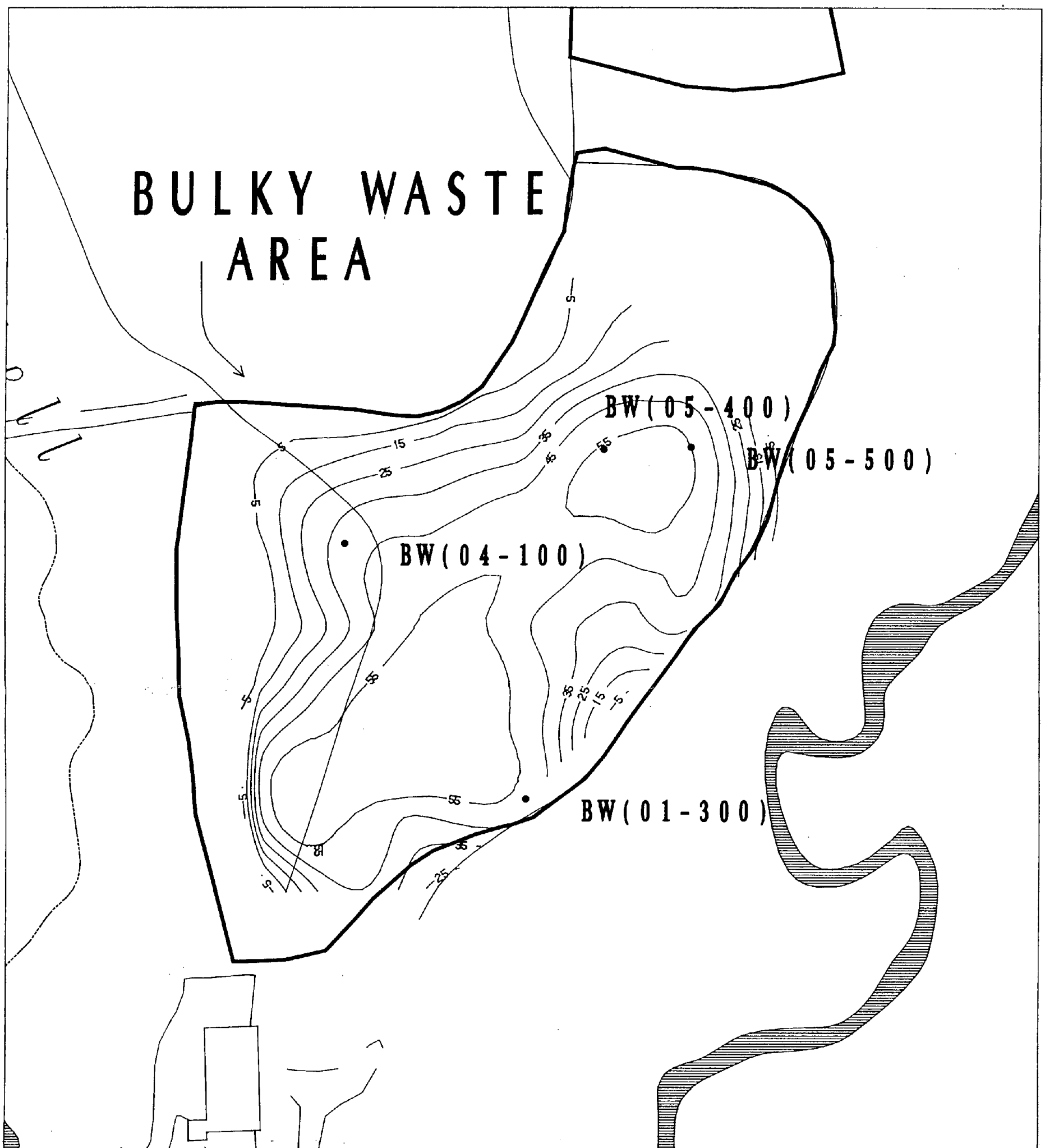
NOTE: Contour units are percent by volume.

FIGURE 4-31

Carbon Dioxide Concentrations in the Bulky Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

10 Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

125 0 50 100 125

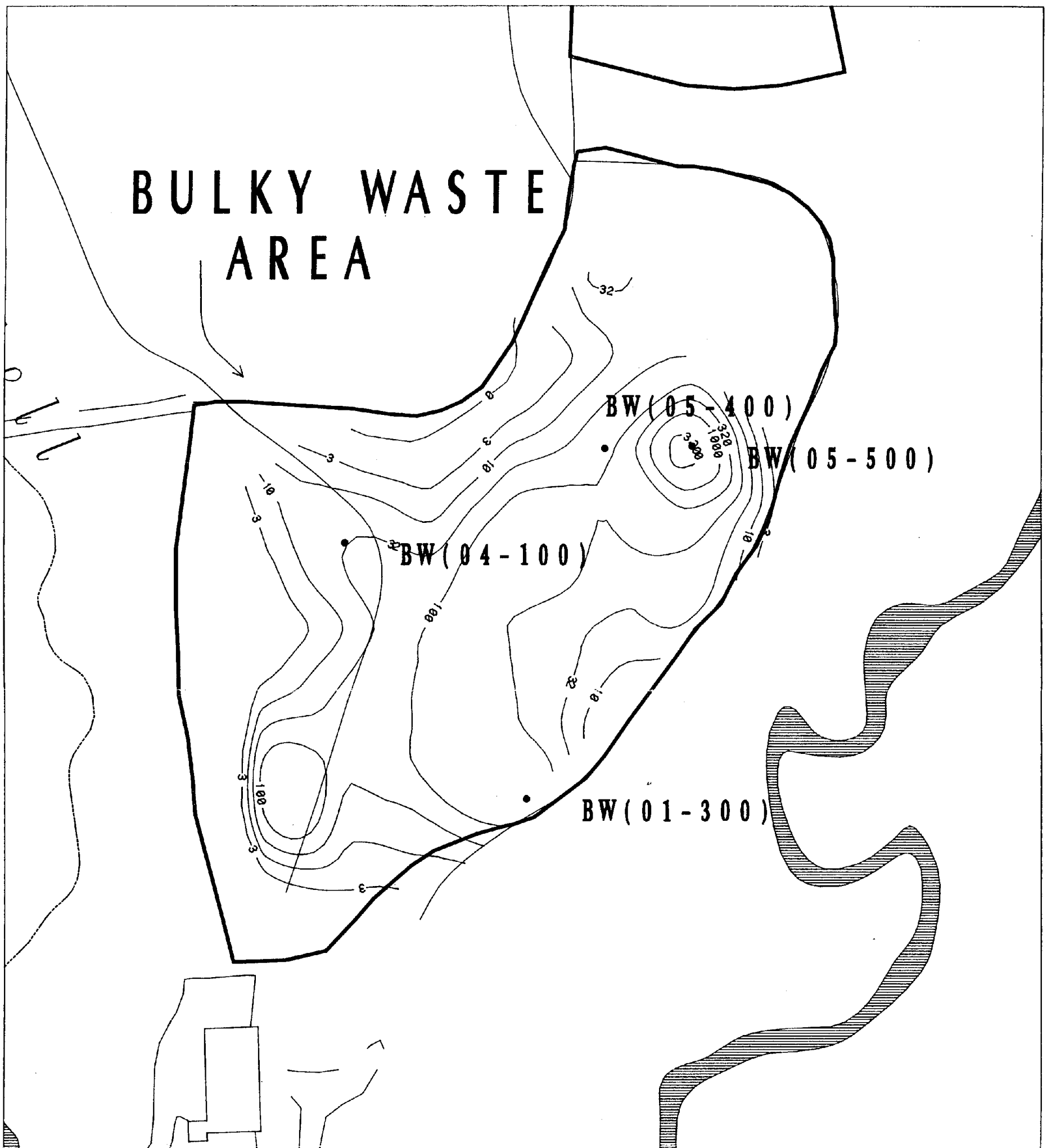
NOTE: Contour units are percent by volume.

FIGURE 4-32

Methane Concentrations in the Bulky Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



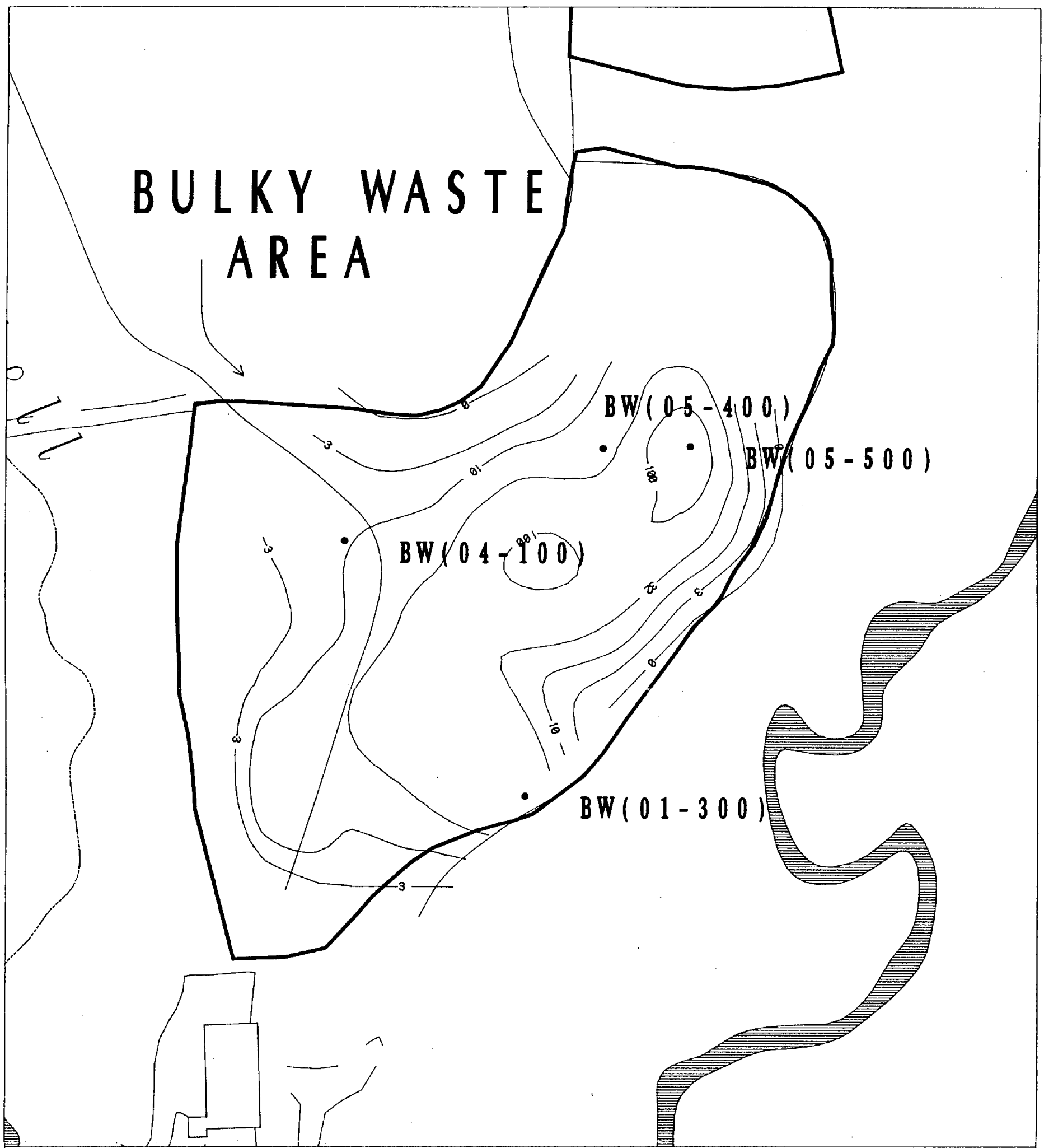
NOTES: Contour scale is based on the data transformation log (concentration + 1). Units are mg/m^3.

FIGURE 4-33

cis-1,2-Dichloroethene Concentrations in the Bulky Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



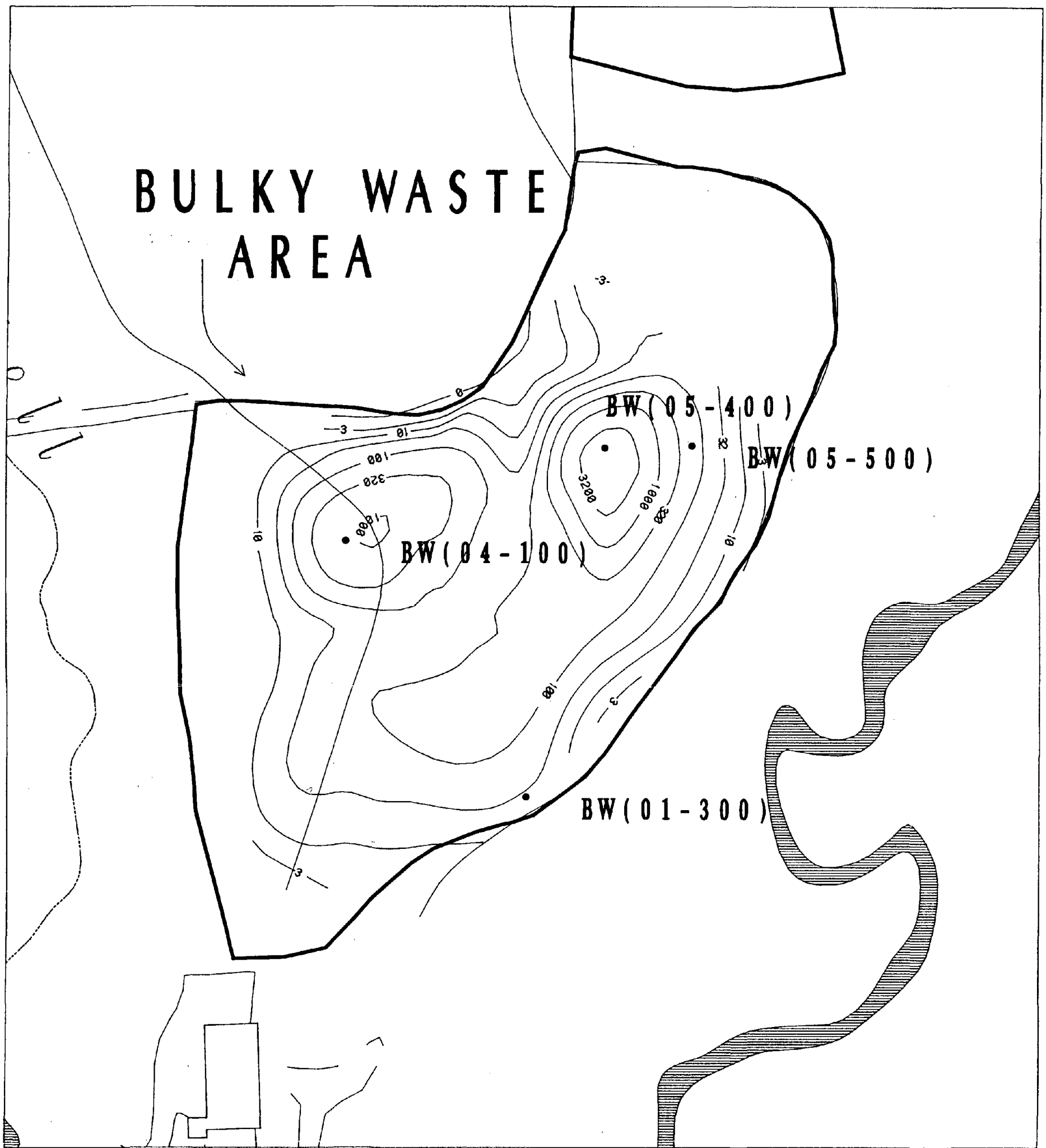
NOTES: Contour scale is based on the data transformation log (concentration + 1). Units are mg/m^3.

FIGURE 4-34

Trichloroethene Concentrations in the Bulky Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

125 0 50 100 125

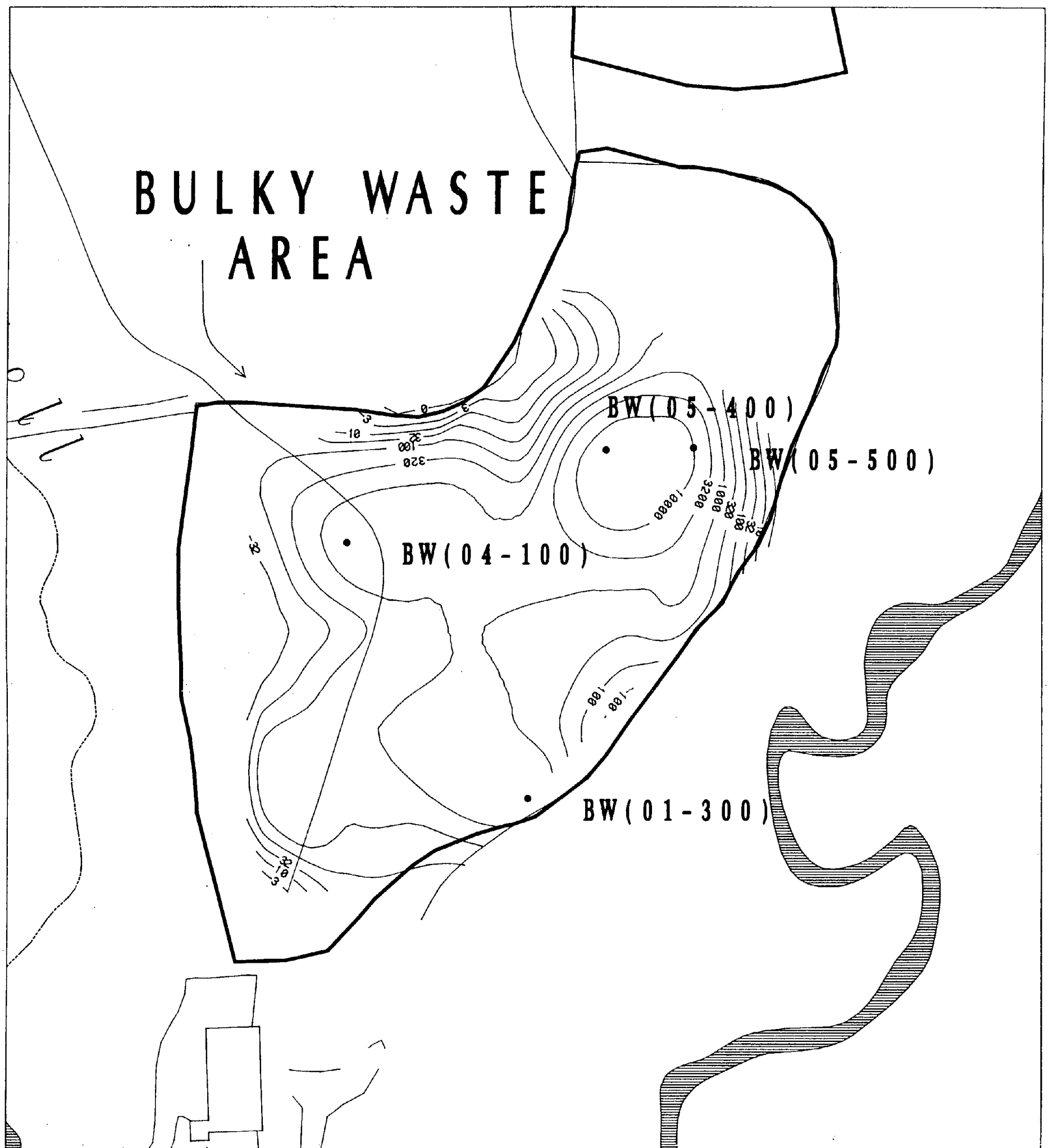
NOTES: Contour scale is based on the data transformation log (concentration + 1). Units are mg/m^3.

FIGURE 4-35

Toluene Concentrations in the Bulky Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

125 0 50 100 125

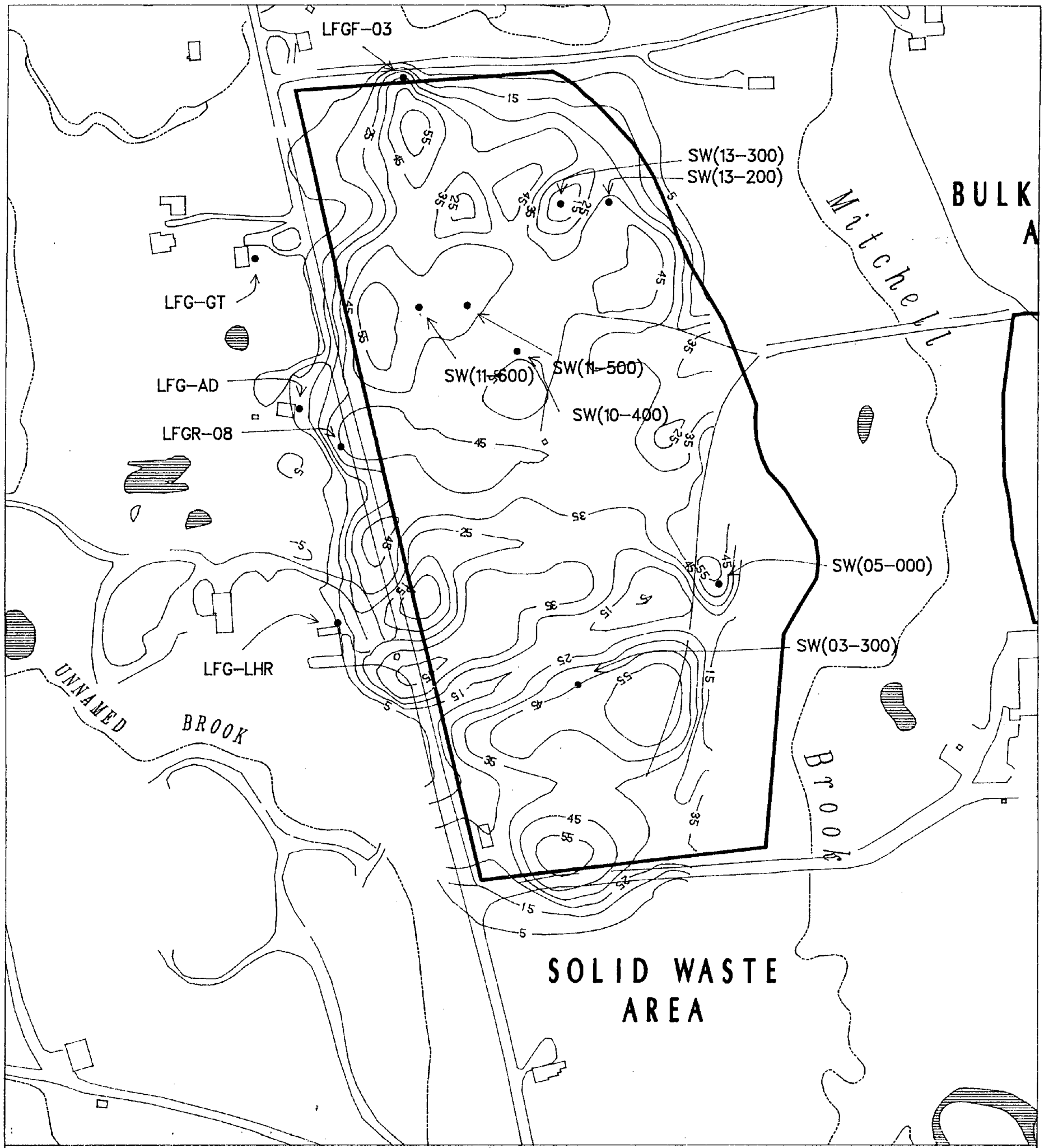
NOTES: Contour scale is based on the data transformation log (concentration + 1). Units are mg/m^3.

FIGURE 4-36

Total VOC Concentrations in the Bulky Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

225 0 100 225

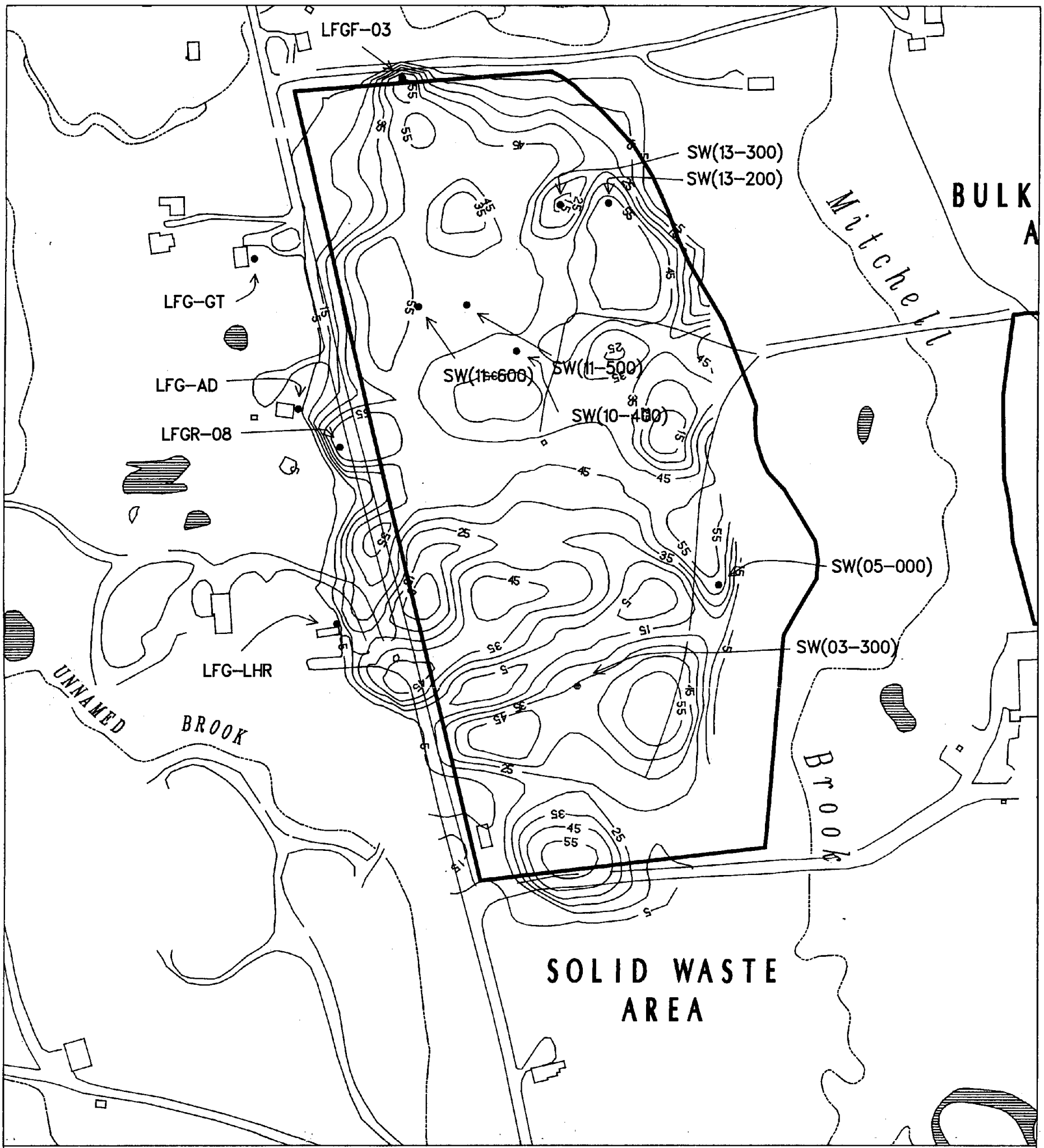
NOTES: This figure was developed using data from both the June/July and December 1991 sampling rounds. Units are percent by volume.

FIGURE 4-37

Carbon Dioxide Concentrations in Landfill Gas in the Solid Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

225 0 100 225

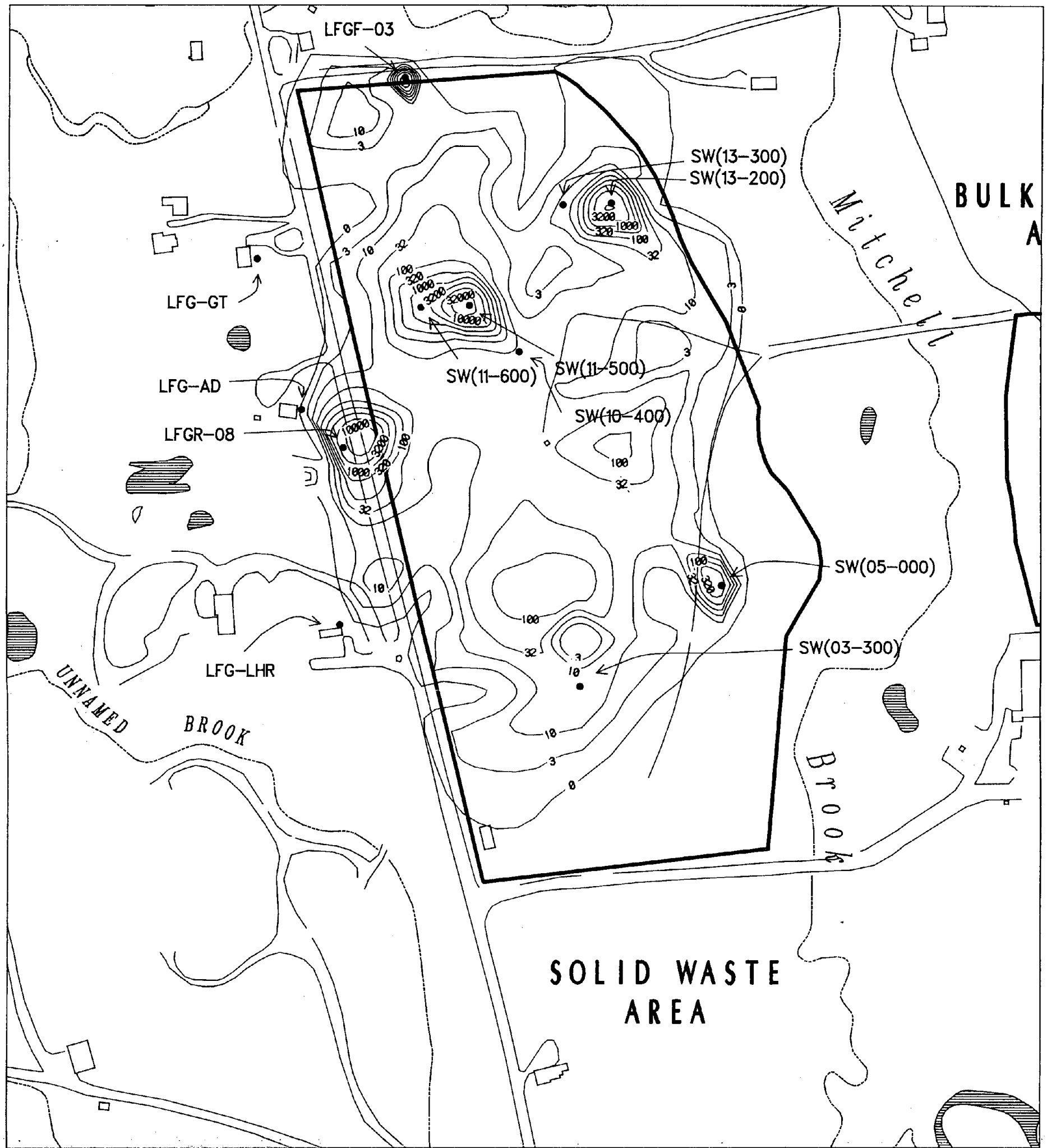
NOTES: This figure was developed using data from both the June/July and December 1991 sampling rounds. Units are percent by volume.

FIGURE 4-38

Methane Concentrations in Landfill Gas in the Solid Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

225 0 100 225

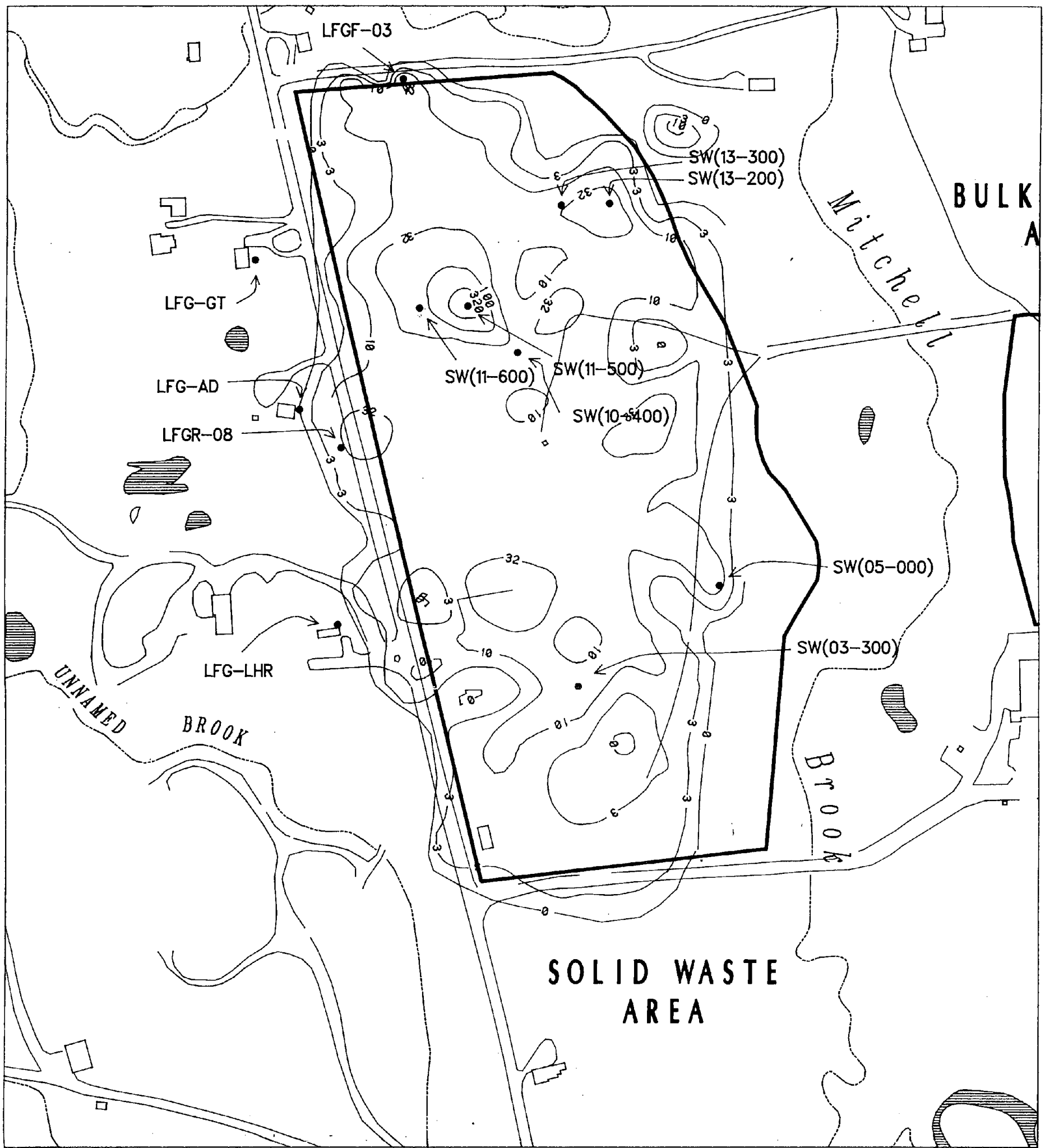
NOTES: Contour scale is based on the data transformation log (concentration + 1). This figure was developed using data from both the June/July and December 1991 sampling rounds. Units are in mg/m^3.

FIGURE 4-39

cis-1,2-Dichloroethene Concentrations in Landfill Gas in the Solid Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

225 0 100 225

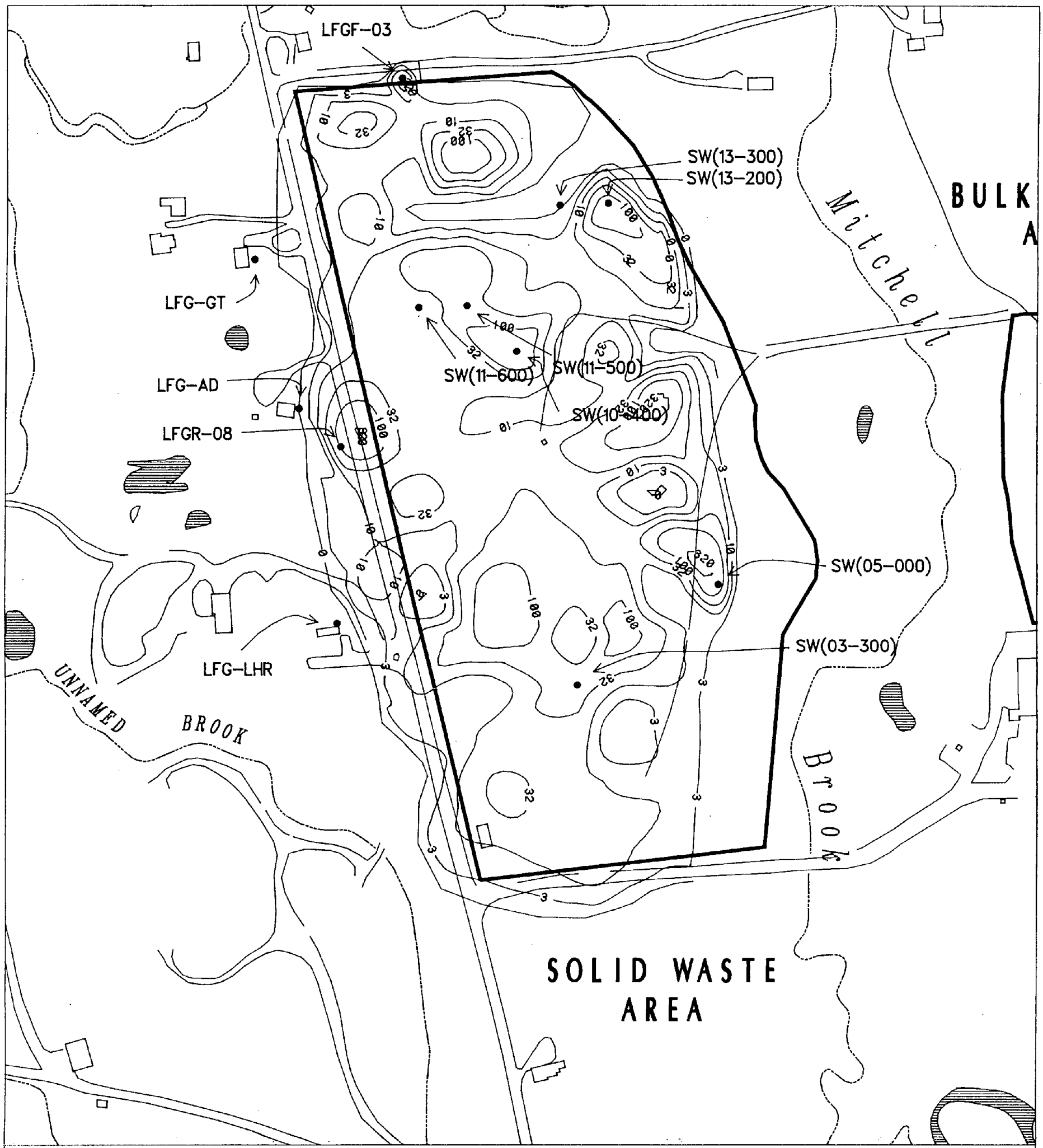
NOTES: Contour scale is based on the data transformation log (concentration + 1).
This figure was developed using data from both the June/July and December 1991 sampling rounds.
Units are mg/m³.

FIGURE 4-40

Trichloroethene Concentrations in Landfill Gas in the Solid Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

225 0 100 225

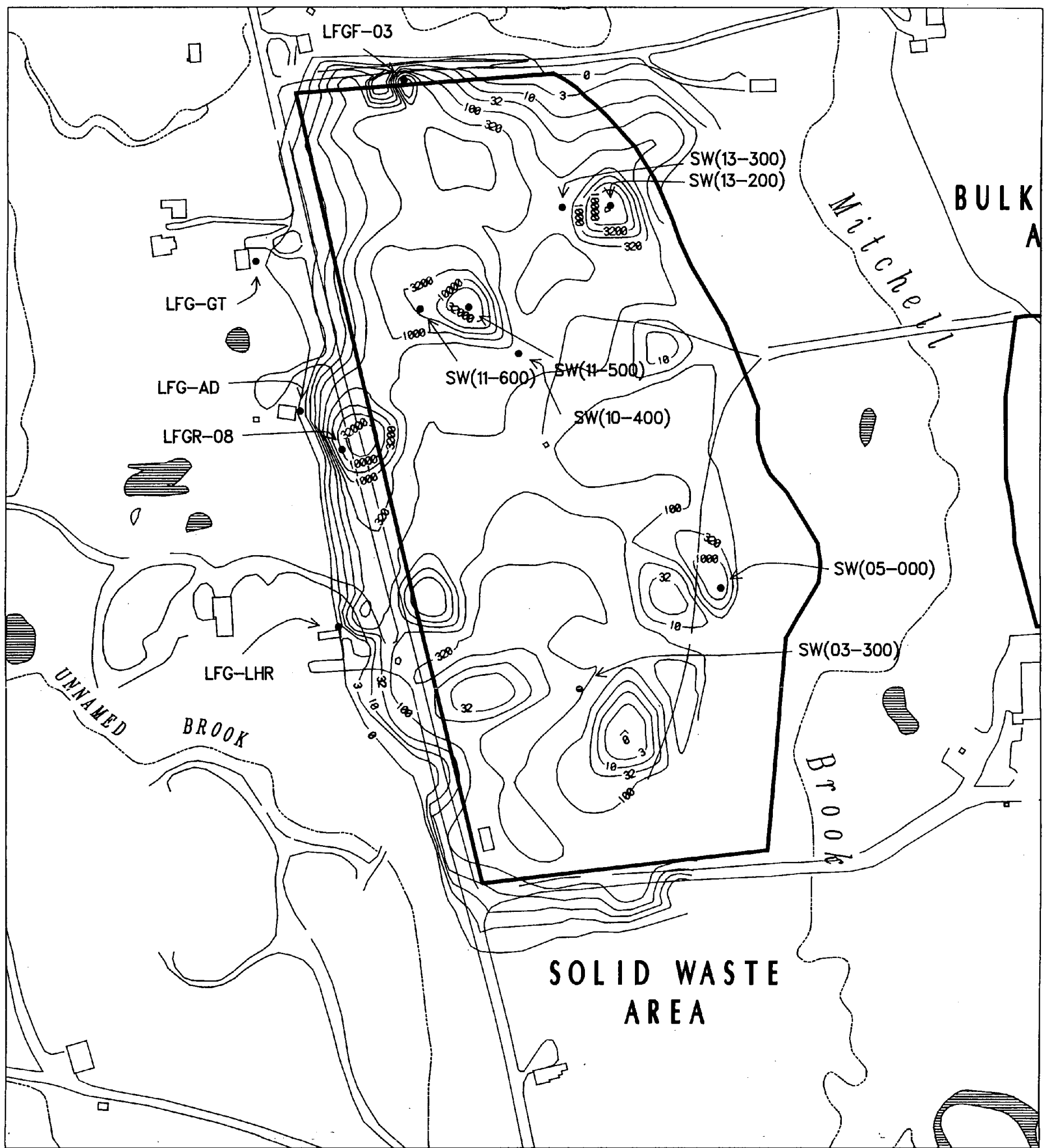
NOTES: Contour scale is based on the data transformation log (concentration + 1).
This figure was developed using data from both the June/July and December 1991 sampling rounds.
Units are mg/m^3.

FIGURE 4-41

Toluene Concentrations in Landfill Gas in the Solid Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

— 10 — Landfill Gas Contours

Landfill Area

Lake, Pond, or River

Selected Landfill Gas Sampling Locations

SCALE IN FEET

225 0 100 225

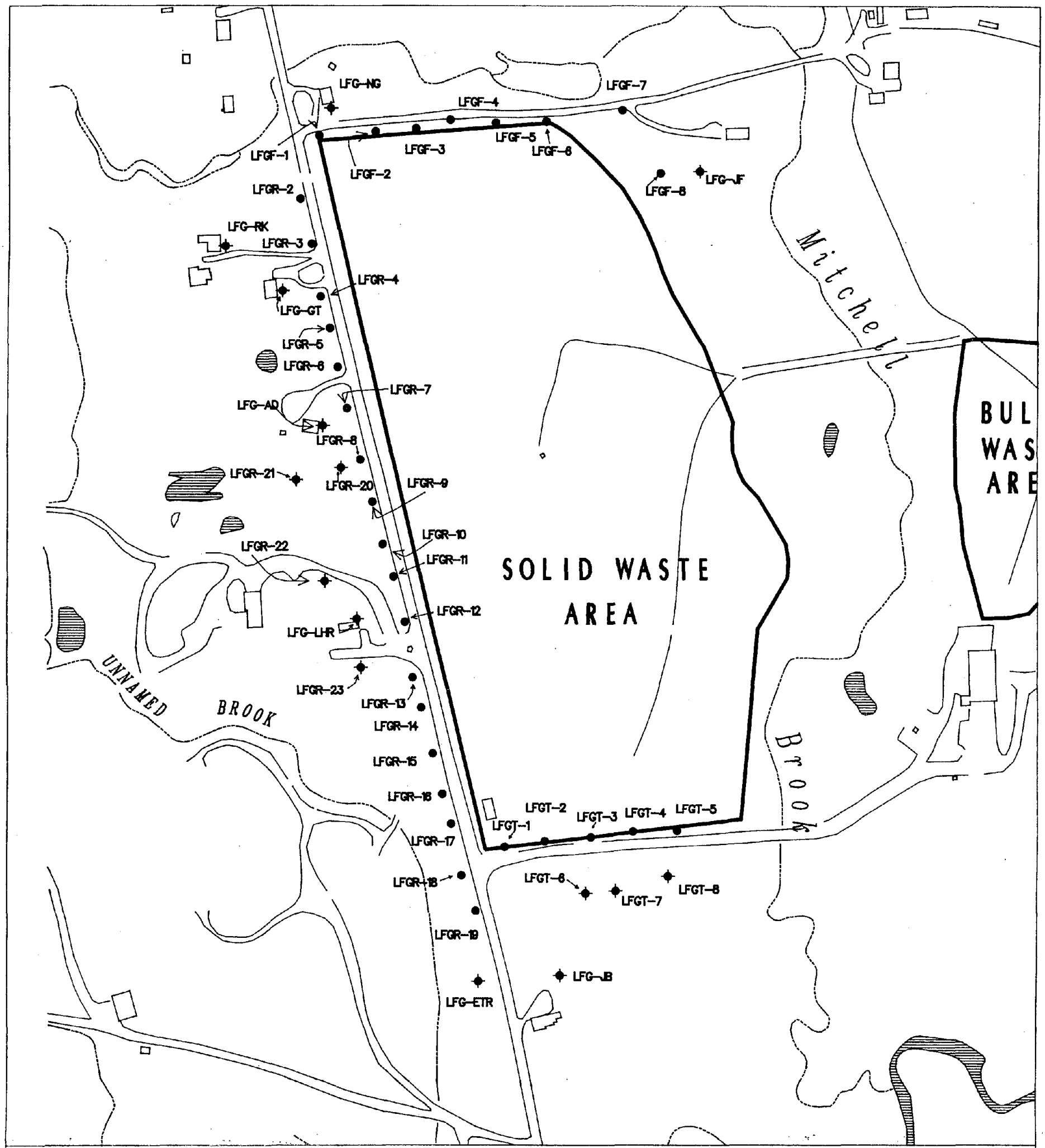
NOTES: Contour scale is based on the data transformation log (concentration + 1).
This figure was developed using data from both the June/July and December 1991 sampling rounds.
Units are mg/m^3.

FIGURE 4-42

Total VOC Concentrations in Landfill Gas in the Solid Waste Area

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Landfill Gas Sampling Location, installed in June/July 1991.

Landfill Gas Samping Location, installed in December 1991.

SCALE IN FEET

250 0 100 250

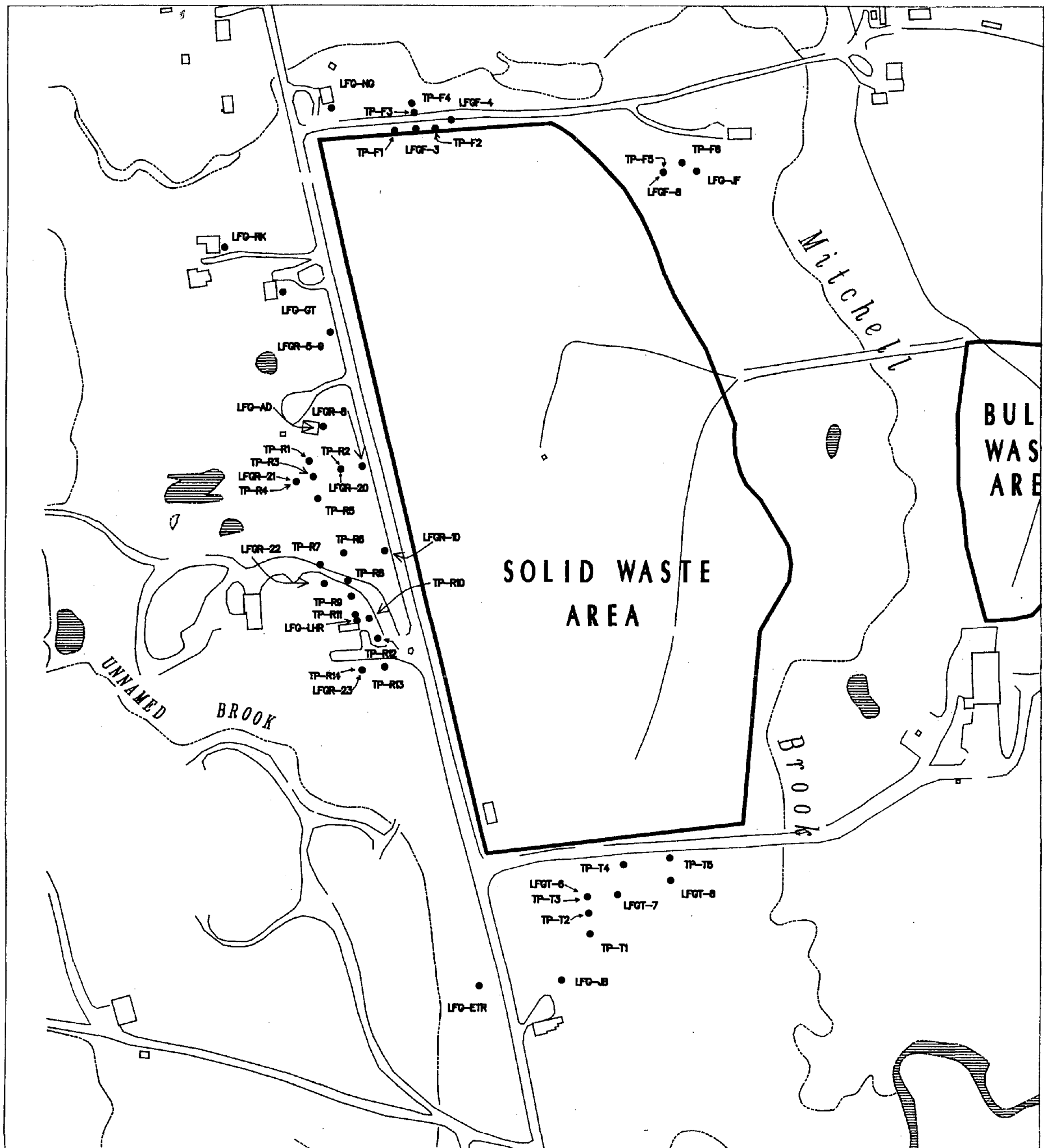
FIGURE 4-43

PERMANENT LANDFILL GAS SAMPLING LOCATIONS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTES: LFG - Permanent points.
TP - Temporary points sampled only in December, 1991.
Some points have both an LFG and a TP label. These points were first sampled as temporary points and then installed as permanent sampling locations.

Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
December 1991 Sampling Locations

SCALE IN FEET
250 0 100 250

FIGURE 4-44

LANDFILL GAS LOCATIONS SAMPLED IN DECEMBER, 1991

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

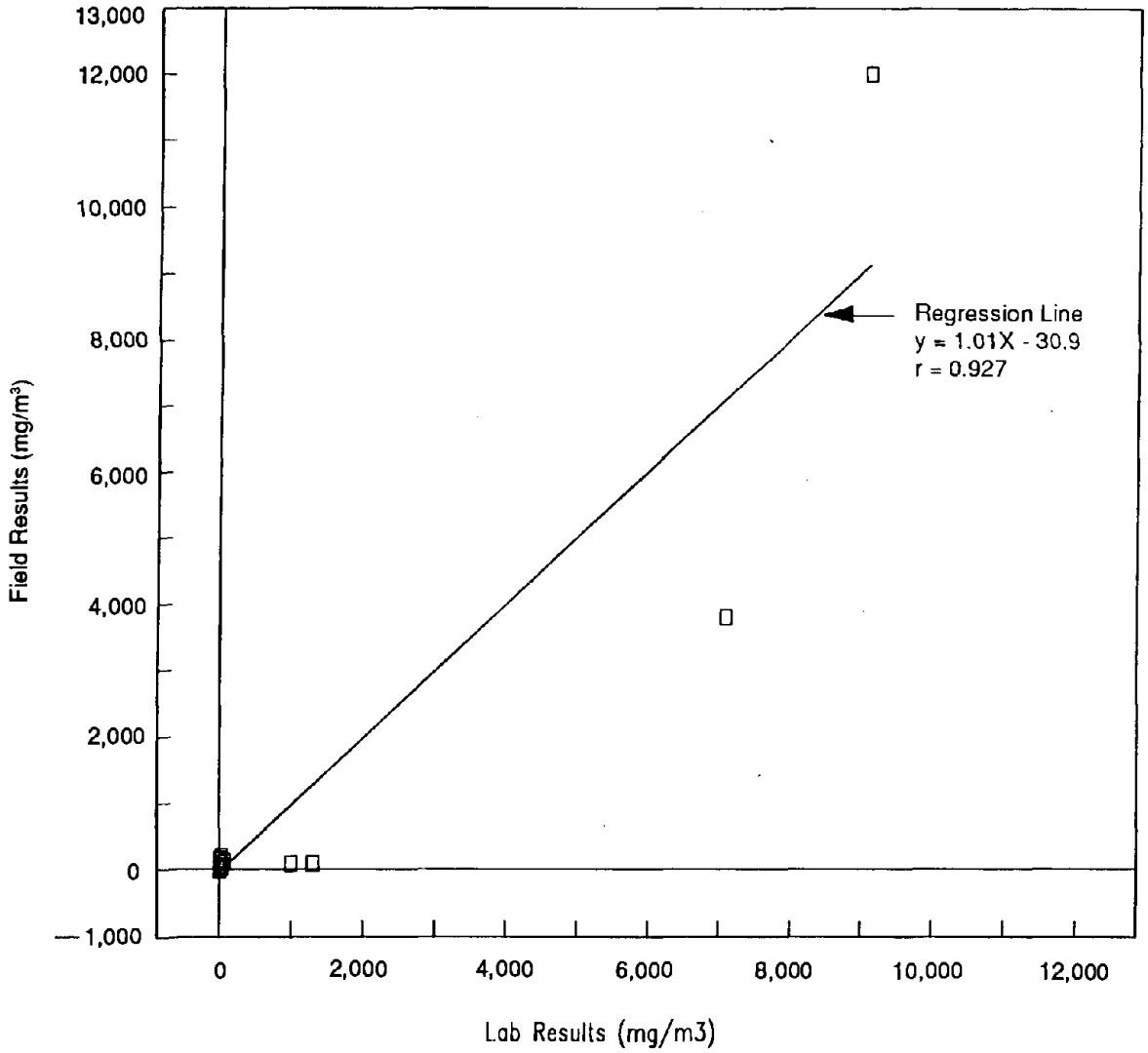


FIGURE 4-45. FIELD GC RESULTS VERSUS SUMMA CANISTER RESULTS FOR VOCs IN LANDFILL GAS

METCALF & EDDY

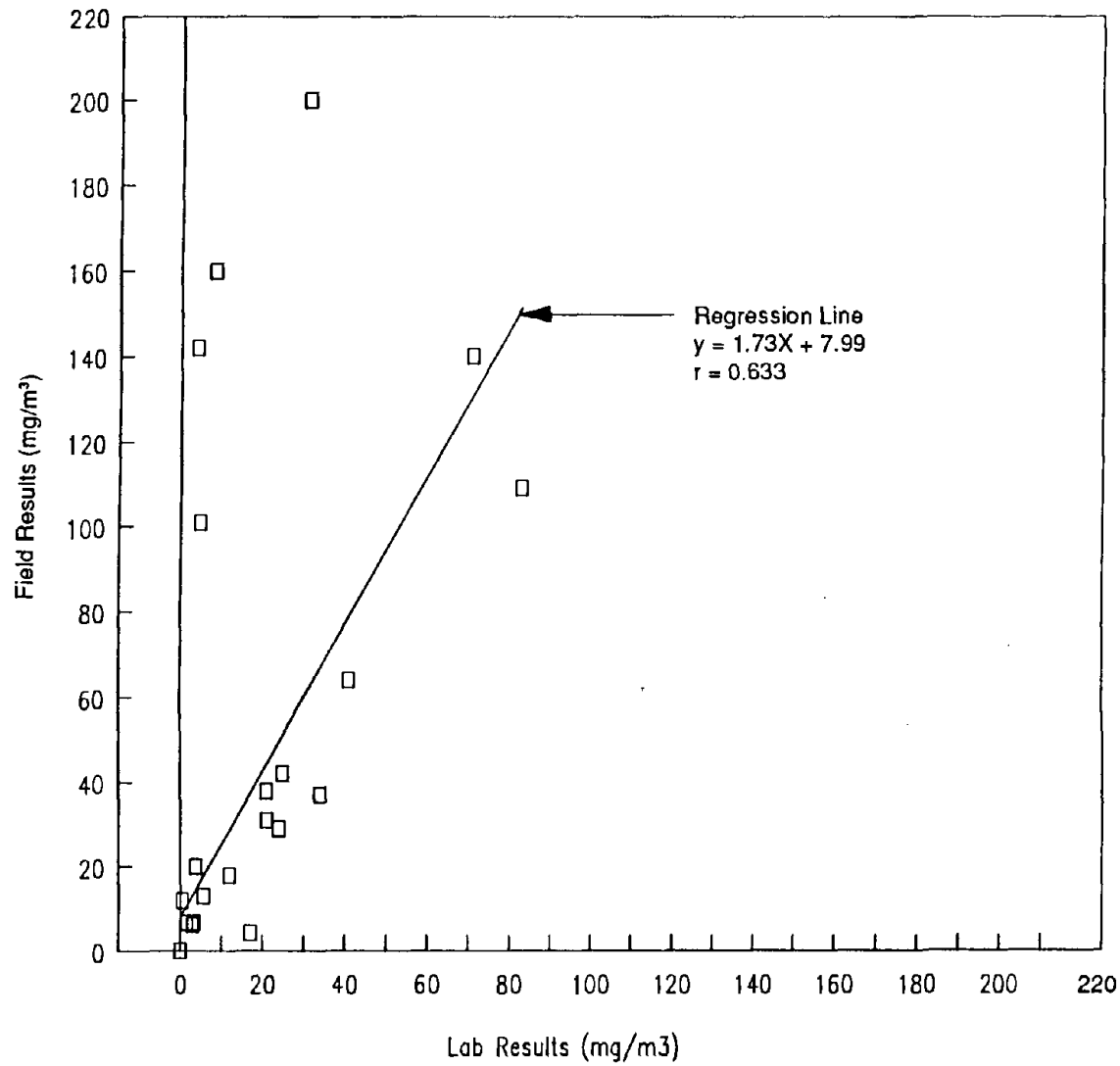


FIGURE 4-46. FIELD GC RESULTS VERSUS SUMMA CANISTER RESULTS FOR VOCs IN LANDFILL GAS
(Omitting the highest four data points)

METCALF & EDDY

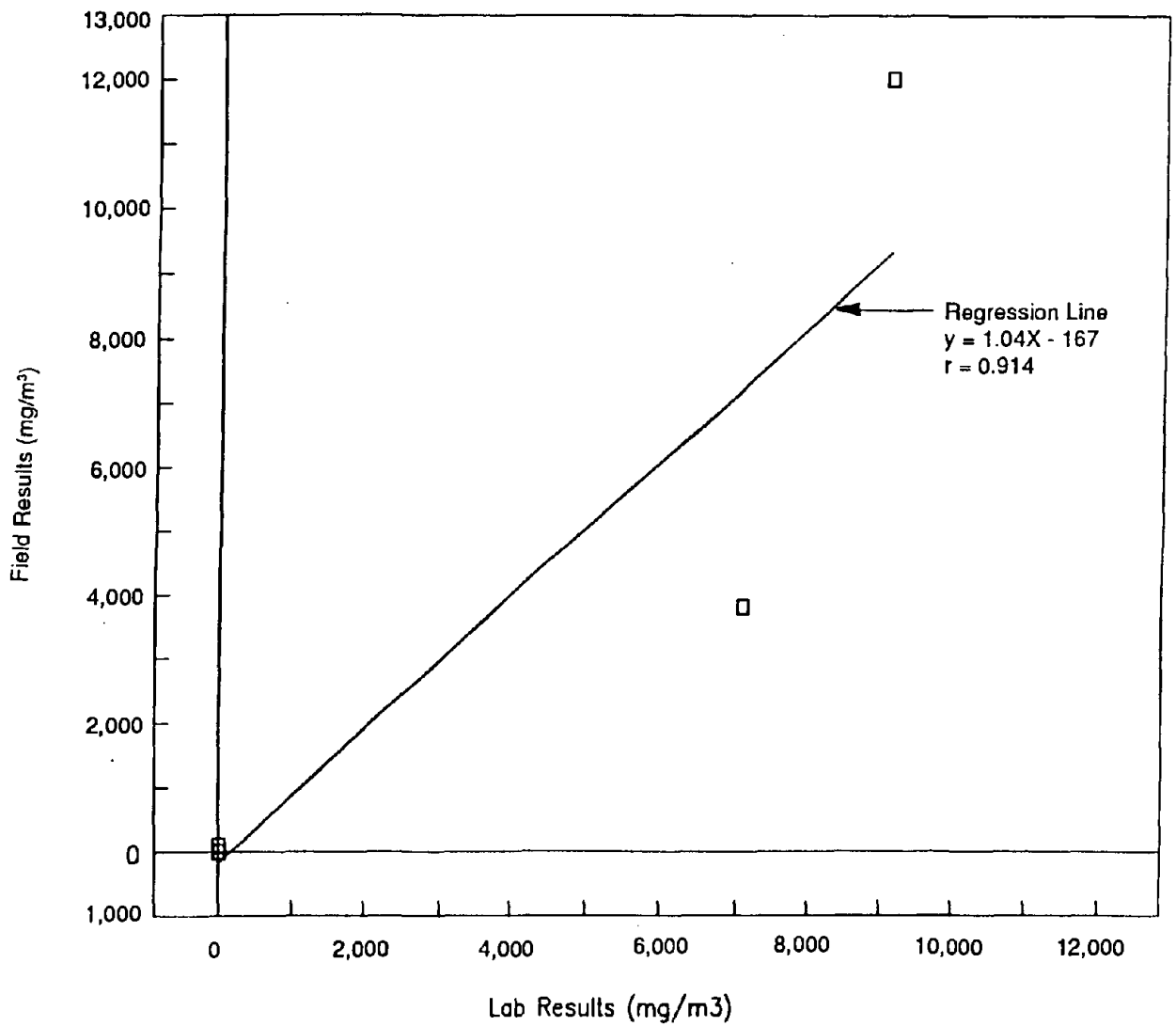


FIGURE 4-47. FIELD GC RESULTS VERSUS SUMMA CANISTER RESULTS FOR cis-1,2-DICHLOROETHENE IN LANDFILL GAS

METCALF & EDDY

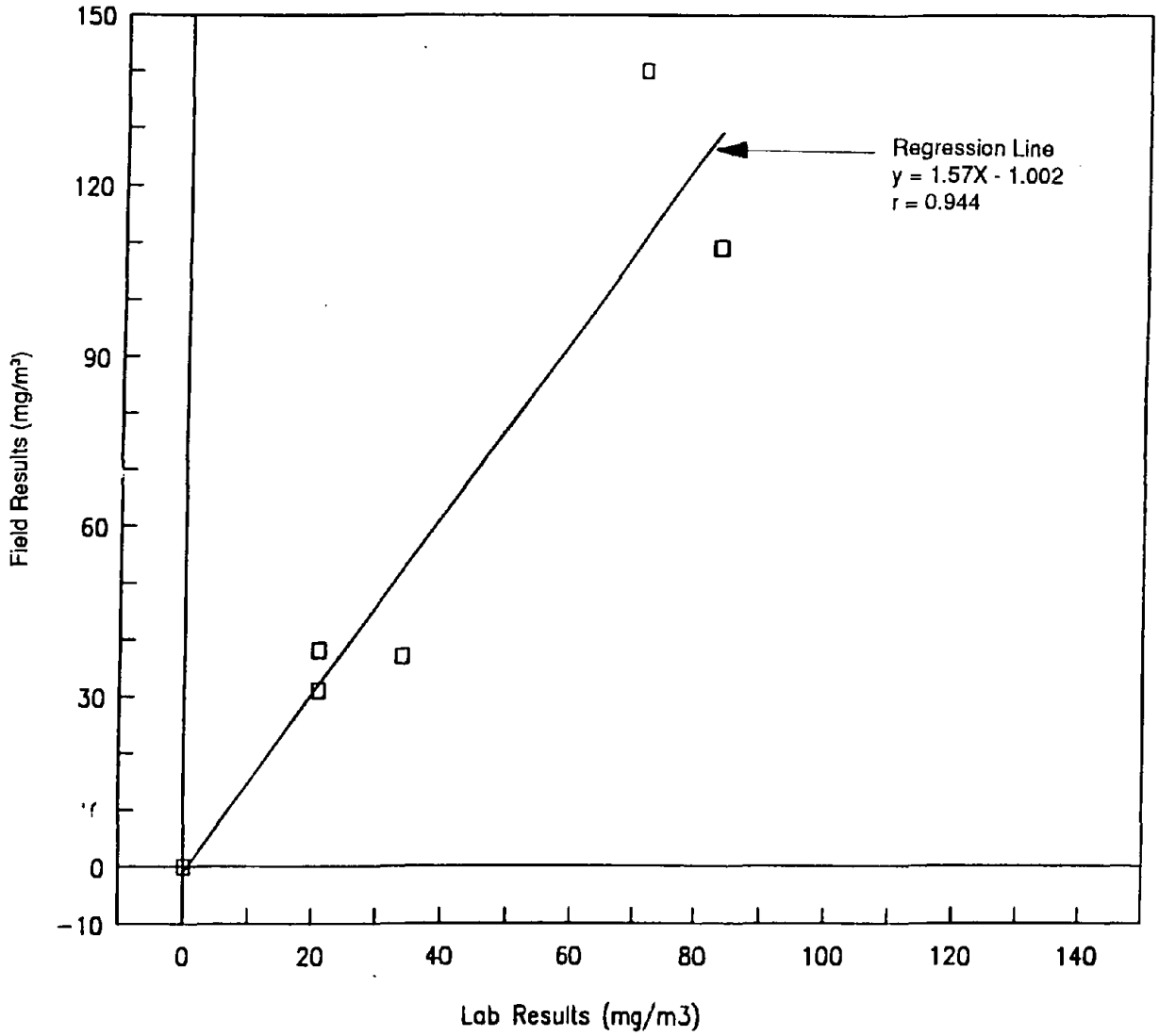


FIGURE 4-48. FIELD GC RESULTS VERSUS SUMMA CANISTER RESULTS FOR TOLUENE IN LANDFILL GAS

METCALF & EDDY

Section Six

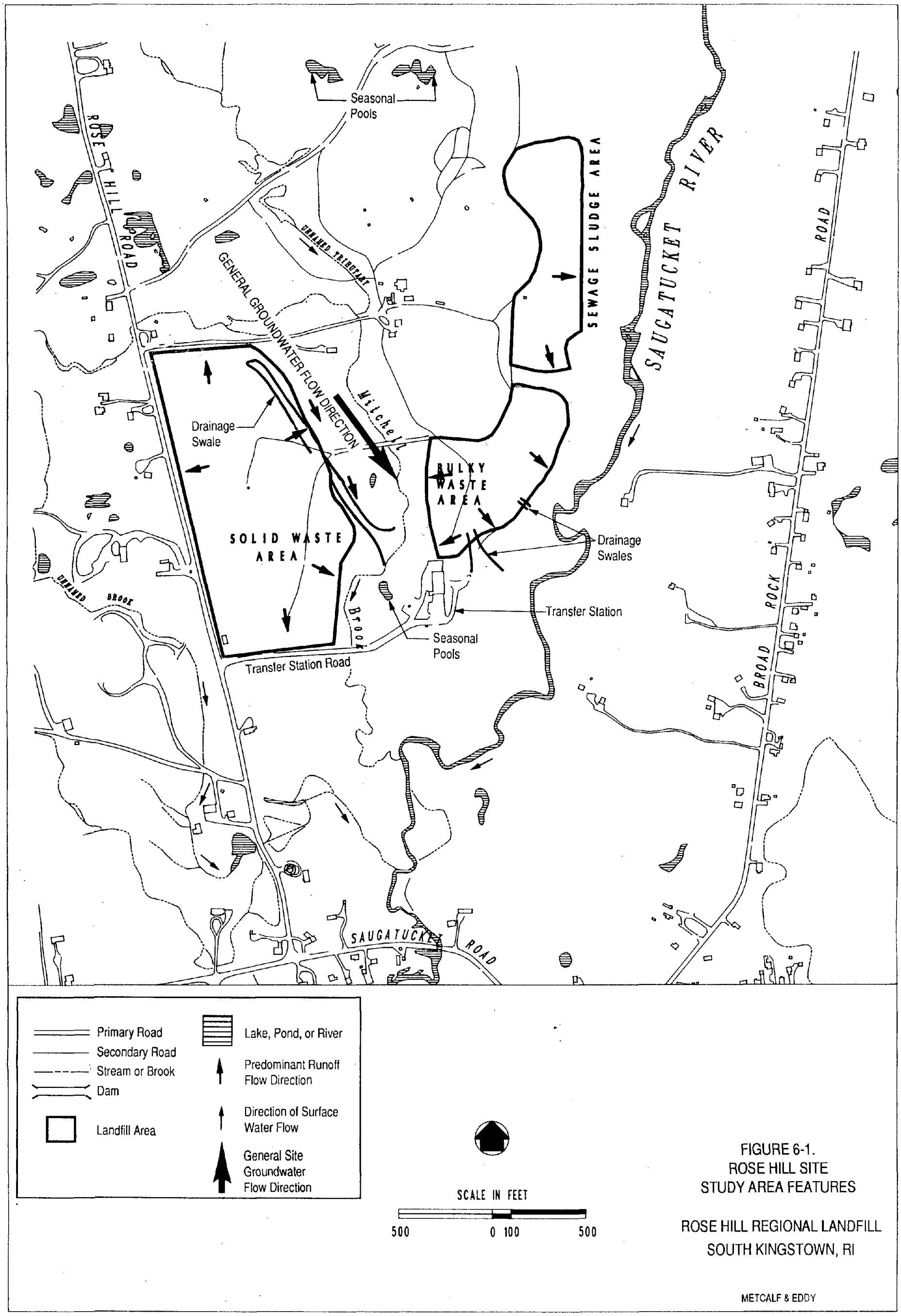
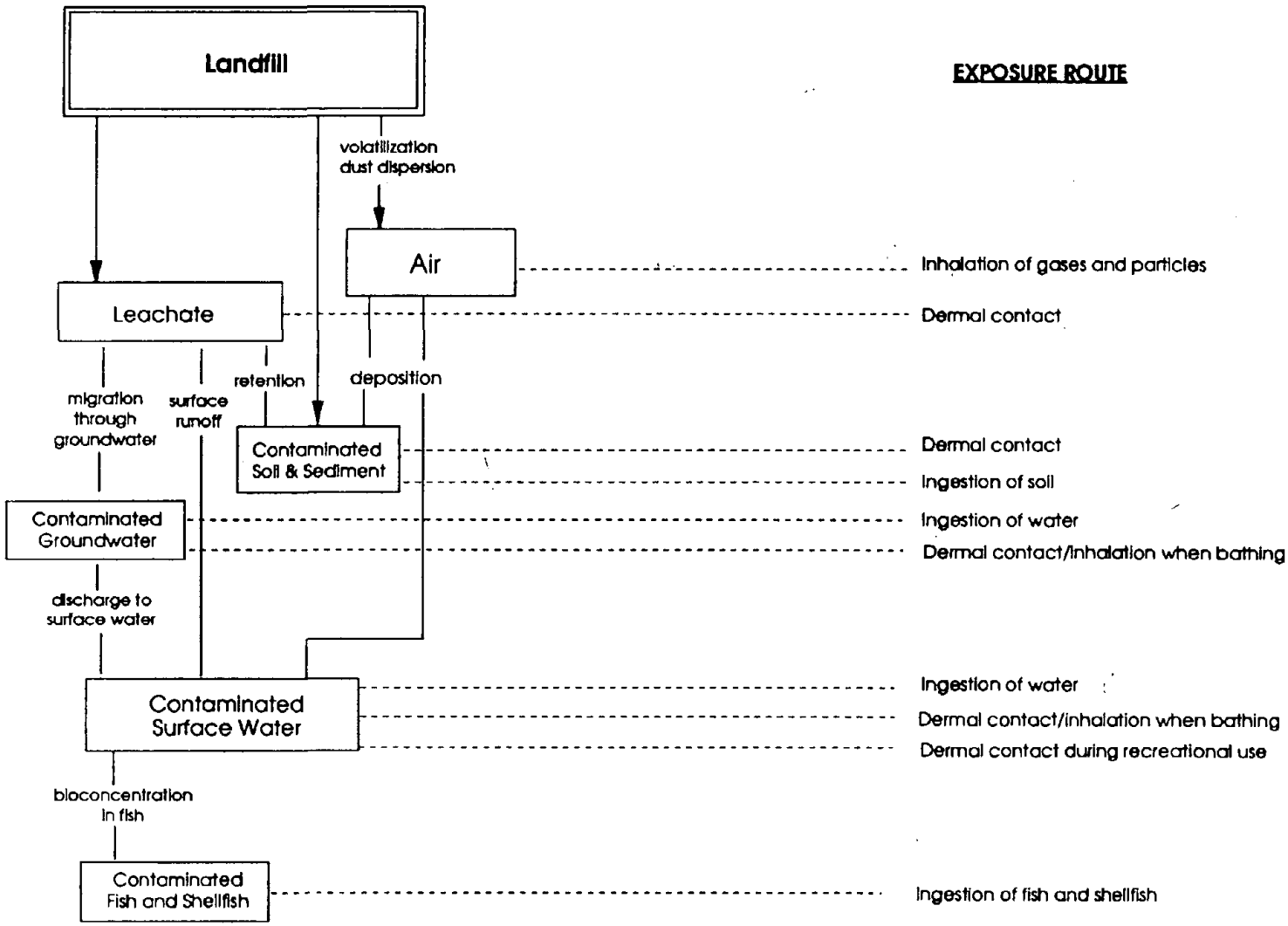


FIGURE 6-1.
ROSE HILL SITE
STUDY AREA FEATURES

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI



SOURCE: Doyle, M.E. and J.C. Young, 1993 ."Human Health Risk Assessments," in *Ecological Assessment of Hazardous Waste Sites*, J.T. Maughan, ed. New York: Van Reinhold.

FIGURE 6-2. POTENTIAL EXPOSURE PATHWAYS FOR LANDFILLS

METCALF & EDDY

FIGURE 6-3. INCIDENTAL INGESTION OF CHEMICALS IN SURFACE SOILS SITE VISITOR EXPOSURE SCENARIO

$$\text{Exposure dose (mg/kg/day)} = \frac{C \times IR \times EF \times ED \times RAF}{BW \times AVG \times 365 \text{ days/yr} \times 10^6 \text{ mg/kg}}$$

C = Contaminant concentration in soil (mg/kg)

IR = Soil Ingestion Rate Adult - 100 mg/day;
Child (1-6 yrs. old) - 200 mg/day
(Residential; EPA, SDEF)

EF = Exposure Frequency - 150 days/yr
(USEPA 1992-9/9)

ED = Exposure Duration
Adult - 24 years
Child - 6 years
(Residential; USEPA 1991 - SDEF)

RAF = Relative Absorption Factor

VOCs	100%
PAHs	100%
inorganics	100%

(USEPA 1989b - SRAG)

BW = Body Weight
Adult - 70 kg (USEPA 1991 - SDEF)
Child - 15 kg (USEPA 1991 - SDEF)

AVG = Number of years over which the exposure is averaged
Carcinogenic effects - 70 yrs
Noncarcinogenic effects - ED

FIGURE 6-4. DERMAL CONTACT WITH CHEMICALS IN SURFACE SOILS SITE VISITOR EXPOSURE SCENARIO

$$\text{Exposure Dose (mg/kg/day)} = \frac{C \times SCR \times EF \times ED \times RAF}{BW \times AVG \times 365\ \text{days/yr} \times 10^6\ \text{mg/kg}}$$

C = Contaminant Concentration in soil (mg/kg)

SCR = Soil Contact Rate - 500 mg/day
(Residential/recreational; USEPA 1989b - SRAG)

EF = Exposure Frequency - 150 days/yr
(USEPA 1992-9/9)

ED = Exposure Duration
Adult - 24 years
Child - 6 years
(Residential; USEPA 1991 - SDEF)

RAF = Relative Absorption Factor for soil contaminants via the dermal pathway

VOCs	50%
PAHs	5%
inorganics	negligible

(USEPA 1989b - SRAG)

BW = Body Weight
Adult - 70 kg
Child - 15 kg

AVG = Number of years over which the exposure is averaged
Carcinogenic effects - 70 yrs
Noncarcinogenic effects - ED

FIGURE 6-5. DERMAL CONTACT WITH CHEMICALS IN LEACHATE SITE VISITOR EXPOSURE SCENARIO

$$\text{Exposure Dose (mg/kg/day)} = \frac{C \times DPC \times AV \times ET \times EF \times ED}{BW \times AVG \times 365\ \text{days/yr} \times 10^3\ \text{cm}^3/\text{L} \times 10^3\ \mu\text{g/mg}}$$

C = Measured Surface Water Concentration (μg/L)

DPC = Dermal Permeability Constant (cm/hr)
(chemical-specific estimated Kd; USEPA 1992 - DERM)

AV = Skin surface area available for contact - 1800 cm^2
(adult hands and feet; USEPA 1992 - DERM)

ET = Exposure time - 1 hr/day of exposure
(assume wetted clothes)

EF = Exposure Frequency - 104 days/yr
(three times per week, eight months of the year)

ED = Exposure Duration 30 yrs
(Residential; USEPA 1991 - SDEF)

BW = Body Weight
Adult - 70 kg
Adolescent - 58 kg (average of ages 12 through 18)

AVG = Number of years over which the exposure is averaged
Carcinogenic effects - 70 years
Noncarcinogenic effects - ED

FIGURE 6-6. INCIDENTAL INGESTION OF CHEMICALS IN SURFACE WATER RECREATIONAL EXPOSURE SCENARIO

$$\text{Exposure Dose (mg/kg/day)} = \frac{C \times IR \times ET \times EF \times ED}{BW \times AVG \times 365 \text{ days/yr} \times 10^3 \ \mu g/mg}$$

C = Measured Surface Water Concentration (µg/L)

IR = Water Ingestion Rate (0.05 L/hr)
(USEPA 1989b - SRAG)

ET = Exposure Time - 1 hr/day of exposure

EF = Exposure Frequency - 10 days/yr
(average for swimming in northeast U.S.; USDOI 1973)

ED = Exposure Duration
Adult - 30 years
Adolescent - 7 years

BW = Body Weight
Adult - 70 kg
Adolescent - 58 kg (average, ages 12 through 18)

AVG = Number of years over which the exposure is averaged
Carcinogenic effects - 70 years
Noncarcinogenic effects - ED

FIGURE 6-7. DERMAL CONTACT WITH CHEMICALS IN SURFACE WATER RECREATIONAL EXPOSURE SCENARIO

$$\text{Exposure Dose (mg/kg/day)} = \frac{C \times DPC \times AV \times ET \times EF \times ED}{BW \times AVG \times 365\ \text{days/yr} \times 1000\ \text{cm}^3/\text{L} \times 1000\ \mu\text{g/mg}}$$

C = Measured Surface Water Concentration (µg/L)

DPC = Dermal Permeability Constant (cm/hour)
(chemical specific estimated Kd; from USEPA 1992 - DERM)

AV = Skin Surface Area Available for Contact
Adult, Saugatucket River - 18,000 cm^2
(Average Adult; USEPA 1992 - DERM)
Adolescent, Saugatucket River - 16,000 cm^2
(calculated from USEPA 1989 - EFH)
Mitchell Brook - 1800 cm^2
(Adult hands and feet; USEPA 1992 - DERM)

ET = Exposure Time
Recreational exposure in river - 1 hr/day of exposure
Recreational exposure in brook - 1 hr/day of exposure (assume wetted clothes)

EF = Exposure Frequency
Saugatucket River - 10 days/yr
(average for swimming in northeast U.S.; USDOI 1973)
Mitchell Brook - 26 days/yr
(once per week in spring and summer)

ED = Exposure Duration
Adult - 30 yrs
Adolescent - 7 yrs

BW = Body Weight
Adult - 70 kg
Adolescent - 58 kg (average, ages 12 through 18)

AVG = Number of years over which the exposure is averaged
Carcinogenic effects - 70 yrs
Noncarcinogenic effects - ED

FIGURE 6-8. INGESTION OF CHEMICALS IN DRINKING WATER PRESENT AND FUTURE RESIDENTIAL EXPOSURE SCENARIOS

$$\text{Exposure Dose (mg/kg/day)} = \frac{C \times IR \times EF \times ED}{BW \times AVG \times 365\ \text{days/yr} \times 10^3\ \mu g/mg}$$

C = Measured Groundwater Concentration (µg/L)

IR = Water Ingestion Rate - 2 L/day
(USEPA 1989b - SRAG)

EF = Exposure Frequency - 350 days/yr
(Residential; USEPA 1991 - SDEF)

ED = Exposure Duration - 30 years
(Residential; USEPA 1991 - SDEF)

BW = Body Weight - 70 kg
(Residential; USEPA 1991 - SDEF)

AVG = Number of years over which the exposure is averaged
Carcinogenic effects - 70 years
Noncarcinogenic effects - 30 years

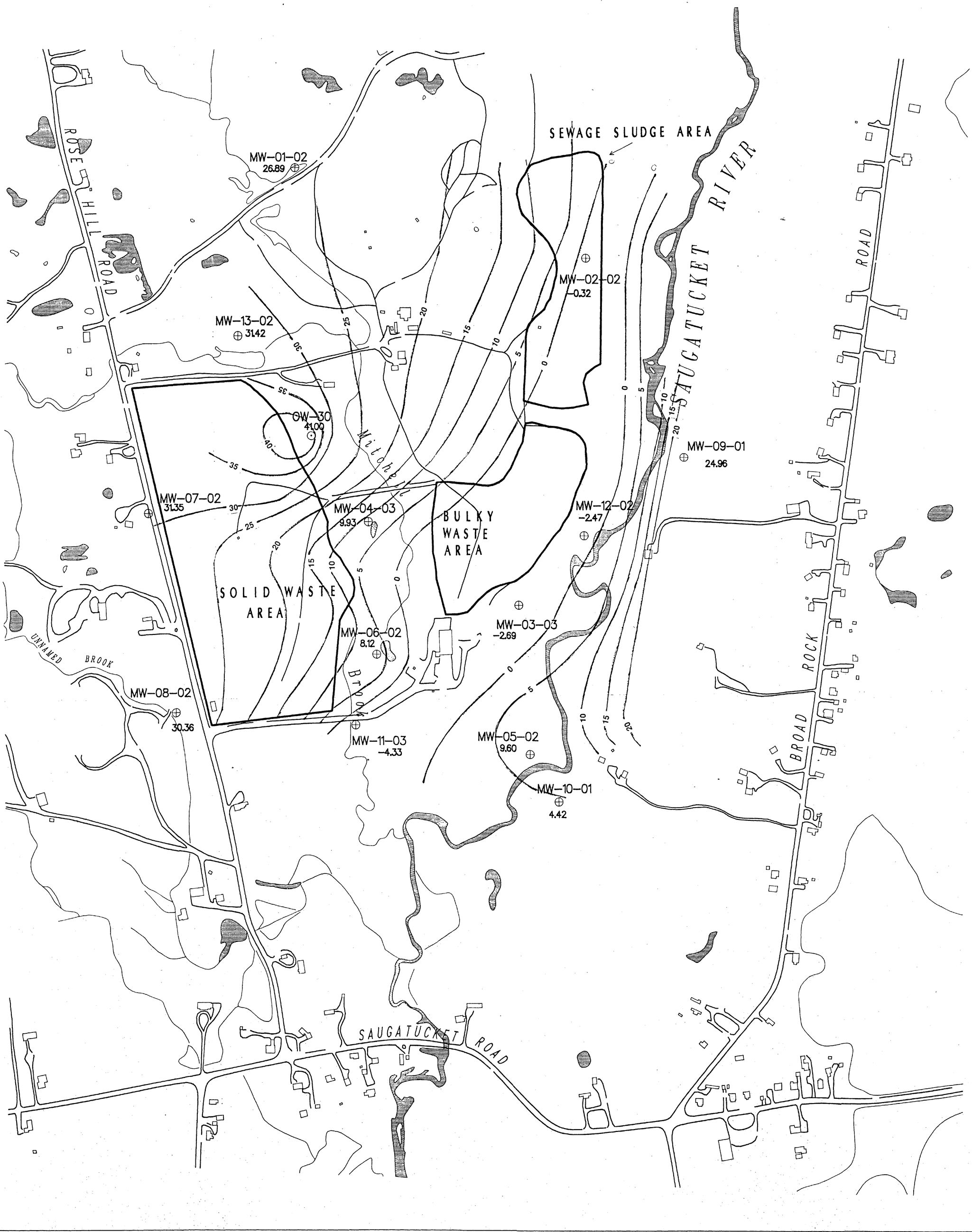


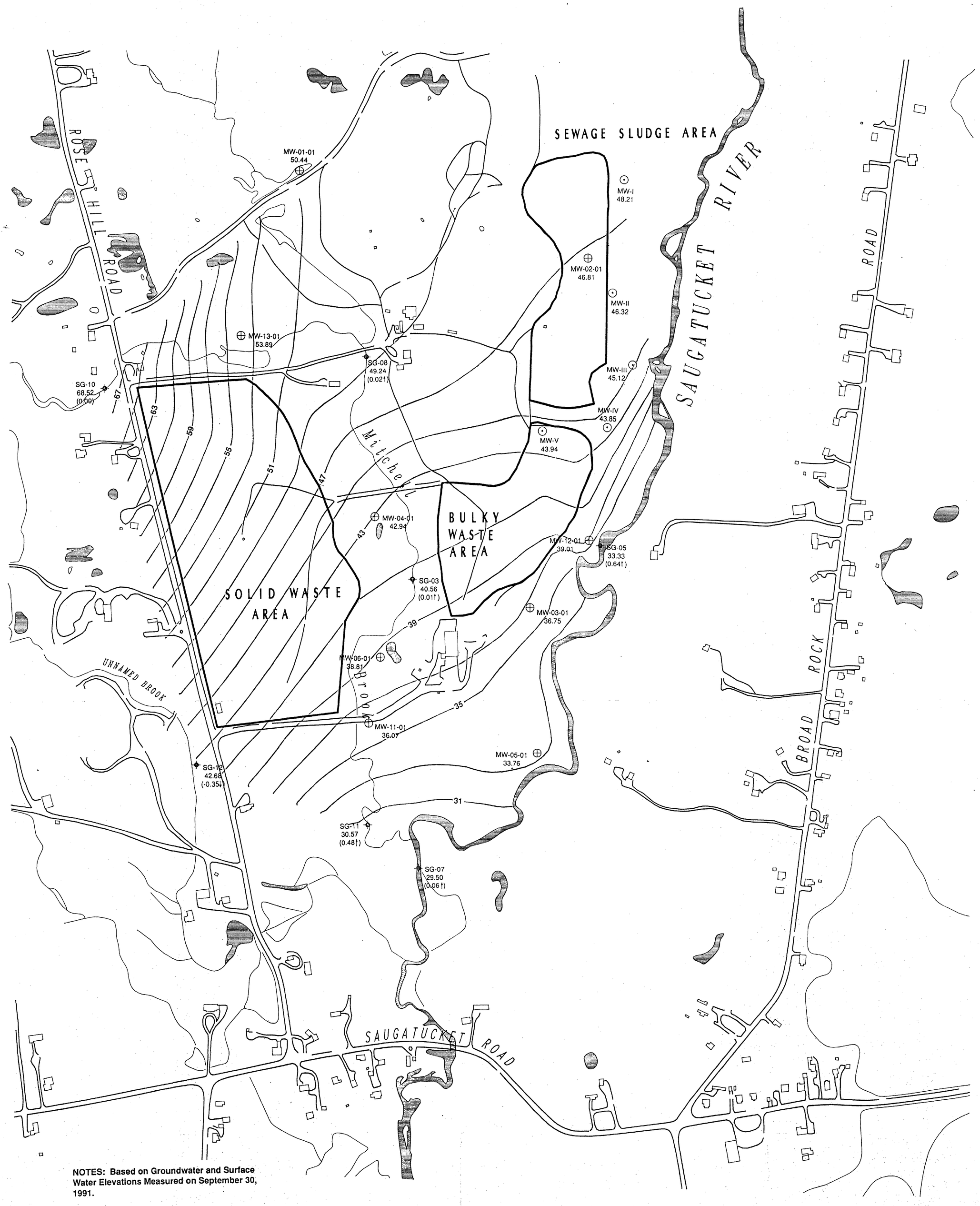
PLATE 1.

BEDROCK SURFACE ELEVATION CONTOURS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTES: Based on Groundwater and Surface Water Elevations Measured on September 30, 1991.

Staff Gauge Locations are Only Shown for Monitoring Stations Where Both a Seepage Meter and a Mini-Piezometer are Present.

Wells MW-09-01 and MW-10-01 are Included with the Deep Overburden Groundwater Elevation Contours, on Plate 3.

Primary Road

Secondary Road

Stream or Brook

31 Groundwater Contour Elevation

Land Fill Area

Lake, Pond, or River

Staff Gauge

Existing Monitoring Well

New Monitoring Well

29.50 Groundwater Elevation

(0.06↑) Vertical Gradient Upward Flow from Groundwater to Surface Water

(-0.35↓) Vertical Gradient Downward Flow from Surface Water to Groundwater

SCALE IN FEET
State Plane Coordinates
400 300 200 100 0 200 400

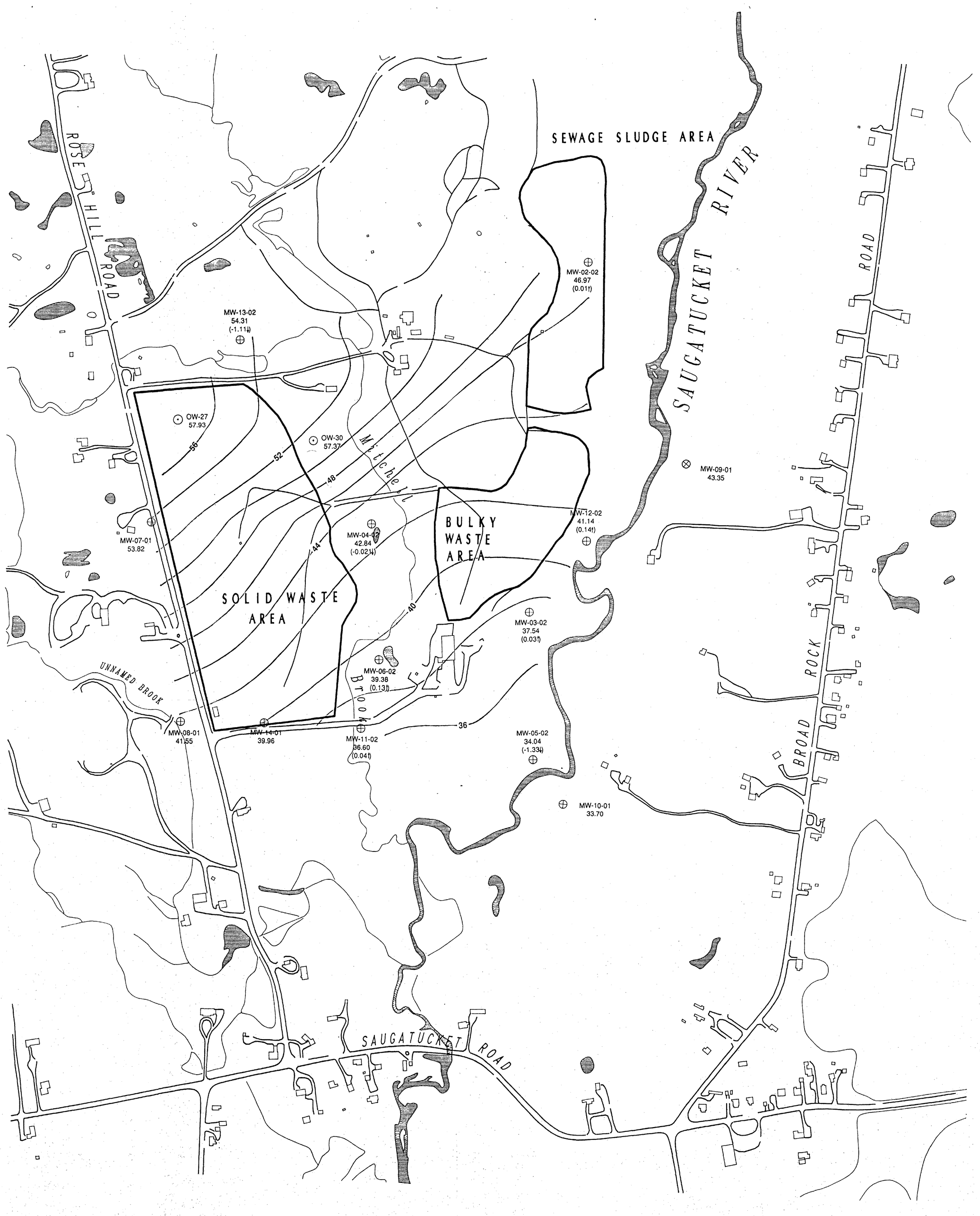
PLATE 2.

SHALLOW OVERBURDEN GROUNDWATER ELEVATION CONTOURS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTE: Based on Groundwater Elevations measured on September 30, 1991

Primary Road

Secondary Road

Stream or Brook

36 Groundwater Contour Elevation

Landfill Area

Lake, Pond, or River

Existing Monitoring Well

New Monitoring Well

36.60 Groundwater Elevation

(0.13↑) Vertical Gradient Upward Flow from the Deep Overburden to the Shallow Overburden

(-1.33↓) Vertical Gradient Downward Flow from the Shallow Overburden to the Deep Overburden

SCALE IN FEET
State Plane Coordinates

400 300 200 100 0 200 400

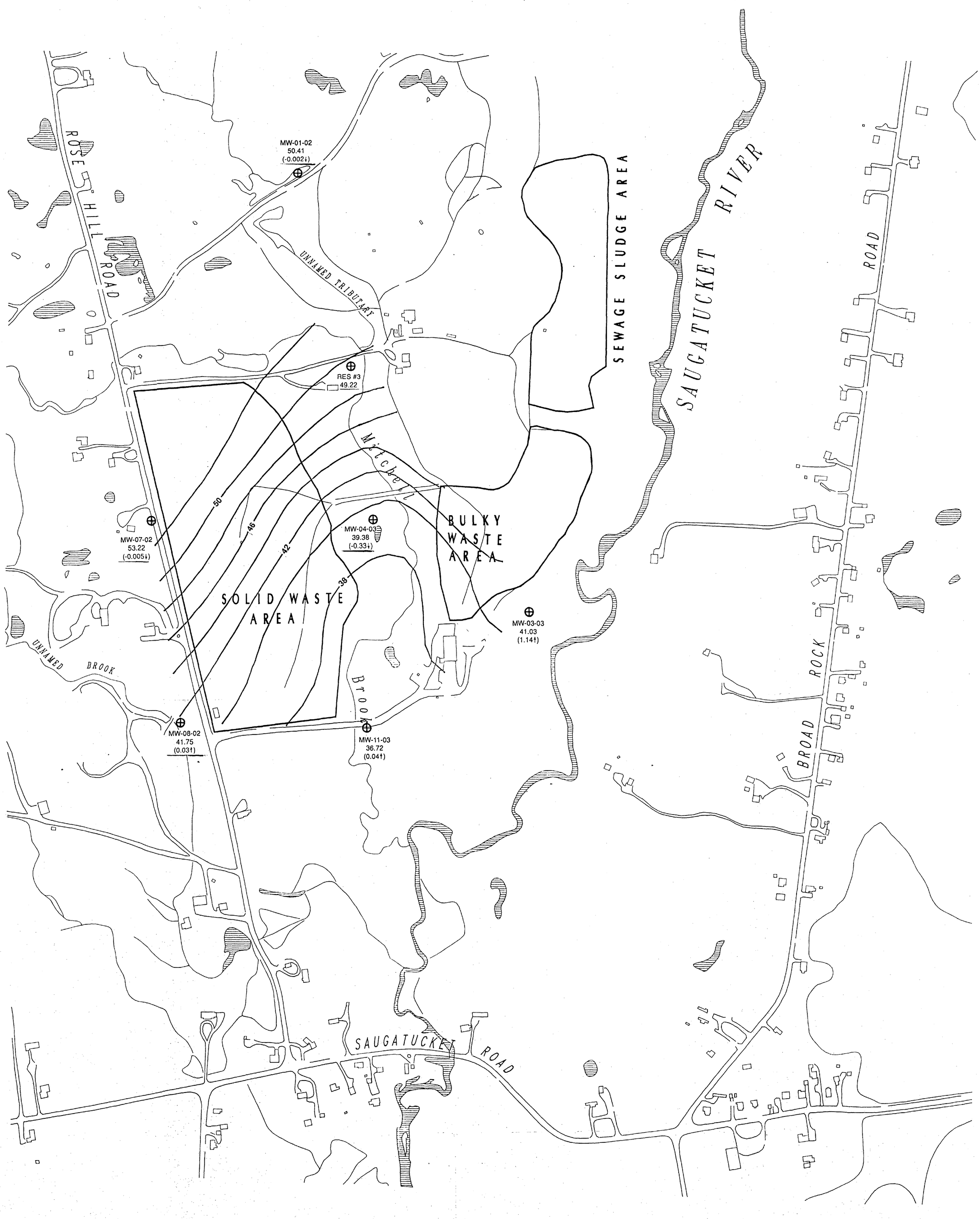
PLATE 3.

DEEP OVERBURDEN GROUNDWATER ELEVATION CONTOURS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



NOTE: Based on Groundwater Elevations measured on September 30, 1991

Primary Road

Secondary Road

Stream or Brook

38 Groundwater Contour Elevation

Landfill Area

Lake, Pond, or River

New Monitoring Well

Residential Well

41.72 Groundwater Elevation

(0.03↑) Vertical Gradient Upward Flow from Bedrock to Deep Overburden

(-0.05↓) Vertical Gradient Downward Flow from Deep Overburden to Bedrock

SCALE IN FEET
State Plane Coordinates
400 300 200 100 0 200 400

PLATE 4.

BEDROCK GROUNDWATER ELEVATION CONTOURS

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY

Site: Rose Hill
Break: 3.6
Other: 9080

EPA Contract No. 68-W9-0036
EPA Work Assignment No. 18-1LA5

EPA Project Officer: Diane Kelley
EPA Remedial Project Manager: David Newton

SDMS DocID 9080

REMEDIAL INVESTIGATION FINAL REPORT

Volume IV
Appendices A-C

Rose Hill Regional Landfill Superfund Site
South Kingstown, Rhode Island

May 1994

Prepared by:

Metcalf & Eddy
An Air & Water Technologies Company

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- September/October 1991
- January/February 1992
- April 1992

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APPENDIX A
SITE RECONNAISSANCE DATA

A-1 Residential Well Inventory

A-2 Survey Data

A-1 RESIDENTIAL WELL INVENTORY

TABLE A-1. RESIDENTIAL WELL INVENTORY*

	RESIDENT'S/OWNER'S LAST NAME	FIRST NAME	LOCAL ADDRESS	HOME PHONE	PLAT	LOT	RET. FORM Y/N	ACCESS AGREE Y/P/N	WELL STATUS N/A/D/S	TOWN WATER Y/N	COMMENTS
1			BROAD ROCK ROAD		33	50	N		N	Y	
2			BROAD ROCK ROAD		33	61	Y		N	Y	
3			BROAD ROCK ROAD		33	12	Y		D	N	
4			BROAD ROCK ROAD		33	24	Y		S	Y	
5			ROSE HILL ROAD		33	43	Y		N	N	
6			BROAD ROCK ROAD		33	26	Y		D	N	
7			BROAD ROCK ROAD		33	1	Y		A	Y	
8			SAUGATUCKET ROAD		41	50	Y		D	N	
9			ROSE HILL ROAD		33	29	Y		A	Y	
10			BROAD ROCK ROAD		33	23	Y		D	N	
11	RESIDENT #8		BROAD ROCK ROAD		33	47	Y		D	N	
12			BROAD ROCK ROAD		33	58	Y		D	N	
13			ROSE HILL ROAD		25	33	Y		D	N	
14			BROAD ROCK ROAD		33	67	Y		N	Y	
15			ROSE HILL ROAD		33	42	Y		N	Y	
16			BROAD ROCK ROAD		33	60	Y		D	N	
17			BROAD ROCK ROAD		33	48	Y		N	Y	
18			BROAD ROCK ROAD		41	44	Y		D	N	
19	RESIDENT #1		ROSE HILL ROAD		33	82	Y		S	Y	
20	RESIDENT #4		ROSE HILL ROAD		33	30	Y		S	Y	
21	RESIDENT #4		ROSE HILL ROAD		33	31	Y		S	Y	
22	RESIDENT #4		ROSE HILL ROAD		33	32	Y		S	Y	
23	RESIDENT #4		ROSE HILL ROAD		33	34	Y		S	Y	
24	RESIDENT #3		ROSE HILL ROAD		33	33	Y		A	Y	
25	RESIDENT #2		ROSE HILL ROAD		33	36	Y		A	Y	
26			SAUGATUCKET ROAD		41-1	15	Y		D	Y	
27			BROAD ROCK ROAD		41	47	Y		D	N	
28			BROAD ROCK ROAD		33	49	Y		N	Y	
29			BROAD ROCK ROAD		33	13	N		A	N	
30			BROAD ROCK ROAD		41	33	Y		N	?	
31			BROAD ROCK ROAD		33	22	Y		D	N	
32	RESIDENT #7		BROAD ROCK ROAD		33	28	Y		D	N	
33			BROAD ROCK ROAD		33	9	Y		D	N	
34			BROAD ROCK ROAD		33	15	Y		D	N	
35			ROSE HILL ROAD		33	44	Y		N	Y	
36			ROSE HILL ROAD		33	45	Y		N	Y	
37			BROAD ROCK ROAD		33	16	N		A	Y	
38			ROSE HILL ROAD		33	39	Y		D	N	
39	RESIDENT #6		ROSE HILL ROAD		41-1	17	Y		D	N	
40			SAUGATUCKET ROAD		41	26	Y		D	Y	

TABLE A-1 (CONTINUED). RESIDENTIAL WELL INVENTORY*

	RESIDENT'S/OWNER'S LAST NAME	FIRST NAME	LOCAL ADDRESS	HOME PHONE	PLAT	LOT	RET. FORM Y/N	ACCESS AGREE Y/P/N	WELL STATUS N/A/D/S	TOWN WATER Y/N	COMMENTS
41			SAUGATUCKET ROAD		41	48	Y		S	N	
42			ROSE HILL ROAD		32	10	Y		D	N	
43			ROSE HILL ROAD		33	40	Y		D	Y	
44			ROSE HILL ROAD		31	12	Y		D	N	
45			BROAD ROCK ROAD		33	57	Y		D	N	
46			BROAD ROCK ROAD		33	19	Y		N	N	
47			BROAD ROCK ROAD		33	52	Y		A	Y	
48	RESIDENT #9		BROAD ROCK ROAD		33	51	Y		D	N	
49			BROAD ROCK ROAD		41	36	Y		D	N	
50			BROAD ROCK ROAD		41	37	Y		D	N	
51			BROAD ROCK ROAD		33	27	N		-	-	
52			BROAD ROCK ROAD		41	42	N		-	-	
53			BROAD ROCK ROAD		33	55	MAIL		D	N	
54			BROAD ROCK ROAD		33	56	N		D	N	
55			BROAD ROCK ROAD		33	54	Y		N	Y	
56			BROAD ROCK ROAD		33	6	Y		N	N	
57			BROAD ROCK ROAD		41	34	Y		N	N	
58			BROAD ROCK ROAD		33	53	Y		D	N	
59			BROAD ROCK ROAD		33	66	N		-	-	
60			BROAD ROCK ROAD		33	8	N		S	Y	
61			BROAD ROCK ROAD		33	63	Y		N	N	
62			BROAD ROCK ROAD		33	20	Y		D	N	
63			BROAD ROCK ROAD		41	29	Y		S	Y	
64			BROAD ROCK ROAD		41	30	Y		S	Y	
65			BROAD ROCK ROAD		41	31	Y		S	Y	
66			BROAD ROCK ROAD		41	32	Y		S	Y	
67			BROAD ROCK ROAD		33	17	Y		N	Y	
68			BROAD ROCK ROAD		33	81	Y		N	Y	
69			BROAD ROCK ROAD		25	70	Y		N	N	
70			BROAD ROCK ROAD		33	68	Y		N	Y	
71			BROAD ROCK ROAD		33	2	Y		N	N	
72			BROAD ROCK ROAD		33	3	Y		N	N	
73			BROAD ROCK ROAD		33	4	Y		N	N	
74			SAUGATUCKET ROAD		41	49	Y		N	Y	
75			BROAD ROCK ROAD		41	40			N	N	
76			BROAD ROCK ROAD		33	7	Y		D	N	
77			BROAD ROCK ROAD		41	43	Y		S	Y	
78			SAUGATUCKET ROAD		41-1	11	Y		-	-	
79			BROAD ROCK ROAD		33	64			N	N	
80			BROAD ROCK ROAD		33	14	N		N	N	

TABLE A-1 (CONTINUED). RESIDENTIAL WELL INVENTORY*

	RESIDENT'S/OWNER'S LAST NAME	FIRST NAME	LOCAL ADDRESS	HOME PHONE	PLAT	LOT	RET. FORM Y/N	ACCESS AGREE Y/P/N	WELL STATUS N/A/D/S	TOWN WATER Y/N	COMMENTS
81			BROAD ROCK ROAD		41	35	N		N	N	
82			ROSE HILL ROAD		33	46	N		N	N	
83			BROAD ROCK ROAD		41	28	Y		N	N	
84			BROAD ROCK ROAD		41	46	Y		N	Y	
85			BROAD ROCK ROAD		41	46	Y		N	Y	
86			ROSE HILL ROAD		41-1	23	Y		N	Y	
87	RESIDENT #5		ROSE HILL ROAD		41-1	18	Y		D	N	
88	RESIDENT #5		ROSE HILL ROAD		41-1	18	Y		D	N	
89			BROAD ROCK ROAD		33	65	N		N	Y	
90			ROSE HILL ROAD		33	41	Y		A	Y	
91			SAUGATUCKET ROAD		41-1	13	Y		D	N	
92			BROAD ROCK ROAD		41-4	48	Y		N	N	
93			BROAD ROCK ROAD		33	5	Y		D	N	
94			NORTH ROAD		41	45	Y		N	N	
95			SAUGATUCKET ROAD		41-1	19	Y		D	N	
96			BROAD ROCK ROAD		33	21	N		D	N	
97			BROAD ROCK ROAD		33	10	N		A	N	
98			BROAD ROCK ROAD		33	11	N		A	N	
99			SAUGATUCKET ROAD		41	25	Y		D	N	
100			SAUGATUCKET ROAD		41-1	14	Y		D	N	
101			ROSE HILL ROAD		32	12	Y		D	N	
102			BROAD ROCK ROAD		33	59	Y		D	N	

RET. FORM: Y = (YES) FORM RETURNED TO M&E AND LOGGED
N = (NO) FORM NOT RETURNED TO M7E
MAIL = AGREEMENT IS IN THE MAIL

ACCESS AGREE: Y = (YES) FULL ACCESS GRANTED
P = (PROVISIONAL) PROVISIONAL ACCESS GRANTED
N = (NO) ACCESS DENIED

WELL STATUS: N = (NONE) NO WELL ON PROPERTY
A = (ABANDONED) ABANDONED WELL ON PROPERTY
D = (DRINKING) WELL ON PROPERTY, USED FOR ALL WATER NEEDS
S = (SUPPLIMENTAL) WELL ON PROPERTY, USED FOR OTHER PURPOSES

TOWN WATER: Y = (YES) USING TOWN WATER (WELL STATUS = N, A, OR S)
N = (NO) NO TOWN WATER HOOK-UP (WELL STATUS = D)

* CERTAIN INFORMATION HAS BEEN EDITED FOR PUBLIC RELEASE

A-2 SURVEY DATA

Drawing: '90038110' Wed Jun 24 14:47:52 1992

LISTING OF CURRENTLY SET SIDESHOT, TRAVERSE, AND COORDINATE POINTS

Point		Coordinates	Elevation	Desc / Type
1	N	144657.5620	0.00	H/T
	E	492799.0170		CPNT
2	N	144631.8380	0.00	PK
	E	492959.7840		CPNT
3	N	144532.4080	0.00	DH
	E	493413.8920		CPNT
4	N	144465.6560	0.00	SPIKE
	E	493930.1120		CPNT
5	N	144589.6740	0.00	DH
	E	494464.0210		CPNT
6	N	144858.7160	0.00	PK
	E	495352.4050		CPNT
7	N	145402.2780	0.00	PK
	E	498328.6020		CPNT
8	N	145501.3000	0.00	PK
	E	499251.5830		CPNT
9	N	145714.2440	168.09	PK
	E	499790.6780		CPNT
10	N	145148.3390	155.96	PK
	E	499984.9850		CPNT
11	N	144589.5490	134.06	PK
	E	500111.5530		CPNT
12	N	144330.3700	123.98	H/T
	E	500185.6830		CPNT
13	N	143759.9570	89.55	H&T
	E	500464.4160		CPNT
14	N	143333.4640	81.43	PK
	E	500484.5220		CPNT
14	N	143333.4640	81.43	PK
	E	500484.5220		CPNT
16	N	141060.5860	76.91	AL DISK EPA #3
	E	501046.2480		CPNT
17	N	140190.7880	58.92	H&T
	E	501298.8230		CPNT
18	N	139497.0750	36.54	H&T
	E	501416.1790		CPNT
19	N	139365.4260	34.91	PK
	E	501521.7330		CPNT
20	N	138857.9640	40.63	PK
	E	501625.6150		CPNT

21	N	138969.7560	32.73	H&T
	E	502191.2570		CPNT
22	N	138933.7670	33.11	SPIKE
	E	502477.7320		CPNT
23	N	138528.5800	51.49	PK
	E	502908.3280		CPNT
24	N	138542.5070	66.73	PK
	E	503446.0810		CPNT
25	N	138821.9160	79.26	PK
	E	503691.9160		CPNT
26	N	139240.2430	75.53	DH
	E	504018.3280		CPNT
27	N	140792.1930	85.79	PK
	E	504208.2810		CPNT
28	N	141522.0870	77.57	H&T
	E	504327.9990		CPNT
29	N	142765.3100	68.41	PK
	E	504489.5580		CPNT
30	N	143830.8430	58.65	PK
	E	504632.2620		CPNT
31	N	144958.3860	61.08	PK
	E	504709.4440		CPNT
32	N	145948.3120	58.67	H&T
	E	504761.2920		CPNT
33	N	147195.5010	56.52	H&T
	E	504474.2160		CPNT
34	N	147384.1580	56.36	PK
	E	504284.6660		CPNT
35	N	147701.8010	57.32	PK
	E	503684.4140		CPNT
36	N	148367.9500	72.88	DH
	E	503128.3430		CPNT
37	N	148728.0060	0.00	PK
	E	504719.8880		CPNT
38	N	148975.2230	0.00	PK
	E	506664.0110		CPNT
39	N	149567.6520	0.00	PK
	E	509642.1420		CPNT
40	N	149782.7040	0.00	PK
	E	511333.0480		CPNT
41	N	149829.4380	0.00	DH
	E	511726.4930		CPNT
42	N	150708.1300	0.00	STATION McSPARRAN 4
	E	511671.7800		CPNT

43	N	152294.2750	0.00	McSPARRAN AZ MARK
	E	511061.8680		CPNT
50	N	142554.6850	68.83	SPIKE
	E	500949.8560		CPNT
51	N	142727.5550	66.50	SPIKE
	E	501063.0030		CPNT
52	N	143065.4560	55.35	SPIKE
	E	501510.1500		CPNT
53	N	143270.2540	57.32	H&T
	E	501830.8620		CPNT
54	N	144216.1520	72.15	H&T
	E	502387.8700		CPNT
55	N	144132.6300	72.55	H&T
	E	502779.6620		CPNT
56	N	143271.1300	75.10	SPIKE
	E	502826.7430		CPNT
57	N	142704.8180	83.92	H&T
	E	502899.2850		CPNT
57	N	142704.8180	83.92	H&T
	E	502899.2850		CPNT
58	N	141481.5900	67.25	H&T
	E	502771.6360		CPNT
58	N	141481.5900	67.25	H&T
	E	502771.6360		CPNT
59	N	140671.1920	51.96	PK
	E	502374.8060		CPNT
60	N	140516.4600	42.75	H&T
	E	501916.0480		CPNT
61	N	140493.0660	61.48	PK
	E	501553.6720		CPNT
62	N	140485.2240	62.81	AL DISK EPA #2
	E	501236.1000		CPNT
63	N	141956.8900	61.56	H&T
	E	502160.4460		CPNT
64	N	142148.1960	60.25	H&T
	E	502096.8070		CPNT
65	N	142352.7180	59.79	SPIKE
	E	502100.1670		CPNT
66	N	142306.0350	56.27	H&T
	E	501944.9070		CPNT
67	N	142209.3760	64.07	SPIKE
	E	501537.8850		CPNT
68	N	142205.1680	62.85	SPIKE
	E	501327.9410		CPNT

70	N	141104.8160	86.81	H&T
	E	501177.8290		CPNT
71	N	141675.2680	89.49	H&T
	E	501218.1110		CPNT
72	N	141479.1380	69.07	H&T
	E	503709.3490		CPNT
73	N	141455.2690	55.06	H&T
	E	503381.5050		CPNT
74	N	141434.4000	39.55	H&T
	E	503262.4720		CPNT
75	N	141402.2110	37.01	H&T
	E	503193.1320		CPNT
76	N	144126.4690	71.46	H&T
	E	503105.4060		CPNT
77	N	144130.4330	59.95	H&T
	E	503456.4470		CPNT
78	N	144063.9830	50.61	H&T
	E	503688.3420		CPNT
79	N	144002.8090	47.74	H&T
	E	503778.7530		CPNT
80	N	143961.3840	47.37	H&T
	E	503804.0450		CPNT
81	N	142681.7550	58.98	SPIKE
	E	501945.5850		CPNT
82	N	142797.2800	60.92	H&T
	E	501678.8870		CPNT
83	N	142776.0730	53.07	H&T
	E	501653.3300		CPNT
84	N	141369.4310	68.39	H&T
	E	502488.2620		CPNT
85	N	141353.4770	59.73	H&T
	E	502291.7050		CPNT
86	N	141199.6300	58.28	H&T
	E	502426.4160		CPNT
87	N	141234.9280	48.03	H&T
	E	502258.8870		CPNT
88	N	140345.7350	62.23	H&T
	E	501193.5010		CPNT
89	N	140184.4830	44.42	H&T
	E	501577.2840		CPNT
90	N	139971.1870	38.36	H&T
	E	501722.0170		CPNT
91	N	139932.7290	35.57	H&T
	E	501825.2740		CPNT

92	N	139865.3950	41.88	H&T
	E	501913.5200		CPNT
93	N	139808.4040	41.37	H&T
	E	502047.3780		CPNT
94	N	139824.1250	30.57	H&T
	E	502132.5390		CPNT
95	N	139795.6830	29.68	H&T
	E	502209.3090		CPNT
96	N	138789.8780	29.98	H&T
	E	502329.4300		CPNT
97	N	139167.3660	37.27	H&T
	E	502489.1290		CPNT
100	N	144567.3510	0.00	CHURCH STEPLE
	E	492872.0690		CPNT
101	N	144864.3800	0.00	STATION KINGSTON
	E	494415.8100		CPNT
102	N	140471.4670	63.94	AL DISK EPA #1
	E	501565.2800		CPNT
200	N	143949.8390	49.05	SW/SD-02
	E	503821.1640		CPNT
201	N	143964.6180	49.70	SG-01
	E	503822.6380		CPNT
203	N	143814.0690	63.57	BM#1 ON SQ CUT
	E	502688.4220		CPNT
204	N	140624.7170	45.39	S-2C/S-2B 7+50
	E	502048.1710		CPNT
205	N	140639.9220	41.30	H&T
	E	502438.8650		CPNT
206	N	140650.9520	46.45	S-7 3+00
	E	502782.0230		CPNT
207	N	140597.0490	64.19	S-2C/S-2B 0+00
	E	501300.4410		CPNT
208	N	141659.9120	58.62	EM-7 0+00
	E	502301.2750		CPNT
209	N	141610.2920	60.83	BULK WASTE 5+00
	E	502407.4810		CPNT
210	N	141718.0070	62.29	BULK WASTE 6+300
	E	502704.3320		CPNT
211	N	141117.7190	49.10	BULK WASTE 0+200
	E	502619.8330		CPNT
212	N	141118.3760	44.47	EM-14 2+75
	E	502624.2540		CPNT
213	N	141217.5870	51.03	H&T
	E	502758.3380		CPNT

214	N	141444.7210	50.83	EM12 0+00/EM13 4+72
	E	502960.1820		CPNT
215	N	141725.5220	57.16	BULK WASTE 7+600
	E	503004.1720		CPNT
216	N	141525.6290	50.70	BULK WASTE 4+600
	E	503008.9620		CPNT
217	N	141967.6760	59.41	SEWAGE SLUDGE 0+00
	E	503084.9540		CPNT
219	N	141973.7620	58.37	S-4&S-6
	E	503126.5700		CPNT
220	N	141796.4780	54.62	S-6 0+00
	E	503107.3260		CPNT
221	N	141939.2230	68.07	EM-8 0+00
	E	502708.5440		CPNT
222	N	141961.8230	68.82	SEWAGE SLUDGE 0+400
	E	502685.7650		CPNT
223	N	141114.1450	63.97	BULK WASTE 0+00
	E	502421.4400		CPNT
224	N	141116.2660	60.41	H&T
	E	502451.0760		CPNT
225	N	141111.6950	56.86	EM-14 0+00
	E	502348.8810		CPNT
226	N	141062.3290	40.72	LE-02
	E	502761.5040		CPNT
227	N	139414.3540	34.25	EM-15 0+00
	E	502573.8040		CPNT
228	N	138773.0520	30.17	SG-06
	E	502323.0240		CPNT
229	N	138781.4090	29.84	SW/SD-08
	E	502306.6830		CPNT
230	N	139503.2160	35.85	SG-04
	E	501473.1030		CPNT
231	N	140339.7290	47.66	SW/SD-10
	E	501133.5070		CPNT
232	N	140312.4900	44.95	SG-12
	E	501135.2570		CPNT
233	N	140357.4120	59.76	LFGR-19
	E	501217.1710		CPNT
234	N	140355.9960	59.90	EM-1 0+00
	E	501217.4860		CPNT
235	N	140389.0930	58.73	EM-2 0+00
	E	501257.9880		CPNT
236	N	140504.1950	62.59	LFGT-1
	E	501283.8980		CPNT

237	N	140598.4570	64.70	SOLID WASTE 0+400
	E	501350.6460		CPNT
238	N	140719.7520	73.32	OW-25
	E	501419.6870		CPNT
239	N	140672.5470	65.87	WL-B1
	E	501475.0720		CPNT
240	N	140682.5160	66.21	WL-B2
	E	501461.7190		CPNT
241	N	140683.1530	66.11	WL-B3
	E	501431.9390		CPNT
242	N	140661.9170	66.14	WL-B4
	E	501364.6700		CPNT
243	N	140646.0900	65.58	WL-B5
	E	501326.2250		CPNT
244	N	140637.5450	65.71	WL-B6
	E	501342.0020		CPNT
245	N	140632.9220	65.57	WL-B7
	E	501382.6860		CPNT
246	N	140649.0050	66.11	WL-B8
	E	501429.2260		CPNT
247	N	140655.1580	65.69	WL-B9
	E	501478.7440		CPNT
248	N	140663.0550	65.97	WL-B10
	E	501495.5820		CPNT
249	N	140013.0970	33.52	H&T
	E	501968.3750		CPNT
250	N	139806.3130	32.46	SG-07
	E	502218.3350		CPNT
251	N	139663.3510	31.98	SW/SD-06
	E	502239.2200		CPNT
252	N	140341.2970	36.77	SW/SD-07
	E	501987.5200		CPNT
253	N	141449.7650	64.56	EM-25 4+00
	E	503586.6180		CPNT
254	N	141605.0290	52.02	H&T
	E	503415.2680		CPNT
255	N	141648.1830	40.97	H&T
	E	503374.8020		CPNT
256	N	141710.6930	41.46	H&T
	E	503404.9020		CPNT
257	N	141849.3400	41.03	SW/SD-03
	E	503441.0150		CPNT
258	N	141760.8210	42.85	LE-06
	E	503355.9230		CPNT

259	N	141350.1450	36.50	SW/SD-04
	E	503108.2440		CPNT
260	N	141375.9260	35.34	SG-05
	E	503111.1800		CPNT
261	N	141395.6770	36.58	LE-04
	E	503102.1220		CPNT
262	N	141425.5440	41.40	LE-03
	E	503089.9580		CPNT
263	N	141415.8180	50.65	H&T
	E	502934.3710		CPNT
264	N	141134.7750	44.44	H&T
	E	502760.1990		CPNT
265	N	141140.9110	36.00	SW/SD-05
	E	503021.7440		CPNT
266	N	141331.3480	41.00	LE-05
	E	502971.8540		CPNT
267	N	141359.4990	44.05	SW/SD-09
	E	502219.5090		CPNT
268	N	141383.5800	45.00	S-1 EM-5B 7+60
	E	502019.0640		CPNT
269	N	141211.7030	44.12	SG-03
	E	502194.3810		CPNT
270	N	142939.2050	69.36	S-5 0+00
	E	502727.7790		CPNT
271	N	143262.5760	74.44	EM-9 0+00
	E	502799.0630		CPNT
272	N	143263.4840	73.13	SEWAGE SLUDGE 13+300
	E	502766.9670		CPNT
273	N	143267.2830	70.53	SEWAGE SLUDGE 13+00
	E	503066.0360		CPNT
274	N	143312.6870	61.45	EM-9 4+00
	E	503195.8040		CPNT
275	N	140610.6840	74.42	SOLID WASTE 0+100
	E	501648.6330		CPNT
276	N	141710.5780	65.10	SOLID WASTE 11+00
	E	501708.0170		CPNT
277	N	141914.0580	58.03	S-4 0+00
	E	501786.8260		CPNT
278	N	142089.7070	65.26	EM-3 6+00
	E	501504.2890		CPNT
279	N	142084.4450	73.47	SOLID WASTE 15+700
	E	500992.6760		CPNT
280	N	142105.9880	71.86	EM-3 0+00
	E	500904.8400		CPNT

281	N	141486.2140	75.98	SOLID WASTE 6+696
	E	501022.2960		CPNT
282	N	141999.9210	73.83	OW-27(PVC)
	E	501055.8700		CPNT
283	N	141903.4500	57.22	OW-30 (PVC)
	E	501725.7020		CPNT
284	N	141327.8610	61.40	S-3 0+00
	E	501677.4230		CPNT
285	N	141922.3010	55.31	EM-5A/S-1 13+00
	E	501986.8810		CPNT
286	N	142155.4470	53.73	SW/SD-15
	E	501966.3830		CPNT
287	N	142789.6570	55.08	SG-02
	E	501638.2150		CPNT
288	N	142816.4300	56.04	SW/SD-01
	E	501615.5660		CPNT
289	N	142283.4570	52.73	SG-08
	E	501970.0860		CPNT
290	N	142322.8400	53.52	SW/SD-14
	E	501513.4870		CPNT
291	N	142204.9610	65.94	LFGF-7
	E	501549.6770		CPNT
292	N	142250.9170	61.30	LE-01
	E	501305.9610		CPNT
293	N	142204.4100	63.73	PK
	E	501203.6120		CPNT
294	N	142274.3380	59.82	SG-09
	E	501155.8730		CPNT
295	N	142183.4850	65.53	LFGF-4
	E	501153.8950		CPNT
296	N	142149.7810	71.37	LFGF-1
	E	500850.2390		CPNT
297	N	142132.0460	74.16	SG-10
	E	500691.6270		CPNT
298	N	142090.3340	74.68	SW/SD-13
	E	500630.3530		CPNT
299	N	142002.9340	70.77	LFGR-2
	E	500809.2620		CPNT
300	N	141130.4550	76.33	LFGR-11
	E	501028.0220		CPNT
301	N	140527.5710	64.49	LFGT-3
	E	501483.2330		CPNT
302	N	140543.7080	53.7	LFGT-5
	E	501681.5530		CPNT

303	N	142594.3740	67.67	MW-II (PVC)
	E	503172.4850		CPNT
304	N	142247.2440	56.37	MW-III (PVC)
	E	503270.7270		CPNT
305	N	141942.5610	58.45	MW-IV (PVC)
	E	503146.8370		CPNT
306	N	141927.2150	67.24	MW-V (PVC)
	E	502829.9640		CPNT
307	N	143149.1760	59.33	MW-I (PVC)
	E	503229.0560		CPNT
308	N	141529.5650	53.28	H&T
	E	502969.3930		CPNT
309	N	141402.2410	38.18	OW-A (PVC)
	E	503056.7340		CPNT
310	N	142385.2640	62.80	MW-13-01 (PVC)
	E	501358.0040		CPNT
311	N	142388.5520	62.99	MW-13-02 (PVC)
	E	501367.0550		CPNT
952	N	140018.9630	33.43	SG-11
	E	501971.8100		CPNT
953	N	140008.0110	36.34	SW/SD-12
	E	501981.4970		CPNT
407	N	142445.2474	53.02	WL-D5
	E	502015.8264		CPNT
406	N	142401.0080	52.40	WL-D4
	E	502022.2981		CPNT
400	N	142362.9442	53.31	PK
	E	502016.3131		CPNT
399	N	142366.0617	53.58	WL-D3
	E	502016.5291		CPNT
398	N	142338.3665	55.27	WL-D2
	E	502011.1695		CPNT
397	N	142332.3848	55.61	WL-D1
	E	501982.0417		CPNT
396	N	142389.9593	51.36	WL-A39
	E	501856.2264		CPNT
395	N	142348.1725	50.71	WL-A41
	E	501911.3616		CPNT
394	N	142349.9950	50.75	WL-A88
	E	501945.6785		CPNT
393	N	142377.7320	50.60	WL-A86
	E	501924.2820		CPNT
392	N	142404.1781	50.74	WL-A84
	E	501888.2247		CPNT

391	N	142395.4154	49.86	PK
	E	501884.2812		CPNT
390	N	142392.2383	52.71	WL-A37
	E	501803.9939		CPNT
389	N	142409.7409	50.46	WL-A82
	E	501817.5912		CPNT
388	N	142433.8289	50.26	WL-A80
	E	501791.7880		CPNT
387	N	142412.4773	52.47	PK
	E	501755.3059		CPNT
386	N	142477.7114	52.96	WL-A78
	E	501766.6133		CPNT
385	N	142410.6857	52.49	WL-A35
	E	501760.6717		CPNT
384	N	142473.9139	53.06	WL-A76
	E	501736.3643		CPNT
383	N	142462.2350	52.67	WL-A74
	E	501721.6020		CPNT
382	N	142319.1378	53.09	WL-A25
	E	501531.0073		CPNT
381	N	142343.4970	51.20	WL-A27
	E	501531.8018		CPNT
380	N	142379.3466	54.07	WL-A29
	E	501620.3076		CPNT
379	N	142398.8314	55.53	WL-A31
	E	501659.9517		CPNT
378	N	142434.5853	53.12	WL-A33
	E	501699.6473		CPNT
377	N	142455.3239	50.87	PK
	E	501718.3401		CPNT
376	N	142447.3179	53.08	WL-A72
	E	501684.7431		CPNT
375	N	142414.7020	53.13	WL-A70
	E	501652.8597		CPNT
374	N	142407.3278	54.19	WL-A68
	E	501613.4636		CPNT
373	N	142369.5576	54.25	WL-A66
	E	501539.1281		CPNT
372	N	142378.2676	58.36	WL-A64
	E	501503.1699		CPNT
371	N	142345.1343	55.35	WL-A62
	E	501505.7127		CPNT
370	N	142328.0304	59.44	WL-A60
	E	501438.5863		CPNT

369	N	142320.7725	60.77	PK
	E	501501.1321		CPNT
368	N	142223.6362	58.23	WL-A23
	E	501461.3972		CPNT
367	N	142219.5882	58.88	WL-A21
	E	501390.4266		CPNT
366	N	142282.6486	55.45	PK
	E	501446.8714		CPNT
365	N	142324.4021	58.91	WL-A58
	E	501389.3205		CPNT
364	N	142392.9011	57.27	WL-A50
	E	501249.2254		CPNT
363	N	142418.5220	60.32	WL-A48
	E	501241.2957		CPNT
362	N	142466.7768	60.57	WL-A46
	E	501168.6776		CPNT
361	N	142444.6029	60.72	WL-A44
	E	501208.7549		CPNT
360	N	142413.5249	59.38	WL-A42
	E	501219.1025		CPNT
359	N	142387.9521	59.81	WL-A40
	E	501217.7282		CPNT
358	N	142386.7922	60.90	PK
	E	501193.7894		CPNT
357	N	142341.3219	57.75	WL-A38
	E	501230.6623		CPNT
356	N	142334.2208	58.37	WL-A36
	E	501181.9772		CPNT
355	N	142359.1781	58.21	WL-A52
	E	501266.2873		CPNT
354	N	142349.2479	57.69	WL-A54
	E	501279.4296		CPNT
353	N	142330.7107	60.30	WL-A56
	E	501334.2625		CPNT
352	N	142256.3780	56.93	PK
	E	501294.3122		CPNT
351	N	142234.5870	60.84	WL-A19
	E	501310.6142		CPNT
350	N	142250.9753	60.54	WL-A17
	E	501234.8859		CPNT
349	N	142271.1658	58.88	WL-A15
	E	501214.6118		CPNT
348	N	142274.6388	59.15	WL-A13
	E	501189.4177		CPNT

347	N	142419.6429	63.44	WL-A28
	E	501029.8931		CPNT
346	N	142424.8674	60.79	WL-A26
	E	500999.5331		CPNT
345	N	142388.1815	61.46	WL-A24
	E	500962.9719		CPNT
344	N	142381.9526	60.77	WL-A22
	E	500973.7667		CPNT
343	N	142373.2528	59.91	WL-A20
	E	501000.0719		CPNT
342	N	142365.1174	61.85	WL-A18
	E	500958.7067		CPNT
341	N	142341.4793	62.84	WL-A16
	E	500960.8747		CPNT
340	N	142347.7809	59.98	WL-A14
	E	501020.1583		CPNT
339	N	142235.5934	60.84	WL-A1
	E	500983.2571		CPNT
338	N	142238.3684	59.58	WL-A3
	E	501030.4639		CPNT
337	N	142244.1317	59.51	WL-A5
	E	501054.7622		CPNT
336	N	142232.8390	59.35	WL-A7
	E	501072.8335		CPNT
335	N	142252.6133	59.65	WL-A9
	E	501104.5926		CPNT
334	N	142264.5632	59.36	WL-A11
	E	501143.0944		CPNT
333	N	142316.5981	57.44	PK
	E	501189.9835		CPNT
332	N	142310.4281	57.90	WL-A34
	E	501164.8122		CPNT
331	N	142310.6251	60.33	WL-A32
	E	501098.3085		CPNT
330	N	142344.2818	58.42	WL-A30
	E	501066.9001		CPNT
329	N	142378.2822	58.59	PK
	E	501027.5776		CPNT
328	N	142337.7648	59.85	WL-A12
	E	501041.9046		CPNT
327	N	142301.2110	59.09	WL-A10
	E	501053.4303		CPNT
326	N	142282.7623	59.50	WL-A8
	E	501052.5242		CPNT

325	N	142268.3254	59.57	WL-A6
	E	501035.7163		CPNT
324	N	142252.0699	60.25	WL-A4
	E	501021.6484		CPNT
323	N	142244.5743	60.22	WL-A2
	E	500995.6548		CPNT
322	N	142264.5807	62.71	ORANGE POST
	E	501051.0564		CPNT
321	N	142277.7538	57.28	PK
	E	501079.7206		CPNT
320	N	142195.5560	66.57	PK
	E	501054.8891		CPNT
69	N	142172.9870	71.72	PK
	E	500802.7220		CPNT
15	N	142464.9904	71.81	PK
	E	500732.9664		CPNT
408	N	142483.0339		WL-D6
	E	501991.6508		CPNT
493	N	140799.2642	36.58	"PK"
	E	501867.5578		CPNT
498	N	140652.4171	63.14	"PK"
	E	501905.3084		CPNT
493	N	140799.2642	36.58	"PK"
	E	501867.5578		CPNT
496	N	140685.7870	46.66	"WL-A154"
	E	501901.1591		CPNT
493	N	140799.2642	36.58	"PK"
	E	501867.5578		CPNT
497	N	140656.8177	51.47	"WL-A109"
	E	501911.3888		CPNT
498	N	140652.4171	63.14	"PK"
	E	501905.3084		CPNT
499	N	140646.1347	62.29	"WL-A156"
	E	501922.6225		CPNT
498	N	140652.4171	63.14	"PK"
	E	501905.3084		CPNT
500	N	140614.3309	72.02	"WL-A111"
	E	501910.4830		CPNT
498	N	140652.4171	63.14	"PK"
	E	501905.3084		CPNT
501	N	140591.8260	68.48	"WL-A158"
	E	501927.7818		CPNT
498	N	140652.4171	63.14	"PK"
	E	501905.3084		CPNT

502	N	140558.8646	71.22	"WL-A160"
	E	501927.7308		CPNT
498	N	140652.4171	63.14	"PK"
	E	501905.3084		CPNT
503	N	140558.7554	81.95	"WL-A113"
	E	501912.7746		CPNT
498	N	140652.4171	63.14	"PK"
	E	501905.3084		CPNT
482	N	140950.8044	39.33	PK
	E	501936.9062		CPNT
486	N	140929.4472	38.34	WL-A148
	E	501937.0506		CPNT
487	N	140862.7984	38.17	WL-A150
	E	501912.1647		CPNT
488	N	140838.6188	35.54	WL-A105
	E	501866.6382		CPNT
489	N	140887.8698	38.89	WL-A103
	E	501863.1700		CPNT
490	N	140928.2007	42.00	WL-A101
	E	501851.9153		CPNT
491	N	140967.5471	42.38	WL-A99
	E	501858.6791		CPNT
492	N	140972.5961	42.51	WL-A97
	E	501894.9294		CPNT
493	N	140851.9193	36.58	PK
	E	501897.4135		CPNT
494	N	140794.6913	37.61	WL-A107
	E	501864.0398		CPNT
495	N	140771.9410	36.97	WL-A152
	E	501879.7509		CPNT
496	N	140799.2642	37.84	PK
	E	501867.5578		CPNT
428	N	141859.0141	46.29	WL-A108
	E	501955.4941		CPNT
430	N	141836.2117	46.65	WL-A110
	E	501983.6507		CPNT
431	N	141820.0881	45.10	PK
	E	501990.5366		CPNT
432	N	141777.6525	47.21	WL-A63
	E	501995.1343		CPNT
434	N	141767.3814	47.68	WL-A112
	E	502024.7322		CPNT
435	N	141746.5678	48.28	WL-A114
	E	502036.7678		CPNT

436	N	141727.0888	49.87	PK
	E	501994.2449		CPNT
437	N	141727.2187	44.30	WL-A116
	E	502045.8402		CPNT
438	N	141713.3432	41.23	WL-A65
	E	502046.2435		CPNT
439	N	141712.1166	41.28	WL-A118
	E	502069.8629		CPNT
440	N	141686.7350	43.62	WL-A120
	E	502095.3965		CPNT
441	N	141666.1445	45.35	WL-A67
	E	502083.9483		CPNT
442	N	141648.5783	48.40	PK
	E	502098.8435		CPNT
443	N	141659.3953	49.65	WL-A122
	E	502112.4913		CPNT
444	N	141621.9360	46.64	WL-A124
	E	502129.2190		CPNT
445	N	141616.0616	46.18	WL-A69
	E	502099.6872		CPNT
446	N	141600.4376	43.73	WL-A126
	E	502140.2675		CPNT
447	N	141563.1922	42.23	PK
	E	502163.8769		CPNT
448	N	141569.6573	43.90	WL-A71
	E	502147.4618		CPNT
449	N	141567.4220	44.10	WL-A128
	E	502174.9373		CPNT
450	N	141511.7723	41.89	WL-A128
	E	502185.3791		CPNT
451	N	141514.6279	41.76	PK
	E	502182.7780		CPNT
452	N	141508.0430	41.95	WL-A73
	E	502174.2148		CPNT
453	N	141453.2331	40.75	WL-A130
	E	502159.5435		CPNT
454	N	141420.7401	42.74	PK
	E	502143.6589		CPNT
455	N	141469.8725	41.72	WL-A75
	E	502142.4677		CPNT
456	N	141422.7000	40.60	WL-A132
	E	502176.1967		CPNT
457	N	141412.2722	42.57	WL-A77
	E	502150.2332		CPNT

458	N	141343.2899	42.49	WL-A79
	E	502180.1147		CPNT
459	N	141297.3772	44.01	PK
	E	502158.3380		CPNT
460	N	141389.1642	42.20	WL-A134
	E	502197.1488		CPNT
461	N	141331.1204	44.56	WL-A134
	E	502232.9763		CPNT
462	N	141209.0810	43.20	WL-A136
	E	502206.2038		CPNT
463	N	141123.7677	40.81	WL-A138
	E	502205.4264		CPNT
464	N	141134.6378	40.98	WL-A85
	E	502193.5255		CPNT
465	N	141215.7710	43.82	WL-A83
	E	502158.2620		CPNT
466	N	141248.6420	42.29	WL-A81
	E	502157.0422		CPNT
467	N	141248.0893	42.99	WL-C6
	E	502118.3315		CPNT
468	N	141276.9503	42.41	WL-C1
	E	502121.0602		CPNT
469	N	141289.5502	42.52	WL-C2
	E	502113.4618		CPNT
470	N	141277.0538	42.10	WL-C3
	E	502098.7192		CPNT
471	N	141250.8701	44.50	WL-C4
	E	502087.7193		CPNT
472	N	141229.3843	42.68	WL-C5
	E	502113.6856		CPNT
473	N	141144.7583	42.43	PK
	E	502120.1087		CPNT
474	N	141122.5475	41.81	WL-A87
	E	502146.8742		CPNT
475	N	141013.0307	41.30	WL-A81
	E	502077.5965		CPNT
476	N	141047.4381	41.00	WL-A89
	E	502122.6058		CPNT
478	N	141005.7322	40.59	WL-A140
	E	502105.9625		CPNT
479	N	140993.5673	41.04	PK
	E	502072.9450		CPNT
480	N	140960.4183	42.20	WL-A142
	E	502099.5642		CPNT

481	N	140962.1745	43.09	WL-A95
	E	501965.6044		CPNT
483	N	140943.5696	39.01	WL-A93
	E	502037.3791		CPNT
484	N	140932.0341	40.64	WL-A144
	E	502075.2708		CPNT
485	N	140928.1715	39.37	WL-A146
	E	501975.5003		CPNT
403	N	142233.9342	51.16	WL-A92
	E	501979.8713		CPNT
404	N	142229.2616	50.74	WL-A45
	E	501931.9124		CPNT
405	N	142219.9386	50.42	PK
	E	501946.1921		CPNT
409	N	142161.6381	50.58	WL-A94
	E	501979.0284		CPNT
410	N	142152.7036	52.67	PK
	E	501929.4117		CPNT
411	N	142187.6910	54.35	WL-A47
	E	501943.0080		CPNT
412	N	142138.4524	51.16	WL-A49
	E	501935.6989		CPNT
413	N	142079.5392	48.80	PK
	E	501905.9828		CPNT
414	N	142090.0366	49.68	WL-A51
	E	501930.3184		CPNT
415	N	142065.3361	49.78	WL-A100
	E	501926.9044		CPNT
416	N	142090.3670	48.92	WL-A98
	E	501958.5461		CPNT
417	N	142124.9970	50.80	WL-A96
	E	501976.8642		CPNT
418	N	142065.1541	48.84	WL-A53
	E	501896.2515		CPNT
419	N	142033.9124	50.20	WL-A55
	E	501880.4188		CPNT
420	N	141996.4263	50.93	WL-A57
	E	501862.1848		CPNT
421	N	141975.1951	46.81	PK
	E	501884.6422		CPNT
422	N	142030.7320	49.88	WL-A102
	E	501916.0172		CPNT
423	N	141915.1532	48.03	WL-A59
	E	501906.3234		CPNT

424	N	141875.9641	46.24	PK
	E	501929.7044		CPNT
425	N	141970.8980	48.82	WL-A104
	E	501896.7767		CPNT
427	N	141907.1683	48.96	WL-A106
	E	501926.6232		CPNT
429	N	141837.9293	48.55	WL-A61
	E	501940.6229		CPNT
401	N	142271.6797	50.89	WL-A43
	E	501946.1982		CPNT
402	N	142275.3338	50.63	WL-A90
	E	501977.4321		CPNT
960	N	140516.4600	81.52	"H&T"
	E	501916.0480		CPNT
600	N	143312.2430	64.89	Radial instr Station
	E	504560.4150		CPNT
601	N	143320.4950	66.19	MAC DONALD WELL
	E	504519.4890		CPNT
602	N	141231.9110	83.15	Radial instr Station
	E	504261.1090		CPNT
603	N	141272.6540	80.54	COX WELL
	E	504107.5150		CPNT
604	N	141507.9660	53.68	Radial instr Station
	E	503392.6370		CPNT
605	N	141797.9190	58.96	MW-09-01
	E	503548.1720		CPNT
606	N	140105.6660	43.44	Radial instr Station
	E	502895.0350		CPNT
607	N	140125.1370	40.42	MW-10-01
	E	502936.5210		CPNT
608	N	140177.6980	44.46	Radial instr Station
	E	503037.4620		CPNT
609	N	140299.7460	64.30	GRISWOLD WELL
	E	503308.5250		CPNT
610	N	139353.2640	40.47	KEEFE WELL
	E	501591.0530		CPNT
611	N	139691.5950	38.13	Radial instr Station
	E	501400.7830		CPNT
612	N	139858.6270	45.21	TIMPSON WELL
	E	500908.6950		CPNT
613	N	140536.4360	65.29	MW-14-01/BH-07
	E	501482.0230		CPNT
614	N	140543.6470	67.49	Radial instr Station
	E	501155.1110		CPNT

615	N	140559.2250	46.36	MW-08-02
	E	501063.8550		CPNT
616	N	140542.5110	46.31	MW-08-01
	E	501073.4720		CPNT
617	N	140515.7140	42.21	MW-11-01
	E	501977.6120		CPNT
618	N	140508.0490	41.31	MW-11-02
	E	501954.0320		CPNT
619	N	140499.6500	40.37	MW-11-03
	E	501941.6170		CPNT
620	N	140842.9340	42.12	MW-06-02
	E	502044.0460		CPNT
621	N	140835.6340	42.54	MW-06-01
	E	502035.4380		CPNT
622	N	140651.3140	46.30	Radial instr Station
	E	502785.1250		CPNT
623	N	140377.3380	38.55	Radial instr Station
	E	502791.3230		CPNT
624	N	140370.8230	38.51	MW-05-01
	E	502800.5160		CPNT
625	N	140357.1660	38.60	MW-05-02
	E	502795.2260		CPNT
626	N	141512.6970	73.29	MW-07-01
	E	500933.3700		CPNT
627	N	141526.2240	73.35	MW-07-02
	E	500929.2670		CPNT
628	N	142204.1720	67.02	GAGNE WELL
	E	500946.4860		CPNT
629	N	142254.5680	55.05	J. FRISELLA WELL
	E	501901.7500		CPNT
630	N	142257.9650	60.33	Radial instr Station
	E	502089.0800		CPNT
631	N	142258.9590	65.35	E. FRISELLA WELL
	E	502207.1010		CPNT
632	N	142626.9340	71.61	E. FRISELLA JR WELL
	E	500882.8720		CPNT
633	N	143190.7760	54.44	MW-01-01
	E	501643.9920		CPNT
634	N	143203.6110	54.89	MW-01-02
	E	501643.9770		CPNT
635	N	143290.3470	65.53	BH 05
	E	502599.1230		CPNT
636	N	142763.6700	69.10	MW-02-01
	E	503052.3950		CPNT

637	N	142766.7080	68.18	MW-02-02
	E	503067.9140		CPNT
638	N	142776.2980	68.31	BH-03
	E	503060.7350		CPNT
639	N	142465.3460	71.78	BH-04
	E	502964.9330		CPNT
640	N	142076.4680	66.32	BH-01
	E	502984.5900		CPNT
641	N	142265.8990	68.95	BH-02
	E	502787.3940		CPNT
642	N	141414.5160	68.49	SP-07
	E	502512.6380		CPNT
643	N	141416.9440	68.17	BH-12
	E	502612.3640		CPNT
644	N	141417.5150	66.79	SP-08
	E	502712.5060		CPNT
645	N	141620.4020	67.06	SP-09
	E	502808.0510		CPNT
646	N	141550.8720	53.00	BH-06
	E	502977.6260		CPNT
647	N	141204.6560	49.93	Radial instr Station
	E	502764.0120		CPNT
648	N	141082.5930	41.81	MW-03-03
	E	502739.9600		CPNT
649	N	141076.4080	36.42	MW-03-01
	E	502767.5680		CPNT
650	N	141077.2470	36.21	MW-03-02
	E	502779.7450		CPNT
651	N	141432.1180	40.83	MW-12-02
	E	503051.7200		CPNT
652	N	141419.8450	39.75	MW-12-01
	E	503060.1350		CPNT
653	N	141295.7410	87.05	BH-09
	E	501223.5410		CPNT
654	N	141194.9050	86.58	SP-04
	E	501226.9680		CPNT
655	N	140898.2930	81.02	SP-01
	E	501339.6390		CPNT
656	N	140905.9080	73.91	SP-02
	E	501539.8310		CPNT
657	N	141004.3780	74.61	BH-08
	E	501531.3040		CPNT
658	N	141304.0130	79.18	SP-03
	E	501522.4640		CPNT

659	N	141601.0980	83.26	BH-10
	E	501413.6420		CPNT
660	N	141795.2710	83.48	SP-06
	E	501304.9790		CPNT
661	N	141798.3880	86.60	BH-11
	E	501209.5060		CPNT
662	N	141692.1680	87.96	SP-05
	E	501111.9210		CPNT
663	N	141623.3230	49.45	Radial instr Station
	E	501994.9870		CPNT
664	N	141516.1140	45.08	MW-04-01
	E	502009.9430		CPNT
665	N	141501.6860	44.87	MW-04-02
	E	502009.3470		CPNT
666	N	141485.2210	45.43	MW-04-03
	E	502004.4640		CPNT
700	N	138957.7610	31.61	Radial instr Station
	E	502324.3940		CPNT
701	N	139002.5000	30.75	SW/SD-11
	E	502347.0800		CPNT
702	N	143358.1080	63.83	SS02
	E	501612.8610		CPNT
703	N	141694.4710	88.24	SS05
	E	501210.5680		CPNT
704	N	141907.6290	63.79	SS03
	E	501543.3190		CPNT
705	N	142113.1770	63.11	SS08
	E	501616.2480		CPNT
706	N	141110.2790	57.66	SS04
	E	501731.6760		CPNT
707	N	141120.4350	49.42	SS13
	E	501765.7330		CPNT
708	N	141397.6130	78.51	SS07
	E	500951.8980		CPNT
709	N	141438.7180	58.10	SS10
	E	502475.4790		CPNT
710	N	141620.8610	56.33	SS09
	E	502905.3070		CPNT
711	N	143312.7820	68.72	SS01
	E	502569.3530		CPNT
712	N	143002.5630	69.43	SS11
	E	503106.3210		CPNT
713	N	142131.1200	65.39	SS12
	E	502913.9700		CPNT

714	N	140482.1600	64.18	Radial instr Station
	E	501480.3260		CPNT
715	N	140367.0850	50.58	SS06
	E	501480.3970		CPNT
1000	N	144086.3640	52.31	SS-14
	E	503675.2860		CPNT
1001	N	141255.0990	87.18	SS-16
	E	501242.5820		CPNT
1002	N	140723.9460	81.20	SS-17
	E	501292.7250		CPNT
1003	N	141696.9390	49.96	SS-21
	E	501873.5100		CPNT
1004	N	141268.4850	43.37	SS-20
	E	502142.8370		CPNT
1005	N	141377.4600	65.95	SS-24
	E	502715.3050		CPNT
1006	N	142581.5730	68.83	SS-15
	E	503003.2890		CPNT
1007	N	141306.1050	35.36	SS-22
	E	502985.2940		CPNT
1008	N	141445.4940	34.73	SS-23
	E	503133.0050		CPNT
1009	N	141395.7320	36.52	SW-16
	E	503098.3450		CPNT
1010	N	141104.8010	43.53	SS-19
	E	502100.0560		CPNT
1011	N	142246.9050	62.73	SS-18
	E	501175.7710		CPNT
1012	N	140497.4330	37.45	SW-21
	E	501917.5970		CPNT
1013	N	139499.0250	34.69	SW-20
	E	501460.5620		CPNT
1014	N	138904.5170	31.27	SW-18
	E	502402.2580		CPNT
1015	N	138802.8220	37.76	Radial instr Station
	E	501185.1200		CPNT
1016	N	138393.2900	42.01	Radial instr Station
	E	501158.0490		CPNT
1017	N	138071.9110	31.01	SW-19
	E	501204.5690		CPNT
1018	N	141345.5680	66.28	WEBSTER'S WELL
	E	503532.1870		CPNT
1019	N	141345.9120	64.30	Ground
	E	503532.1790		CPNT

Drawing: '90038110' Wed Jun 24 15:12:08 1992

LISTING OF CURRENTLY SET SIDESHOT, TRAVERSE, AND COORDINATE POINTS

Point		Coordinates	Elevation	Desc / Type
1020	N	148368.6320	70.24	SW-17
	E	503275.9800		CPNT
2003	N	140394.9690	33.96	SW/SD-18
	E	503010.3440		CPNT
2002	N	140371.3130	38.73	Radial instr Station
	E	502791.3080		CPNT
2001	N	140638.2210	35.50	SW/SD-17
	E	502915.5430		CPNT
2000	N	140667.6530	39.04	SW/SD-16

ROSEHILL LANDFILL
SETTLEMENT PLATFORM OBSERVATIONS
DTC PROJECT NUMBER - 90-038-110

ELEVATIONS AT TOP OF PIPE

DATE	1	2	3	4	5	6	7	8	9
9/18/91	82.26	75.48	80.99	88.26	89.75	85.47	70.38	68.23	68.53
4/15/92	82.12	75.34	80.92	88.19	89.67	85.42	70.32	68.19	68.47

Appendix B

APPENDIX B
GEOLOGIC AND HYDROGEOLOGIC DATA

B-1 Geologic Logs

B-2 Monitoring Well Installation Logs

B-3 Well Development Logs

B-4 Surface Water Budget Analysis

B-5 Slug Test and Streambed Hydraulic Conductivity Calculations

B-6 Final Geophysical Survey Results

B-7 Test Boring and Permeability Test Points - 07/22/91-09/04/91

B-1 GEOLOGIC LOGS

GEOLOGIC LOG GRAPHIC SYMBOLS

Well Graphic Log

Concrete Surface Seal

Concrete and Bentonite Slurry Grout

Bentonite Seal

Sand Pack; above well screen

Sand Pack; around well screen

Bentonite Plug

Strata Graphic Log

Topsoil

Fill

Sewage Sludge/Refuse

Glacio-fluvial Outwash

Glacial Lacustrine

Ablation Till

Boulders

Biotite Gneiss

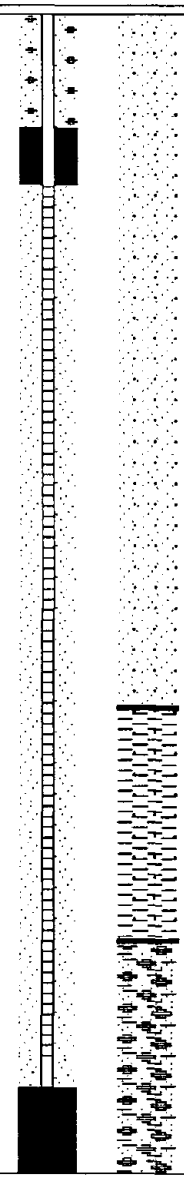
Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 3	*BORING NO.* **MW-01-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 143190.78 E: 501643.99	*Ground Elevation:* 54.4	*Total Depth* 53.4
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 7/22/91	
DRILL RIG: Jaswell Air Rotary	*DRILLER:* Vern	*FINISHED:* 7/25/91	
Hole Size: 8"/ 4"	*Weather:* PARTLY SUNNY & RAINY	*Ground Water (Depth/Elev.):* 6.0/48.4	
Drilling Method: HSA 6 5/8" ID, S.C., ROLLER, NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 28.0/26.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	4-4-5-7	12"		*SAND, medium fine grained, tan (SP)*		
	SS-2	0.0	6-8-11-12	14"		*SAND, well sorted, medium to fine grained, wet, tan, (SP)*		
5	SS-3	0.0	6-7-8-8	12"		*SAND, medium to coarse grained, subrounded gravel, wet, tan, (SP)*	50	
	SS-4	0.0	3-6-7-9	12"		*SAND, well sorted, coarse grained, 5% 3/4" gravel, tan (SP)*		*GLACIOFLUVIAL OUTWASH*
	SS-5	0.0	4-7-10-9	14"		*SAND, medium-coarse grained, tan (SP)*	45	
10	SS-6	0.0	3-3-8-9	12"		*Silty SAND, medium-coarse grained, grey (SM)*		
	SS-7	0.0	1-10-12-13	10"		*SAND, fine grained, 3% silty clay, grey (SM)*		
15	SS-8	0.0	1-7-13-15	10"		*Silty SAND, fine grained, trace clay, grey (SM)*	40	*GLACIAL LACUSTRINE*
	SS-9	0.0	13-15-23-28	10"		*Clayey SILT, 5% gravel, grey (ML)*		
						No sample taken - used roller bit to 20.0'	35	*ABLATION TILL*

GRAPHIC: Well Log, Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING
ROLLER=ROLLER BIT No soil samples submitted for analysis

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 3	*BORING NO.* **MW-01-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 143190.78 E: 501643.99	*Ground Elevation:* 54.4	*Total Depth* 53.4
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 7/22/91	
DRILL RIG: Jaswell Air Rotary	*DRILLER:* Vern	*FINISHED:* 7/25/91	
Hole Size: 8"/ 4"	*Weather:* PARTLY SUNNY & RAINY	*Ground Water (Depth/Elev.):* 6.0/48.4	
Drilling Method: HSA 6 5/8" ID, S.C., ROLLER, NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 28.0/26.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-10	0.0	100/2"	0"		*No Recovery: used roller bit to 25.0'*		*ABLATION TILL*
							-30-	
25	SS-11	0.0	21-17-100/4"	<1"		*Poor Recovery: Cobbles/Boulders: Used roller bit to 30.0'*		*BOULDERS*
								TOP OF BEDROCK AT 28.0'
							-25-	
30	NX-1	0.0			81	*Pink-Grey, Granitic, GNEISS: phaneritic biotite with random rust stains on fractured surfaces*		*GRANITE GNEISS*
							-20-	
35	NX-2	0.0			66	*Pink-Grey, Granitic, GNEISS, same as above*		
							-15-	

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING
ROLLER=ROLLER BIT No soil samples submitted for analysis

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 3	*BORING NO.* **MW-01-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 143190.78 E: 501643.99	*Ground Elevation:* 54.4	*Total Depth* 53.4
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 7/22/91	
DRILL RIG: Jaswell Air Rotary	*DRILLER:* Vern	*FINISHED:* 7/25/91	
Hole Size: 8"/ 4"	*Weather:* PARTLY SUNNY & RAINY	*Ground Water (Depth/Elev.):* 6.0/48.4	
Drilling Method: HSA 6 5/8" ID, S.C., ROLLER, NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 28.0/26.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	NX-3	0.0			68	*Pink-Grey, Granite GNEISS, more porphyritic-phaneritic at 41-43'*	-10-	*GRANITE GNEISS*
45	NX-4	0.0			98	*Grey-Black, Porphyritic-Phaneritic, GNEISS, brown staining on fractured surfaces, at 44' bands of two textures, one phaneritic, one more porphyritic, pink feldspar veins*	-5-	
50	NX-5	0.0			64	*Grey-Black, Granitic, GNEISS, phaneritic, weathered broken feldspar with quartz crystals, fracture surfaces show green clay, probably chlorite, waxy consistency, some feldspar phenocrysts*	-0-	*END OF BORING AT 53.4'*
55						*END OF BORING AT 53.4' (bgs) Elevation 1.6*	--5-	

GRAPHIC: Well Log | Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING
ROLLER=ROLLER BIT No soil samples submitted for analysis

Metcalf & Eddy, Inc.
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GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 4	*BORING NO.* **MW-02-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142766.71 E: 503067.91	*Ground Elevation:* 68.2	*Total Depth* 73.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M.Lewis	*BEGUN* : 7/26/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Vern L.	*FINISHED:* 8/2/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 23.6/44.6	
Drilling Method: 6 5/8" HSA, 4" S.C.A, NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 68.5/-0.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	5-7-9-13	16"		*0.4" grass & roots SAND, well sorted, fine grained, 5% silt, tan (SP)*		*TOPSOIL*
	SS-2	0.0	15-12-REF	3"		*SAND, well sorted, medium grained, white-tan w/rust (SP)*	-65-	*SANDY FILL*
5	SS-3	0.0	4-8-2-2	14"		*SAND, medium-coarse grained, tan (SP) 4.7' SLUDGE, organic matter with strong odor, black*		
	SS-4	0.0	4-19-23-35	15"		*SLUDGE, organic matter, strong odor, black*		
	SS-5	0.0	2-9-25-30	12"		*SAND, fine-medium grained, 5% silt, 5% coarse grained sand, (SP) Strong odor*	-60-	
10	SS-6	0.0	32-40-23-12	18"		*SLUDGE, w/ medium to coarse grained sand*		*SLUDGE*
	SS-7	0.0	13-11-13-12	2"		*poor recovery: large stone in spoon, sludge*	-55-	
15	SS-8	0.0	9-10-12-14	17"		*Sandy GRAVEL, 10% sand, 5% silt strong odor (GP)*		
	SS-9	0.0	20-12-11-14	0"		*NO RECOVERY*		*GLACIOFLUVIAL OUTWASH*
	SS-10	0.0	7-5-5-6	21"		*SAND, fine grained, 5% silt, wet, gray, (SP)*	-50-	*Grain size and organic content sample*

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING Sample from 18.0'-22.0' sumbitted for grain size and organic content

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 4	*BORING NO.* **MW-02-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142766.71 E: 503067.91	*Ground Elevation:* 68.2	*Total Depth* 73.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M.Lewis	*BEGUN* : 7/26/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Vern L.	*FINISHED:* 8/2/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 23.6/44.6	
Drilling Method: 6 5/8" HSA, 4" S.C.A, NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 68.5/-0.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.0	7-7-9-11	16"		*Silty SAND, fine-medium grained, 5% coarse grained sand, grey, (SM)*		*collected from 18.8-22.0' Grain size results: % pass; Gravel - 3.5 Sand - 81.9 Silt - 14.5 Clay - 0.1 Organic content 0.5% GLACIOFLUVIAL OUTWASH*
	SS-12	0.0	3-4-5-9	24"		*Silty SAND, fine-medium grained, 5% gravel, greyish-black, (SM)*	45	
25	SS-13	0.0	2-3-4-7	18"		*Silty SAND, wet, orangish tan, (SM)*		
	SS-14	0.0	9-8-9-13	24"		*SAND, fine-medium grained, 5% silt, 5% gravel, greyish-tan (SP)*		
	SS-15	0.0	1-2-3-7	24"		*SAND, fine-medium grained, 5% silt, tan (SP)*	40	
30	SS-16	0.0	1-3-4-7	16"		*Silty SAND, fine-medium grained, trace coarse sand, greyish-tan, (SM)*		
	SS-17	0.0	3-5-4-3	16"		*Silty SAND, w/ layers of gray silt (SM)*	35	
35	SS-18	0.0	WOR	12"				
						SAND, 5% silt, greyish-tan (SP)	30	
						Running sand problem: No soil samples: spun 4" to 61.0'		

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING Sample from 18.0'-22.0' sumbitted for grain size and organic content

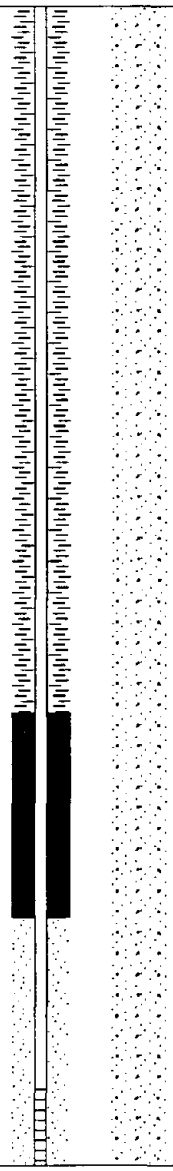
Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 4	*BORING NO.* **MW-02-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142766.71 E: 503067.91	*Ground Elevation:* 68.2	*Total Depth* 73.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M.Lewis	*BEGUN* : 7/26/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Vern L.	*FINISHED:* 8/2/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 23.6/44.6	
Drilling Method: 6 5/8" HSA, 4" S.C.A, NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 68.5/-0.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
45						*Running sand problem: no samples collected: spun 4" to 61'*	25	*GLACIOFLUVIAL OUTWASH*
50							20	
55							15	
							10	



SAMPLE NOTES:
SS = Soil Split Spoon, NX = NX Bedrock Core

NOTES: HSA = HOLLOW STEM AUGER S.C. = SPUN CASING Sample from 18.0'-22.0' sumbitted for grain size and organic content

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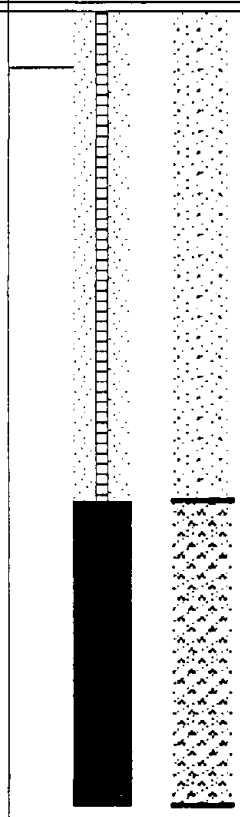
GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 4 OF 4	*BORING NO.* **MW-02-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142766.71 E: 503067.91	*Ground Elevation:* 68.2	*Total Depth* 73.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M.Lewis	*BEGUN* : 7/26/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Vern L.	*FINISHED:* 8/2/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 23.6/44.6	
Drilling Method: 6 5/8" HSA, 4" S.C.A, NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 68.5/-0.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-19	0.0	2-4-10-24	8.5'		*SAND, fine grained, cobble fragments (SP)*		
	SS-19	0.0	8-24-30-34	13"		*SAND, fine-coarse grained, tan (SP)*	-5-	
65								*GLACIOFLUVIAL OUTWASH*
	SS-20	0.0	100/0			*No recovery*	-0-	
	NX-1	0.0			76	*TOP OF BEDROCK AT 68.50'* *Start NX coring* *Biotite GNEISS w/ abundant feldspar and k-spar*		*TOP OF BEDROCK AT 68.5'*
70								*BIOTITE GNEISS*
							--5-	
75								*END OF BORING AT 73.7*
							--10-	



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING Sample from 18.0'-22.0' sumbitted for grain size and organic content

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 4	*BORING NO.* **MW-03-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141077.25 E: 502779.75	*Ground Elevation:* 36.2	*Total Depth* 69.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 7/30/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* Tim Sabo	*FINISHED:* 8/16/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 1.8/34.4	
Drilling Method: 6 5/8' HSA, 4 " S.C., NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.5/-8.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.8	WOR	8.5'		*Silty SAND, fine grained, orange stained, organics, roots*	-35-	
	SS-2	0.8	4-13-23-18	13"		*PEAT, black-greenish, 40% silty sand 5% gravel, greenish-black*		*TOPSOIL*
5	SS-3	0.6	7-13-15-16	12"		*SAND, coarse grained, 10% fine sand, greenish-grey (SM)*		
	SS-4	0.5	8-13-10-9	20"		*SAND, fine grained, gray-green, finely laminated, coarsening downward (SM-SP)*	-30-	
	SS-5	0.3	8-15-20-24	20"		*SAND, coarse grained, 5% gravel, greyish-grey (SP)*		
10	SS-6	0.3	6-7-9-21	24"		*Sandy GRAVEL, greyish-tan, .05' seam of plastic clay (GP)*	-25-	*GLACIOFLUVIAL OUTWASH*
	SS-7	0.3	4-5-20-52	15"		*SAND, fine-medium grained,grey, laminated with finer tan sand(SP)*		
15	SS-8	0.2	6-12-48-69	20"		*SAND, fine-medium grained, tan, lamininated with dark brown sand*		
	SS-9	0.0	15-14-15-32	17"		*Same as above; several 1 " layers of coarse sand/gravel*	-20-	
	SS-10		12-13-15-18	16"		*Clayey Silt, grey-green, rust stained with 10% grey-green corase angular sand (ML)*		*GLACIAL LACUSTRINE*

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: COMPOSITE SAMPLES 16-20, 25-39.5' for TCO and grain size
HSA=HOLLOW STEM AUGER S.C.=SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 4	*BORING NO.* **MW-03-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141077.25 E: 502779.75	*Ground Elevation:* 36.2	*Total Depth* 69.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 7/30/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* Tim Sabo	*FINISHED:* 8/16/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 1.8/34.4	
Drilling Method: 6 5/8' HSA, 4 " S.C., NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.5/-8.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11		6-15-12-12	24"		*Silty SAND, fine to coarse angular grained, grey-green (SM)*	-15-	*Grain size and organic content sample collected from 16.2 - 20.5'*
	SS-12		9-10-24-31	24"		*SAND, fine to medium grained, brown-grey 5% coarse sand, black, 10% silt, 5% gravel (SP)*		*Results Grain Size % pass Gravel-0 Sand-6.9 Silt-90 Clay-3.0 Carbon content 0.6%*
25	SS-13		7-7-11-13	14"		*Same as above*		
	SS-14		6-5-7-30	18"		*Same as above*	-10-	
	SS-15	45.0	33-9-6-6	3"		*SAND, Fine grained, well sorted, green-brownish (SP)*		
30	SS-16	7.0	12-10-12-14	14"		*Same as above, 5% coarse sand, very thin layers of grey silt*	-5-	*GLACIOFLUVIAL OUTWASH*
	SS-17	1.8	6-4-7-17	18"		*SAND, fine-medium grained, well sorted, tan (SP)*		*Grain size/organic content sample collected 25-39.5' Results Grain Size %Pass Gravel-3.1 Sand-90.6 Silt-6.3 Clay-0 Organic content 0.2%*
35	SS-18	15.5	12-16-22	21"		*Same as above: silty clay lenses at 35.5'*		
	SS-19	0.0	15-19-32-35	13"		*same as above*	-0-	
	SS-20	0.0	39-100/6"	4"		*SAND, fine grained, blackish-brown, occasional grey silt and clay lenses, with rust staining*		

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS = Soil Split Spoon, NX = NX Bedrock Core

NOTES: COMPOSITE SAMPLES 16-20, 25-39.5' for TCO and grain size
HSA = HOLLOW STEM AUGER S.C. = SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 4	*BORING NO.* **MW-03-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141077.25 E: 502779.75	*Ground Elevation:* 36.2	*Total Depth* 69.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 7/30/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* Tim Sabo	*FINISHED:* 8/16/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 1.8/34.4	
Drilling Method: 6 5/8' HSA, 4 " S.C., NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.5/-8.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-21	0.0	17-22-34-24	11"		*Silty SAND, fined grained, silt laminations (SM)* *41' Clayey SILT, grey (ML)*	-5-	*GLACIAL LACUSTRINE*
	SS-22		25-26-61-100	0		*Silty SAND, poorly sorted, 10% gravel (SM)*		*ABLATION TILL*
45						*Roller bit to 45'* *Bedrock at 44.5'*		*BEDROCK AT 44.5'*
	NX-1	0.0	9.0	3.5'		*Grey-Pink, Biotite GNEISS*	-10-	
50	NX-2	0.0	10.0	5'	45	*Same as above*	-15-	*BIOTITE GNEISS*
55	NX-3	0.0	14.0	5'	60	*Grey, Biotite GNEISS*	-20-	
	NX-4	0.0	7.0	2.9'	83			

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: COMPOSITE SAMPLES 16-20, 25-39.5' for TCO and grain size
HSA=HOLLOW STEM AUGER S.C.=SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 4 OF 4	*BORING NO.* **MW-03-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141077.25 E: 502779.75	*Ground Elevation:* 36.2	*Total Depth* 69.7
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 7/30/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* Tim Sabo	*FINISHED:* 8/16/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 1.8/34.4	
Drilling Method: 6 5/8' HSA, 4 " S.C., NX CORING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.5/-8.3	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
						Light Grey Phaneritic GNEISS, biotite decreases at 60'increase large feldspar phenocrysts	-25-	
	NX-5	0.0	6.5	3'	89	*Biotite GNEISS, rust stains on fracture surfaces*		
65	NX-6	0.0	6.8	5'	90	*Biotite GNEISS, with large quartz veins*	-30-	*BIOTITE GNEISS*
70						*END OF BORING AT 69.7'*	-35-	*END OF BORING AT 69.7'*
75							-40-	

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: COMPOSITE SAMPLES 16-20, 25-39.5' for TCO and grain size
HSA=HOLLOW STEM AUGER S.C.=SPUN CASING

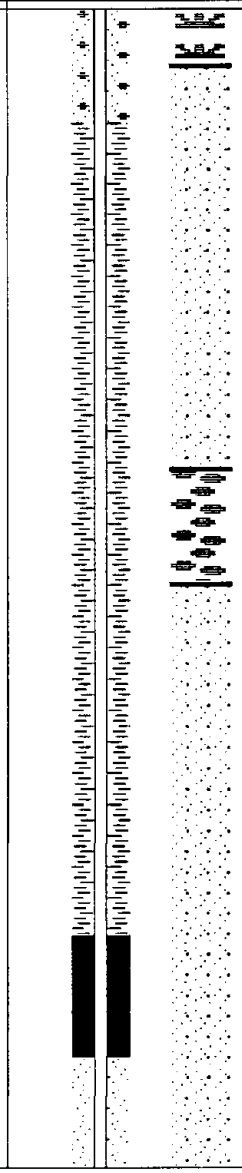
Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		SHEET 1 OF 4	BORING NO. MW-04-02
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	JOB NO.: M&E 004609-0018		
	LOCATION: N: 141501.69 E: 502009.35	Ground Elevation: 44.9	Total Depth 60.5
DRILL CONTRACTOR: LA FRAMBOISE	ENG/GEO: J. McKenna/J.Fitting	BEGUN : 8/21/91	
DRILL RIG: Dietrich D50\Jaswell	DRILLER: T. Szabo	FINISHED: 8/22/91	
Hole Size: 8"/4"	Weather: SUNNY & WARM	Ground Water (Depth/Elev.): 4.3/40.6	
Drilling Method: 6 5/8" HSA, 4" SPUN CASING, NX CORE	Drilling Fluid: TOWN WATER	Top of Rock (Depth/Elev.): 31.83/13.1	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	3-6-12-12	18"		*Silty SAND, black organic, roots* *SAND, medium-coarse grained, tan (SP)*		*TOPSOIL*
	SS-2	0.0	26-30-34-30	12"		*Same as above; 5% silt*		
5	SS-3	0.0	50-42-24	14"		*SAND medium-coarse grained 10% gravel/rock fragments, grey (SP)*	40	
	SS-4	0.0	18-16-13-17	10"		*Gravelly SAND, light gray coarse (SP)*		*GLACIOFLUVIAL OUTWASH*
	SS-5	0.0	12-8-7-7	0"		*NO RECOVERY (boulders)*		*BOULDER*
10	SS-6	0.0	7-8-11-12	11"		*SAND fine grained, grayish brown, 5% silt (SP)*	35	
	SS-7	0.0	11-9-10-13	10"		*SAND fine-medium grained, 10% silt, 5% gravel, grey (SP)*		*GLACIOFLUVIAL OUTWASH*
15	SS-8	0.0	8-10-10-11	22"		*SAND fine grained, 10% silt, grey (SP)*	30	
	SS-9	0.0	16-9-7-9	12"		*SAND fine grained, 10% silt, 5% gravel, small lenses of tan medium grained sand*		
	SS-10	0.0	3-4-3-6	22"		*SAND, fine-medium grained, 5% gravel, tan (SP)*	25	

GRAPHIC: Well Log, Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=4 1/4" HOLLOW STEM AUGER S.C.= 4" SPUN CASING, NX CORE

Metcalf & Eddy, Inc.
ENGINEERS

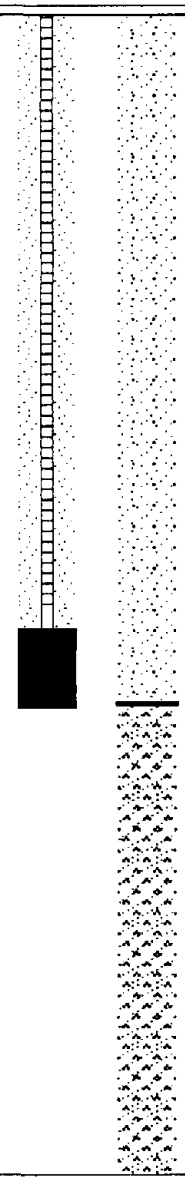
GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 4	*BORING NO.* **MW-04-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141501.69 E: 502009.35	*Ground Elevation:* 44.9	*Total Depth* 60.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* J. McKenna/J.Fitting	*BEGUN* : 8/21/91	
DRILL RIG: Dietrich D50\Jaswell	*DRILLER:* T. Szabo	*FINISHED:* 8/22/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 4.3/40.6	
Drilling Method: 6 5/8" HSA, 4" SPUN CASING, NX CORE	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 31.83/13.1	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.0	19-15-17-45	10"		*Same as above; increase gravel*		
	SS-12	0.0	6-5-4-4	0		*NO RECOVERY*		
25	SS-13	0.0	7-4-6-6	4"		*SAND fine-coarse grained, tan (SP)*	-20-	*GLACIOFLUVIAL OUTWASH*
	SS-14	0.0	9-7-8-8	6"		*Same as above; 5% gravel*		
	SS-15	0.0	3-6-10-8	12"		*Same as above; small lenses of grey sand, 10% silt*		
30	SS-16	0.0	8-100/4"	8"		*Spoon refusal; roller bit to 31.83'* *Bedrock at 31.83'*	-15-	
35						*NX core completed in borehole MW-04-03 but coring information is included in this log for completeness* *Boring MW-04-03 was completed as a bedrock well* *Boring MW-04-02 was*	-10-	*BEDROCK AT 31.83*
	NX-1	0.0	5	4.8'	90	*completed as shown on this log* *Blackish-Grey Biotite GNEISS, pegmatitic, estimate composition* *~ 40% QTZ., ~ 40% F-spar, ~20 Acc. minerals(biotite,horblende,*	-5-	

GRAPHIC: Well Log / Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=4 1/4" HOLLOW STEM AUGER S.C.= 4" SPUN CASING, NX CORE

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 4	*BORING NO.* **MW-04-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141501.69 E: 502009.35	*Ground Elevation:* 44.9	*Total Depth* 60.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* J. McKenna/J.Fitting	*BEGUN* : 8/21/91	
DRILL RIG: Dietrich D50\Jaswell	*DRILLER:* T. Szabo	*FINISHED:* 8/22/91	

Hole Size:	*Weather:*	*Ground Water (Depth/Elev.):*
8"/4"	SUNNY & WARM	4.3/40.6

Drilling Method:	*Drilling Fluid:*	*Top of Rock (Depth/Elev.):*
6 5/8" HSA, 4" SPUN CASING, NX CORE	TOWN WATER	31.83/13.1

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
						chlorite,magnetite)		
	NX-2	0.0	8	5.0'	93	*Biotite GNEISS, pegmatitic with F-spar phenocrysts*		
45							-0-	
	NX-3	0.0	4	2.5'	85	*Biotite GNEISS, horizontal fractures with iron staining and clay filling*		
	NX-4	0.0	12	6.9'	95			
50							-5-	
55							-10-	
	NX-5	0.0	20	4		*Biotite GNEISS, small fracture 55-55.5'*		
						End of Boring 60.5'	-15-	*END OF*

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=4 1/4" HOLLOW STEM AUGER S.C.= 4" SPUN CASING, NX CORE

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GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 4 OF 4	*BORING NO.* **MW-04-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141501.69 E: 502009.35	*Ground Elevation:* 44.9	*Total Depth* 60.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* J. McKenna/J.Fitting	*BEGUN* : 8/21/91	
DRILL RIG: Dietrich D50\Jaswell	*DRILLER:* T. Szabo	*FINISHED:* 8/22/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 4.3/40.6	
Drilling Method: 6 5/8" HSA, 4" SPUN CASING, NX CORE	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 31.83/13.1	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
								BORING 60.5'
65							-20-	
70							-25-	
75							-30-	
							-35-	

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=4 1/4" HOLLOW STEM AUGER S.C.= 4" SPUN CASING, NX CORE

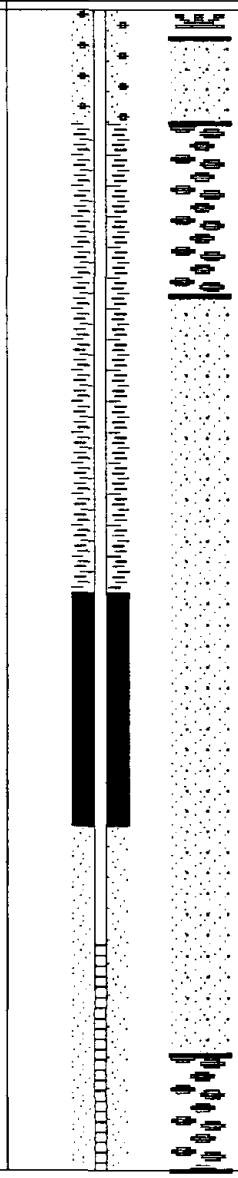
Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **MW-05-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140357.17 E: 502795.23	*Ground Elevation:* 38.6	*Total Depth* 34.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* K. Arena	*BEGUN :* 8/27/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* T.Szabo	*FINISHED:* 8/28/91	
Hole Size: 8"/ 4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 6.8/31.9	
Drilling Method: 6 5/8"HSA, 4"SPUN CASING, 3"ROLLER BIT, NX Core	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 29.0/9.6	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	3-3-2-2	10"		*0-0.5'SAND, dark brown, 40% organics, 0.5-2.0'SAND, coarse grained, tan*		*TOPSOIL* / *GLACIAL OUTWASH*
	SS-2		6-39-40-41	0"		*NO RECOVERY; boulder*	-35-	*BOULDERS*
5	SS-3	0.0	64-100/3"	3"		*poor recovery; rock fragments from boulder*		
	SS-4	0.0	27-59-100/3"	4"		*SAND, coarse grained, 10% gravel/rock fragments, 5%silt,tan*	▽	
	SS-5	0.0	35-32-30-68	12"		*SAND, coarse grained, 20% rock fragments, wet, tan (SP)*	-30-	
10	SS-6	0.0	18-22-21-22	6"		*SAND fine-coarse grained, tan (SP)*		*GLACIOFLUVIAL OUTWASH*
	SS-7	0.0	28-28-37-36	23"		*Same as above* / *6" lense of white-gray silty sand*	-25-	
15	SS-8	0.0	21-9-9-40	24"		*SAND, fine-coarse grained, 10% gravel/rock fragments, tan, (SP)*		
	SS-9	0.0	4-15-13-46	17"		*Sand, fine grained, greyish-white (SP)*		
	SS-10			0"		*NO RECOVERY-spun through boulder*	-20-	*BOULDERS*

GRAPHIC: Well Log / Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING
ROLLER=ROLLER BIT

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **MW-05-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140357.17 E: 502795.23	*Ground Elevation:* 38.6	*Total Depth* 34.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* K. Arena	*BEGUN* : 8/27/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* T.Szabo	*FINISHED:* 8/28/91	
Hole Size: 8"/ 4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 6.8/31.9	
Drilling Method: 6 5/8"HSA, 4"SPUN CASING, 3"ROLLER BIT, NX Core	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 29.0/9.6	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11		58-52-50-60	18"		*Silty SAND, fine grained, 20% rock fragments, (SM)*		
	SS-12	0.0	46-47-26-21	15"		*Silty SAND, fine grained 10% gravel/rock fragments, grey (SM)*	-15-	
25	SS-13			0"		*NO RECOVERY; spun 4" casing and roller bit to 27.0'*		*ABLATION TILL*
	SS-14			2"		*Poor recovery; 2 inches of SAND, 20% gravel/rock fragments, grey*	-10-	
						Roller bit to 29.5'		
						BEDROCK at 29.0';started		*TOP OF BEDROCK AT 29.0'*
30	NX-1				87	*NX coring at 29.5'*		
						Bedrock	-5-	
35						*END OF BORING AT 34.5'*		*END OF BORING AT 34.5'*
							-0-	

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING
ROLLER=ROLLER BIT

Metcalf & Eddy, Inc.

ENGINEERS

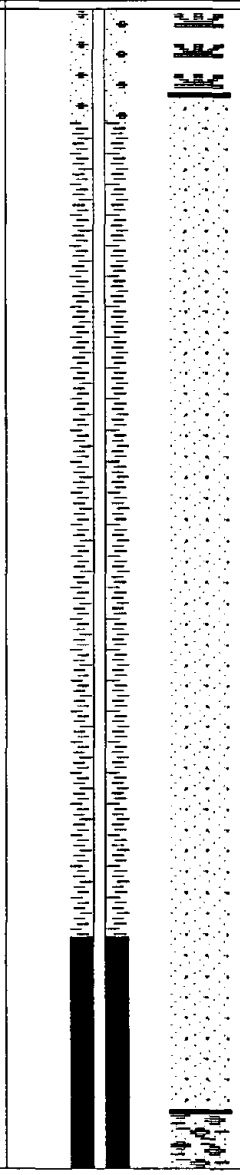
GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **MW-06-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140842.93 E: 502044.05	*Ground Elevation:* 42.1	*Total Depth* 39.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* R. Bursaw	*BEGUN :* 8/22/91	
DRILL RIG: Jaswell	*DRILLER:* Joe	*FINISHED:* 8/27/91	
Hole Size: 4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 5.3/36.8	
Drilling Method: 4 " SPUN CASING and NX core	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 34.0/8.1	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	824	9-10-10-11	22"		*Sandy SILT, 10% medium/coarse grained sand, dark brown*		*TOPSOIL*
	SS-2	190	14-11-11-8	24"		*SAND, fine-medium grained 2-3' SAND, fine-medium grained, wet, tan (SP) 3-4' Silty SAND, tan (SM)*	-40-	
5	SS-3		10-10-11-8	0"		*NO RECOVERY*	▽	
	SS-4	145	14-10-7-15	8"		*GRAVEL, 20% organic silt, 10% sand, black (GM)*	-35-	
	SS-5	215	19-19-25-13	6"		*Silty SAND, fine grained, 10% coarse sand/gravel, black, (SM)*		
10						*SAND, fine-medium grained, grey (SP)*		*GLACIOFLUVIAL OUTWASH*
	SS-6	136	10-8-11-12	12"			-30-	
	SS-7	186	11-10-12-12	12"		*Same as above; 5% silt*		
15	SS-8	141	17-17-9-9	8"		*Same as above; 10% silt*		
	SS-9	96.8	15-17-11-13	8"		*GRAVEL, 30% fine-coarse sand, grey (GM)*	-25-	
	SS-10	137	15-21-12-14	6"		*SAND, poorly sorted, 10% gravel, 10% silt, gray (SP)*		*ABLATION TILL*

GRAPHIC: Well Log, Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING No Samples submitted for analysis

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **MW-06-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140842.93 E: 502044.05	*Ground Elevation:* 42.1	*Total Depth* 39.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* R. Bursaw	*BEGUN* : 8/22/91	
DRILL RIG: Jaswell	*DRILLER:* Joe	*FINISHED:* 8/27/91	
Hole Size: 4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 5.3/36.8	
Drilling Method: 4 " SPUN CASING and NX core	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 34.0/8.1	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	136	19-16-13-20	10"		*Same as above*	-20-	
	SS-12		19-19-21-18	0"		*NO RECOVERY*		
25	SS-13	0.0	20-19-21-24	4"		*Sand, poorly sorted 20% gravel, 10% silt, grey (SP)*		
	SS-14	0.0	29-26-27-29	12"		*Same as above*	-15-	
30	SS-15	0.0	24-51-31-32	14"		*Sand, poorly sorted, 20% silt, 5 % gravel, grey (SP)*		
	SS-16	0.0	24-15-24-21	10"		*Same as above*	-10-	*ABLATION TILL*
	SS-17	0.0	29-23-100/5	8"		*Same as above*		
35	NX-1	0.0			7	*Bedrock at 34.0'* *Grayish-White, Biotite GNEISS, abundant f-spar and quartz porphyritic-phaneritic texture, large quartz vein 39'-39.3'*	-5-	*BIOTITE GNEISS*
						END OF BORING AT 39.5'		

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING No Samples submitted for analysis

Metcalf & Eddy, Inc.

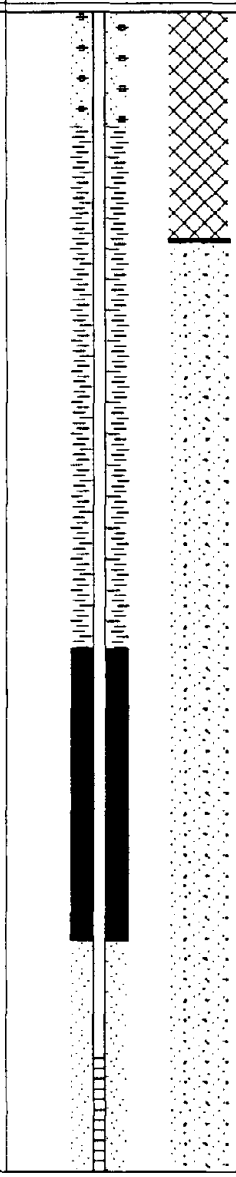
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 4	*BORING NO.* **MW-07-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141512.70 E: 500933.37	*Ground Elevation:* 73.3	*Total Depth* 66.6
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis/K. Harten	*BEGUN* : 8/5/91	
DRILL RIG: Dirtrich D50 Truck	*DRILLER:* Sal/Jim	*FINISHED:* 8/18/91	
Hole Size: 8"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 20.1/53.2	
Drilling Method: HSA 6 5/8" ID	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 42.00/21.2	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	3-8-5-4	14"		*GRAVEL, loose, 11" v.f. sand/silt, gray w/ rust stains*		
	SS-2	0.0	7-9-11-12	24"		*GRAVEL and SAND, moist, grayish-white*	-70-	*FILL*
5	SS-3	0.0	7-8-11-14	15"		*SAND, medium-coarse grained, 5% angular gravel, tanish-white*		
	SS-4	0.0	10-23-24-14	4"		*SAND, medium grained, moist, 20% angular gravel, greyish-white*		
	SS-5	0.0	3-6-7-9	14"		*SAND, well sorted, fine grained, greyish-white (SP)*	-65-	
10	SS-6	0.0	35-50-68-29	24"		*SAND, medium grained, 30% angular gravel, greyish-tan (SP)*		
	SS-7	0.0	16-32-38-42	16"		*SAND, medium-coarse grained w/ flat pebbles, tan (SP)*	-60-	
15	SS-8		17-24-31-30	12"		*Same as above*		*GLACIOFLUVIAL OUTWASH*
	SS-9	0.0	8-10-12-8	14"		*SAND, medium-coarse grained, 20% subrounded gravel, greyish-black*		
	SS-10	0.0	5-7-11-8	24"		*SAND, medium-coarse 15% small subrounded gravel, wet, grey, (SP)*	-55-	

GRAPHIC: Well Log / Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: COMPOSITED SAMPLES FROM 26'-32' FOR TCO AND GRAIN SIZE ANALYSIS HSA= HOLLOW STEM AUGER S.C.=SPUN CASING

Metcalf & Eddy, Inc.

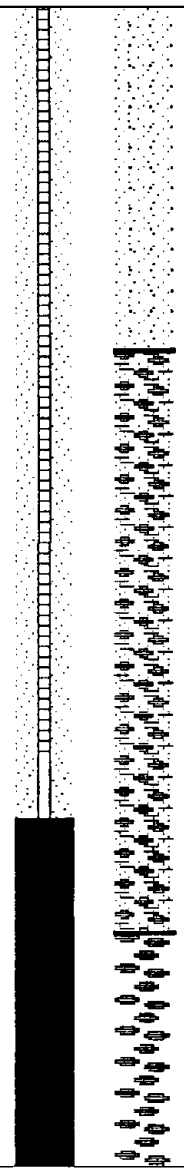
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 4	*BORING NO.* **MW-07-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141512.70 E: 500933.37	*Ground Elevation:* 73.3	*Total Depth* 66.6
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis/K. Harten	*BEGUN* : 8/5/91	
DRILL RIG: Dirtrich D50 Truck	*DRILLER:* Sal/Jim	*FINISHED:* 8/18/91	
Hole Size: 8"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 20.1/53.2	
Drilling Method: HSA 6 5/8" ID	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 42.00/21.2	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.0	2-3-7-9	14"		*SAND, fine-coarse grained, wet, gray (SP)*		*GLACIOFLUVIAL OUTWASH*
	SS-12	0.0	11-11-11-13	24"		*Same as above; slight leachate odor*	-50-	
25	SS-13	0.0	9-9-13-12	24"		*Silty SAND, fine grained, 2" silt laminations, grey (SM)*		
	SS-14	0.0	24-16-34-31	24"		*Silty SAND, fine grained, very dense, 15% gravel, grey (SM)*		*Grain size/organic content samples collectde 26-32' Results Grain Size % pass Gravel-20.3 Sand-69.2 Silt-9.2 Clay-1.3 Organic content 0.5%*
	SS-15	0.0	23-27-40-42	17"		*Silty SAND, fine-medium grained, poorly sorted, 5% gravel, grey (SM)*	-45-	
30	SS-16	0.0	28-21-17-11	16"		*Same as above; 15% gravel*		
	SS-17	0.0	23-20-20-18	24"		*Silty SAND, poorly sorted, 15% gravel, grey (SP)*	-40-	
35	SS-18	0.0	7-12-10-14	18"		*Same as above*		*TILL*
	SS-19	0.0	24-100/5"	15"		*NO RECOVERY*		
	SS-20	0.0	8-100/6"	18"		*Boulders: spun 4" casing to 41' to prevent hole*	-35-	*BOULDERS*

GRAPHIC: Well Log, Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: COMPOSITED SAMPLES FROM 26'-32' FOR TCO AND GRAIN SIZE ANALYSIS HSA= HOLLOW STEM AUGER S.C.=SPUN CASING

Metcalf & Eddy, Inc.

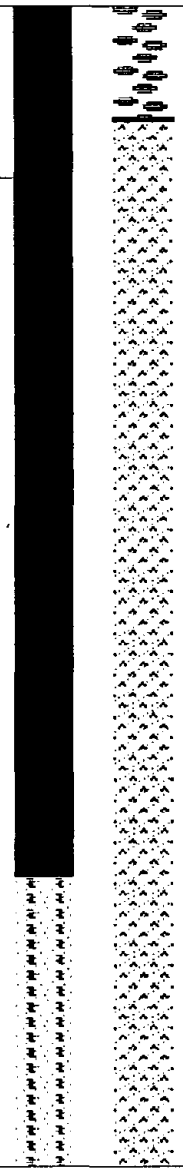
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 4	*BORING NO.* **MW-07-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141512.70 E: 500933.37	*Ground Elevation:* 73.3	*Total Depth* 66.6
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis/K. Harten	*BEGUN* : 8/5/91	
DRILL RIG: Dirtrich D50 Truck	*DRILLER:* Sal/Jim	*FINISHED:* 8/18/91	
Hole Size: 8"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 20.1/53.2	
Drilling Method: HSA 6 5/8" ID	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 42.00/21.2	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	Sample Recovery RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
						Roller bit to 43.0'		*BOULDERS*
						Bedrock at 42.0'; began NX coring at 43.0'		*BEDROCK AT 42.0'*
	NX-1	0.0	10	5.0'	0		-30-	
45						*Pink GRANITE, weathered, iron stained joint faces, badly broken core*		*WHITE-PINK GRANITE*
	NX-2	0.0	10.5	5	0		-25-	
50								
	NX-3	0.0	11	4	0		-20-	
55						*White-Pink, GRANITE, large irregular feldspar crystals,*		
	NX-4	0.0	4	4.0'	12	*58-60'horizontal bands of biotite, extremely weathered,*	-15-	*BANDED GRANITIC GNEISS*

GRAPHIC: Well Log / Strata Log



SAMPLE NOTES:
SS = Soil Split Spoon, NX = NX Bedrock Core

NOTES: COMPOSITED SAMPLES FROM 26'-32' FOR TCO AND GRAIN SIZE ANALYSIS HSA = HOLLOW STEM AUGER S.C. = SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		SHEET 4 OF 4	BORING NO. MW-07-01
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	JOB NO.: M&E 004609-0018		
	LOCATION: N: 141512.70 E: 500933.37	Ground Elevation: 73.3	Total Depth 66.6
DRILL CONTRACTOR: LA FRAMBOISE	ENG/GEO: M. Lewis/K. Harten	BEGUN : 8/5/91	
DRILL RIG: Dirtrich D50 Truck	DRILLER: Sal/Jim	FINISHED: 8/18/91	
Hole Size: 8"	Weather: SUNNY & WARM	Ground Water (Depth/Elev.): 20.1/53.2	
Drilling Method: HSA 6 5/8" ID	Drilling Fluid: TOWN WATER	Top of Rock (Depth/Elev.): 42.00/21.2	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
						Granitic GNEISS, banded w/ quartz, feldspar, biotite, chlorite on fractured surfaces, extremely weathered, many vertical joints		*GRANITIC GNEISS*
	NX-5	.0	6	3.2'	0		-10-	
65						*Same as above; 62'-67' extremely weathered rock, iron staining clay and pyrite on near vertical joint surfaces*		
						END OF BORING AT 66.6'		*END OF BORING AT 66.6'*
							-5-	
70								
							-0-	
75								
							--5-	

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: COMPOSITED SAMPLES FROM 26'-32' FOR TCO AND GRAIN SIZE ANALYSIS HSA= HOLLOW STEM AUGER S.C.=SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

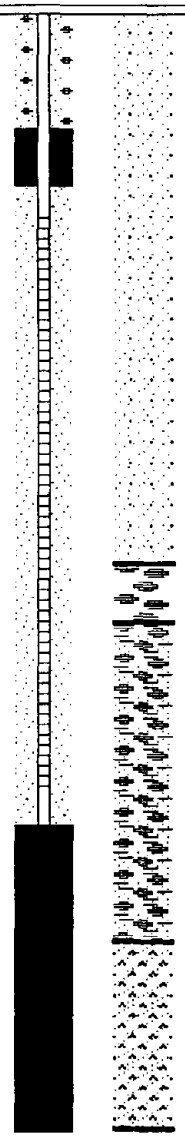
GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 1	*BORING NO.* **MW-08-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140542.51 E: 501073.43	*Ground Elevation:* 46.3	*Total Depth* 19.3
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* S. Vest/M. Lewis	*BEGUN* : 8/9/91	
DRILL RIG: Diedrich D50 Truck	*DRILLER:* Sal	*FINISHED:* 8/12/91	

Hole Size: 6"	*Weather:* LIGHT RAIN	*Ground Water (Depth/Elev.):* 5.7/40.7
Drilling Method: HSA 4 1/4"ID, ROLLER BIT, NX CORE	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 16.00/30.3

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	1-1-2-3	8"		*SAND, coarse grained, 5% fine gravel, brown (SP)*	45	
	SS-2	29	3-5-5-4	10"		*SAND, medium-coarse grained, 10% fine gravel, brown (SP)*		*GLACIOFLUVIAL OUTWASH*
5	SS-3	6.0	5-11-15-19	16"		*Sandy GRAVEL, coarse grained, 30% medium grained sand, brown (GM)*		
	SS-4	0.0	11-14-12-13	7"		*SAND, fine-medium, 10% silt, gray (SP)*	40	
	SS-5	0.0	7-7-23-31	12"		*SILT, several 1" medium sand lenses, 5% gravel, grey (ML)*		
10	SS-6	0.0	59-13-9-20	12"		*Boulders (9.5'-10.5')*		*BOULDERS*
							35	
	SS-7	0.0	6-35-21-24	7"		*Silty SAND, poorly sorted, 10% gravel, grey (SM)*		
15	SS-8	0.0	21-43-46-48	0"		*NO RECOVERY*		*ABLATION TILL*
	SS-9	0.0	100/0"	0"	45	*NO RECOVERY*	30	*BEDROCK AT 16.0'*
	NX-1		16	3.24'		*Bedrock at 16.0'; began coring at 16.0'* *Granitic GNEISS, aphenitic-phaneritic texture, greenish grey staining on fractures*		*GRANITIC GNEISS*
						END OF BORING AT 19.25		*END OF BORING AT 19.25'*

GRAPHIC: Well Log, Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER, ROLLER=ROLLER BIT, NX CORE

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **MW-09-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141797.92 E: 503548.17	*Ground Elevation:* 59.0	*Total Depth* 39.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* K. Arena	*BEGUN* : 8/30/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* T. Szabo	*FINISHED:* 9/4/91	

Hole Size:	*Weather:*	*Ground Water (Depth/Elev.):*
8"/4"	SUNNY & WARM	16.9/42.1

Drilling Method:	*Drilling Fluid:*	*Top of Rock (Depth/Elev.):*
HSA 6 5/8" ID, 4'ID S.C., ROLLER BIT, NX CORE	TOWN WATER	34.0/25.0

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	4-5-4-5	6"		*Sandy SILT, dark brown, (ML)*		*TOPSOIL*
	SS-2	0.0	6-4-13-15	22"		*Sandy SILT, dry, tan-grey (ML)*		
5	SS-3	0.0	6-14-30-38	14"		*4-5' Sandy SILT, dry, grey (ML)* *5-6' SAND, fine-medium grained, 5% gravel, grey (SP)*	55	*GLACIOFLUVIAL OUTWASH*
	SS-4	0.0	100/4"	0"		*NO RECOVERY - boulder*		*BOULDER*
	SS-5	0.0	10-30-46-38	18"		*SAND, fine to medium grained, 5% gravel, tan (SP)*	50	
10	SS-6	0.0	19-16-16-20	12"		*SAND, coarse grained 10% gravel, tan (SP)*		
	SS-7	0.0	7-13-15-39	16"		*SAND, fine to medium grained, tan (SP)*		
15	SS-8	0.0	36-47-56-39	8"		*Same as above*	45	
	SS-9	0.0	40-36-48-40	16"		*SAND, fine-coarse grained, 10% fine gravel/rock fragments, tan*	▽	*GLACIOFLUVIAL OUTWASH*
	SS-10	0.0	37-44-36-44	14"		*Same as above*	40	

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING
ROLLER=ROLLER BIT NX=NX BEDROCK CORING No samples submitted for analysis

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

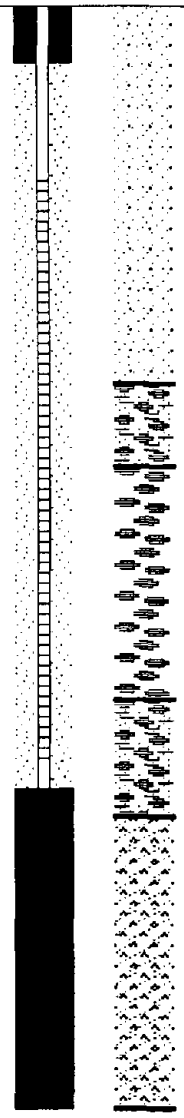
PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **MW-09-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141797.92 E: 503548.17	*Ground Elevation:* 59.0	*Total Depth* 39.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* K. Arena	*BEGUN* : 8/30/91	
DRILL RIG: Dietrich D50 ATV	*DRILLER:* T. Szabo	*FINISHED:* 9/4/91	

Hole Size:	*Weather:*	*Ground Water (Depth/Elev.):*
8"/4"	SUNNY & WARM	16.9/42.1

Drilling Method:	*Drilling Fluid:*	*Top of Rock (Depth/Elev.):*
HSA 6 5/8" ID, 4'ID S.C., ROLLER BIT, NX CORE	TOWN WATER	34.0/25.0

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.0	16-24-34-30	6"		*SAND, fine-medium grained, greyish-tan (SP)*		
	SS-12	0.0	18-16-20-36	14"		*Same as above; 10% rock fragments/gravel*		*GLACIOFLUVIAL OUTWASH*
	SS-13	0.0	42-40-40-29	8"		*Same as above*	-35-	
25								
	SS-14	0.0	32-30-24-100/3	16"		*26-26.6 SAND coarse grained, tan (SP)* *26.6-28 Silty SAND, poorly sorted, 10% rock fragments/gravel (SM)*		*ABLATION TILL*
	SS-15	0.0	74-42-100/3"	8"		*Poor recovery; large rock fragments* *BOULDERS*	-30-	
30						*Cored boulders to 32.0' than collected split spoon sample at 32.0*		*BOULDERS*
	SS-16	0.0	26-69-72-86	14"		*SAND, coarse grained, 20% rock fragments, grey (SP)*		*ABLATION TILL*
	NX-1	0.0	8	5'	44	*Bedrock at 34.0' began NX coring at 34.0'*	-25-	*BEDROCK AT 34.0'*
35						*Biotite Granitic GNEISS, large qtz. vein at 36-36.9' lt brown staining on fracture surfaces*		*BIOTITE GRANITIC GNEISS*
						END OF BORING AT 39.0	-20-	*END OF BORING AT 39.0'*

GRAPHIC: Well Log, Strata Log



SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING
ROLLER=ROLLER BIT NX=NX BEDROCK CORING No samples submitted for analysis

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 3	*BORING NO.* **MW-10-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140125.14 E: 502936.52	*Ground Elevation:* 40.4	*Total Depth* 42.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/26/91	
DRILL RIG:	*DRILLER:* Sal	*FINISHED:* 8/28/91	
Hole Size: 8"/4"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 8.5/31.9	
Drilling Method: HSA 6 5/8" ID, 4" ID S.C., NX CORE	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 36.0/4.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	2-3-2-5	12"		*8"- Grass and Roots, 4"-Silty SAND, fine grained, brownish-orange*	40	*TOPSOIL*
	SS-2	0.0	3-4-5-8	20"		*Silty SAND, fine grained, tan (SM)*		
5	SS-3	0.0	2-7-10-12	16"		*Silty SAND, fine grained, tan (SM)*	35	*GLACIAL LACUSTRINE*
	SS-4	0.0	4-8-13-11	16"		*Silty SAND, fine grained, wet, grey, (SM)*		
	SS-5	0.0	4-7-8-10	16"		*Same as above*	▽	
10	SS-6	0.0	5-7-9-8	17"		*Same as above; small bands rust stained sand*	30	
	SS-7		4-7-7-8	14"		*Sandy SILT, grey (ML)*		
15	SS-8	0.0	4-8-17-16	20"		*Same as above w/ 20% v.f. sand*	25	
	SS-9	0.0	3-13-36-46	16"		*SAND, medium grained, w/ 40% broken angular rock fragments, grey*		*ABLATION TILL*
	SS-10	0.0	25-21-25-24	4"		*Same as above w/ lenses of gray semi-cohesive silt*		

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS = Soil Split Spoon, NX = NX Bedrock Core

NOTES: HSA = HOLLOW STEM AUGER S.C. = SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 3	*BORING NO.* **MW-10-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140125.14 E: 502936.52	*Ground Elevation:* 40.4	*Total Depth* 42.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/26/91	
DRILL RIG:	*DRILLER:* Sal	*FINISHED:* 8/28/91	

Hole Size:	*Weather:*	*Ground Water (Depth/Elev.):*
8"/4"	SUNNY & WARM	8.5/31.9

Drilling Method:	*Drilling Fluid:*	*Top of Rock (Depth/Elev.):*
HSA 6 5/8" ID, 4" ID S.C., NX CORE	TOWN WATER	36.0/4.4

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.0	31-24-21-21	18"		*Same as above w/ 15% gravel, mottled w/ discontinuous lenses of cohesive gray v.f. sand/silt*	-20-	
	SS-12	0.0	21-21-52-52	13"		*Same as above*		
25	SS-13	0.0	20-31-25-21	9"		*Silty SAND, some mottled, bands of silts/fine sands and gravel*	-15-	
	SS-14	0.0	22-35-85-100	12"		*SAND, medium grained, 15% coarse angular gravel, grey (SP)*		
	SS-15	0.0	70-61-55-54	7"		*Same as above; lens of 20% angular gravel*		
30	SS-16	0.0	51-42-30-32	6"		*Silty SAND, poorly sorted, 20% angular rock fragments, grey (SM)*	-10-	*ABLATION TILL*
	SS-17	0.0	33-34-43-67	1"		*Same as above*		
35	SS-18	0.0	58-37-23-25	7"		*Sandy SILT, poorly sorted, 10% gravel, grey (ML)*	-5-	
	SS-19	0.0	61-97-100/2"	0"		*NO RECOVERY Roller bit to 37.7'; start NX coring at 37.7' BEDROCK*		*BEDROCK AT 36.0'*
	NX-1		14	4.8	73	*Granitic GNEISS w/ k-spar, biotite and quartz, porphyritic-phaneritic texture, grey-blue precipitate on fractured surfaces*		*GRANITIC GNEISS*

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 3	*BORING NO.* **MW-10-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140125.14 E: 502936.52	*Ground Elevation:* 40.4	*Total Depth* 42.5
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/26/91	
DRILL RIG:	*DRILLER:* Sal	*FINISHED:* 8/28/91	

Hole Size:	*Weather:*	*Ground Water (Depth/Elev.):*
8"/4"	SUNNY & WARM	8.5/31.9

Drilling Method:	*Drilling Fluid:*	*Top of Rock (Depth/Elev.):*
HSA 6 5/8" ID, 4" ID S.C., NX CORE	TOWN WATER	36.0/4.4

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	Sample Recovery RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
							-0-	GRANITIC GNEISS
						END OF BORING AT 42.5'		END OF BORING AT 42.5'
45							-5-	
50							-10-	
55							-15-	

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=HOLLOW STEM AUGER S.C.=SPUN CASING

Metcalf & Eddy, Inc.
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GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 4	*BORING NO.* **MW-11-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140508.05 E: 501954.03	*Ground Elevation:* 41.3	*Total Depth* 72.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/15/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Sal/Jim	*FINISHED:* 8/21/91	
Hole Size: 4"	*Weather:* LIGHT RAIN	*Ground Water (Depth/Elev.):* 7.1/34.2	
Drilling Method: 4"ID SPUN CASING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.7/-3.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	6-8-9-11	20"		*Silty, SAND, well sorted, fine grained, dark brown*	-40-	
	SS-2	0.0	8-10-3-2	20"		*SAND, medium-coarse grained, moist, brown, (SP)*		*TOPSOIL AND ORGANIC SOILS*
5	SS-3	0.0	2-3-3-3	20"		*SILT, organics, roots, slight sulfide odor, black, (ML)*		
	SS-4	0.0	7-11-16-30	18"		*6-7'- SILT, roots and wood, black* *7-8' SAND, medium-coarse grained,30% subrounded gravel*	-35- ▽	
	SS-5	0.0	2-7-32-24	3"		*Poor recovery; stone in nose of spoon*		*Grain size/organic content sample collected 8-13' Results Grain Size % pass Gravel-23.7 Sand-68.8 Silt-5.8 Clay-1.7 Organic Content 0.9%*
10	SS-6	0.0	9-11-17-21	21"		*SAND, medium-coarse grained, well sorted, wet, tan, (SP)*	-30-	
	SS-7	0.0	11-14-22-24	18"		*Same as above; 5% silt*		
15	SS-8	0.0	12-23-36-41	10"		*Same as above*		
	SS-9	0.0	11-22-17-10	16"		*Sandy SILT, 5% gravel, wet, grey (ML)*	-25-	*GLACIOFLUVIAL OUTWASH*
	SS-10	0.0	11-6-6-5	9"		*SILT, wood fragments, lenses of medium grained sand, grey (ML)*		*GLACIAL LACUSTRINE*

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: S.C.=SPUN CASING

Metcalf & Eddy, Inc.
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GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 4	*BORING NO.* **MW-11-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140508.05 E: 501954.03	*Ground Elevation:* 41.3	*Total Depth* 72.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/15/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Sal/Jim	*FINISHED:* 8/21/91	
Hole Size: 4"	*Weather:* LIGHT RAIN	*Ground Water (Depth/Elev.):* 7.1/34.2	
Drilling Method: 4"ID SPUN CASING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.7/-3.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.0	11-13-13-14	20"		*SILT, 10% fine grained sand, grey (ML)*	-20-	
	SS-12	0.0	7-100	20"		*SILT, lenses of fine-medium grained sand, grey (ML)*		*GLACIAL LACUSTRINE*
25	SS-13	0.0	11-16-36-41	20"		*SILT with alternating bands of fine-medium grained sand, grey 5% trace gravel*		
	SS-14		86-100	1"		*Poor recovery; 2" piece of angular gravel*	-15-	
	SS-15		100/5"	0"		*Poor recovery; 2" stone in split spoon*		
30	SS-16	0.0	24-32-27-26	6"		*Sandy SILT, poorly sorted, gray, 10% gravel (ML)*	-10-	
	SS-17		21-29-33-28	1"		*Poor recovery; 3 pieces angular gravel*		*ABLATION TILL*
35	SS-18		56-68-44-49	<1"		*Silty SAND, poorly sorted, 15% gravel (SM)*		
	SS-19	0.0	37-24-16-12	7"		*Same as above; 20% gravel*	-5-	
	SS-20		22-19-23-26	<1"		*Poor recovery; 1" broken granitic gravel*		*BOULDERS*

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: S.C.=SPUN CASING

Metcalf & Eddy, Inc.
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GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 4	*BORING NO.* **MW-11-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140508.05 E: 501954.03	*Ground Elevation:* 41.3	*Total Depth* 72.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN :* 8/15/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Sal/Jim	*FINISHED:* 8/21/91	
Hole Size: 4"	*Weather:* LIGHT RAIN	*Ground Water (Depth/Elev.):* 7.1/34.2	
Drilling Method: 4"ID SPUN CASING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.7/-3.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-21	0.0	50-100	8"		*Poor recovery; 1" chunk of broken granitic rock*	-0-	*BOULDERS*
45						*NX coring completed in borehole MW-11-03 but coring information is included on this logs. Boring MW-11-02 ended at refusal 44.7' at which point a well was installed. Bedrock at 44.7'*	--5-	*BEDROCK AT 44.7'*
	NX-1		2.5	4.7'	8	*Greenish-grey, Biotite GNEISS, extremely weathered*		
50							--10-	*BIOTITE GNEISS - extremely weathered*
	NX-2		2.0	5.0'	40			
55						*Biotite GNEISS, occasional quartz veins, extremely weathered*	--15-	
	NX-3		2.5	5.0'	31	*Biotite GNEISS, aphenitic texture, some chlorite, weathered*		

GRAPHIC: Well Log Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: S.C.=SPUN CASING

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 4 OF 4	*BORING NO.* **MW-11-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140508.05 E: 501954.03	*Ground Elevation:* 41.3	*Total Depth* 72.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/15/91	
DRILL RIG: Dietrich D50 Truck	*DRILLER:* Sal/Jim	*FINISHED:* 8/21/91	
Hole Size: 4"	*Weather:* LIGHT RAIN	*Ground Water (Depth/Elev.):* 7.1/34.2	
Drilling Method: 4"ID SPUN CASING	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 44.7/-3.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
							-20-	
	NX-4		2.5	5.0'	30	*Biotite GNEISS, less weathered than above*		*BIOTITE GNEISS*
65							-25-	
	NX-5		2	5.0'	30	*Lt. Grey, Biotite GNEISS, striations on some fractured surfaces, changes to pinkish grey at bottom, occasional quartz fracture*		
70							-30-	*END OF BORING AT 72.0'*
75							-35-	

GRAPHIC: Well Log / Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: S.C.=SPUN CASING

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		SHEET 1 OF 3	BORING NO. MW-12-02
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	JOB NO.: M&E 004609-0018		
	LOCATION: N: 141419.85 E: 503060.14	Ground Elevation: 39.8	Total Depth 49.0
DRILL CONTRACTOR: LA FRAMBOISE	ENG/GEO: J. McKenna/D. Berler	BEGUN : 8/7/91	
DRILL RIG: Dietrich D5 ATV	DRILLER: T. Szabo	FINISHED: 8/14/91	
Hole Size: 8"/6"	Weather: SUNNY & WARM	Ground Water (Depth/Elev.): 2.8/37.0	
Drilling Method: 6 5/8" HSA, 4" ID SPUN CASING, NX core	Drilling Fluid: TOWN WATER	Top of Rock (Depth/Elev.): 43.3/-2.5	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	0.0	3-2-1-1	7"		*Sandy SILT, 5% clay, 10% organics, dark brown*		
	SS-2	0.0	7-13-11-16	12"		*Same as above*	▽	*TOPSOIL*
5	SS-3	0.0	13-15-8-8	12"		*SAND, fine-medium grained, 5% silt, 5% organics, brown-grey (SP)*	-35-	
	SS-4	0.0	10-8-11-10	10"		*Same as above*		
	SS-5	0.0	10-6-3-3	16"		*Same as above*		
10	SS-6	0.0	15-17-7-8	24"		*SAND, medium grained, 10% gravel, brown-gray (SP)*	-30-	*GLACIOFLUVIAL OUTWASH*
	SS-7	0.0	2-3-8-10	18"		*Same as above*		
15	SS-8	0.0	9-24-17-33	13"		*SAND, fine grained, mica flakes, greenish-grey, 5% silt (SP)*	-25-	
	SS-9	0.2	22-15-16-16	8"		*Same as above; 5% silt, 5% gravel*		
	SS-10	2.6	5-6-6-19	14"		*Same as above; w/ lenses medium grained yellow-brown sand*	-20-	

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA= HOLLOW STEM AUGER S.C.=SPUN CASING Samples collected for grain size and TCO at 26.9-32.0'

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 3	*BORING NO.* **MW-12-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141419.85 E: 503060.14	*Ground Elevation:* 39.8	*Total Depth* 49.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* J. McKenna/D. Berler	*BEGUN* : 8/7/91	
DRILL RIG: Dietrich D5 ATV	*DRILLER:* T. Szabo	*FINISHED:* 8/14/91	
Hole Size: 8"/6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 2.8/37.0	
Drilling Method: 6 5/8" HSA, 4" ID SPUN CASING, NX core	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 43.3/-2.5	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.3	4-4-7-8	24"				
	SS-12	0.0	13-15-18-21	14"		*SAND, fine-medium grained, 5% fine gravel, tan , lenses of gray silt (SP)*		
25	SS-13	0.0	4-10-10-10	21"		*24-25'- Same as above; w/ 3" gray silty clay lense 25-26 - SAND, fine grained, grey (SP)*	-15-	*GLACIAL LACUSTRINE*
	SS-14	0.0	13-9-16-10	19"		*Silty SAND, grey (SM)*		*Grain size/organic content samples collected 26.9-32' Results Grain Size %pass Gravel-0.0 Sand- 6.7 Silt-82.9 Clay-10.3 Organic Content 0.9%*
	SS-15	0.0	15-12-14-16	10"		*Silty CLAY, dark grey (CL)*		
30	SS-16	0.0	3-16-24-25	11"		*Same as above; 5% fine sand*	-10-	
	SS-17	0.0	100/1"	1"		*Same as above* *Cored boulders to 35.25'*		*BOULDERS*
35							-5-	
	SS-18		12-12-10-10	3"		*Silty SAND, fine grained, 5% clay, gray (SM)*		
	SS-19		8-25-43-35	13"		*Same as above*		*ABLATION TILL*
	SS-20		35-28-22-18	6"		*Silty SAND, poorly sorted,*	-0-	

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA= HOLLOW STEM AUGER S.C.=SPUN CASING Samples collected for grain size and TCO at 26.9-32.0'

Metcalf & Eddy, Inc.
ENGINEERS

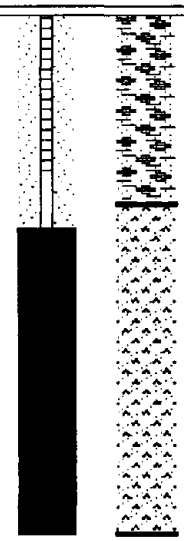
GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 3 OF 3	*BORING NO.* **MW-12-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSEHILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141419.85 E: 503060.14	*Ground Elevation:* 39.8	*Total Depth* 49.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* J. McKenna/D. Berler	*BEGUN* : 8/7/91	
DRILL RIG: Dietrich D5 ATV	*DRILLER:* T. Szabo	*FINISHED:* 8/14/91	
Hole Size: 8"/6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* 2.8/37.0	
Drilling Method: 6 5/8" HSA, 4" ID SPUN CASING, NX core	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 43.3/-2.5	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)
						15% gravel, grey (SM)	
	SS-21		32-42-15-60/4	18"		*Same as above; 5% clay*	
						Bedrock at 43.3'	
45	NX-1		20	5.0'	89	*Pink-Grey Biotite GNEISS, porphyritic-phaneritic, iron stains on fracture surfaces, large f-spar and qtz. zones*	-5-
50							-10-
55							-15-
							-20-

STRATIGRAPHIC DESCRIPTION

GRAPHIC Well Log Strata Log



ABLATION TILL

BEDROCK AT 43.3'

BIOTITE GNEISS

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA= HOLLOW STEM AUGER S.C.=SPUN CASING Samples collected for grain size and TCO at 26.9-32.0'

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **MW-13-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142388.55 E: 501367.06	*Ground Elevation:* 61.0	*Total Depth* 37.1
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D.Berler	*BEGUN* : 7/22/91	
DRILL RIG: Diedrich D-50	*DRILLER:* Brett	*FINISHED:* 7/29/91	
Hole Size: 6"/4"	*Weather:* SUNNY & HOT - LIGHT RAIN	*Ground Water (Depth/Elev.):* 9.2/51.9	
Drilling Method: 4 1/4" HSA, 4 " SC, NX CORE	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 29.6/31.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1		2-2-2-4	6"		*SILT, 30% organic/roots, dark brown*	60	*TOPSOIL*
	SS-2		5-8-17-25	20"		*SAND, fine grained 10% silt, 5 % gravel, tan*		
5	SS-3	0.0	46-73-60-48	18"		*SAND, medium grained 5% fine gravel/cobbles, brownish red (SP)*	55	
	SS-4	0.0	11-18-16-14	16"		*SAND, medium-coarse grained, 5% silt, brownish-red (SP)*		
10	SS-5	0.0	6-9-11-16	18"		*SAND, coarse grained 5% silt wet, brown (SP)*		*Grain size/organic content samples collected 9-17' Results Grain Size Gravel-7.7 Sand-87.4 Silt-4.9 Clay0.0 Organic Content 0.4%*
	SS-6	0.0	6-11-20-19	18"		*SAND, medium-coarse grained, 5% gravel, 5% silt, tan (SP)*	50	
	SS-7	0.0	8-10-10-12	18"		*Same as above*		
15	SS-8	0.0	1-5-10-10	13"		*Same as above*	45	*GLACIOFLUVIAL OUTWASH*
	SS-9	0.0	7-17-12-38	21"		*Same as above; iron staining*		
	SS-10		5-8-5-6	9"		*Same as above*		

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: TCO + SEDIMENT GRAIN SIZE CHOSEN FROM 9-17', 4 TILL SAMPLES FROM INTERVALS 21-23', 26'3"-26'10", 27-29', 29-29.5' COLLECTED FOR TCO + SEDIMENT GRAIN SIZE. HSA=HOLLOW STEM AUGER, S.C.=SPUN CASING

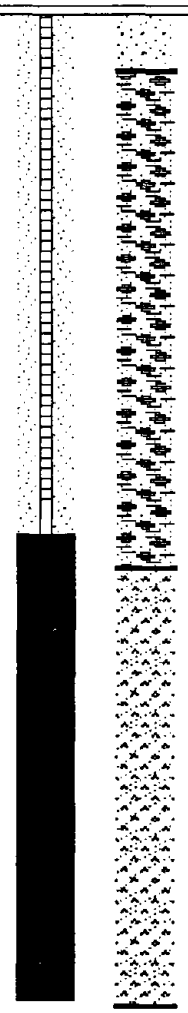
Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **MW-13-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142388.55 E: 501367.06	*Ground Elevation:* 61.0	*Total Depth* 37.1
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D.Berler	*BEGUN* : 7/22/91	
DRILL RIG: Diedrich D-50	*DRILLER:* Brett	*FINISHED:* 7/29/91	
Hole Size: 6"/4"	*Weather:* SUNNY & HOT - LIGHT RAIN	*Ground Water (Depth/Elev.):* 9.2/51.9	
Drilling Method: 4 1/4" HSA, 4 " SC, NX CORE	*Drilling Fluid:* TOWN WATER	*Top of Rock (Depth/Elev.):* 29.6/31.4	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11		6-14-13-13	10"		*Silty SAND, fine-medium grained, large angular pebbles, grey*	-40-	
	SS-12			0"		*NO RECOVERY - due to running sands*		
25	SS-13		5-6-36-100/4"	7"		*Silty SAND, fine-medium grained, 5% clay, 5% rounded gravel, grey*	-35-	
	SS-14		57-15-15-18	6"		*Same as above*		
	SS-15		48-100/0	6"		*SAND, fine-medium grained, 10% silt, brownish-grey (SP)*		
30	NX-1	0.0	10	3.0'	34	*Bedrock at 29.6'* *Pink Biotite GNEISS, phaneritic, many fractures, scattered stains*	-30-	
35	NX-2	0.0	7	4.0'	58	*Pink Biotite GNEISS, some phenocrysts feldspar, pegmatitic phaneritic texture, scattered rust stains and chlorite on fractures*	-25-	

GRAPHIC: Well Log / Strata Log



Grain size/organic content samples collected 21-29.5' Results Grain Size %pass Gravel-26.8 Sand-57.1 Silt-15.3 Clay-0.8 Organic Content 0.2%

ABLATION TILL

BEDROCK AT 29.6'

BIOTITE GNEISS

END OF BORING 37.10'

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: TCO + SEDIMENT GRAIN SIZE CHOSEN FROM 9-17', 4 TILL SAMPLES FROM INTERVALS 21-23', 26'3"-26'10", 27-29', 29-29.5' COLLECTED FOR TCO + SEDIMENT GRAIN SIZE. HSA=HOLLOW STEM AUGER, S.C.=SPUN CASING

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **BH-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142076.46 E: 502984.59	*Ground Elevation:* 66.3	*Total Depth* 20.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/20/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/20/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: HOLLOW STEM AUGER 4 1/4" ID - 3" Calf. SS	*Drilling Fluid:* None used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1	27.0	2-3-3-3			*Silty SAND, 5% clay, tan (SM)*	65	*FILL*
	SS-2	2.0	4-2-2-1			*Same as above; sewer-type odor*		
5	SS-3	0.0	1-1-1-2			*SLUDGE, organic clayey silt, black*		
	SS-4	16.0	20-22-18-24			*Same as above*	60	*SLUDGE*
	SS-5	3.0	7-27-33-39	24"		*Same as above*		
10	SS-6	15	21-19-18-20	18"		*SILT, 10% fine-medium grained sand, 10% gravel (ML)*	55	
	SS-7		8-13-17-23	24"		*Silty SAND, 10% subrounded gravel (SM)*		
15	SS-8	1.0	16-15-12-12	18"		*SAND, medium grained, 20% silt, 20% gravel (SP)*		*GLACIAL OUTWASH*
	SS-9	0.0	12-13-13-13	18"		*Same as above*	50	
	SS-10	1.0	6-10-15-14	18"		*Same as above*		*END OF*

GRAPHIC: Well Log / Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
— Soil Samples from 2-8 feet were submitted for grain-size, vertical hydraulic conductivity, TOC, TCL organics, pesticides/PCBs and TAL metals

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **BH-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142076.46 E: 502984.59	*Ground Elevation:* 66.3	*Total Depth* 20.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/20/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/20/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: HOLLOW STEM AUGER 4 1/4" ID - 3" Calf. SS	*Drilling Fluid:* None used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
								BORING AT 20.0'
							-45-	
25								
							-40-	
30								
							-35-	
35								
							-30-	

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
---- Soil Samples from 2-8 feet were submitted for grain-size, vertical hydraulic conductivity, TOC, TCL organics, pesticides/PCBs and TAL metals

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **BH-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142265.90 E: 502787.39	*Ground Elevation:* 69.0	*Total Depth* 34.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/21/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/21/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: 4 1/4" HSA - 3" Calf. SS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1		2-5-6-6	18"		*Sandy SILT, organics, black*		
	SS-2		5-8-12-15	20"		*Sandy SILT, dark brown*		*TOPSOIL/FILL*
5	SS-3		7-16-24-31	20"		*SAND, fine-medium grained, 5 % silt grey*	-65-	
	SS-4		14-37-37-22	20"		*Sandy SILT, 5% gravel, grey (ML)*		
	SS-5		9-24-21-22			*Same as above*	-60-	
10	SS-6		9-9-12-17	18"		*Gravelly SAND, 5% silt, grey (SP)*		
	SS-7		11-11-13-17	18"		*SAND. fine grained, gray-brown (SP)*		*GLACIAL OUTWASH*
15	SS-8		7-12-13-17	22"		*Same as above; 5% silt*	-55-	
	SS-9		11-12-12-11	18"		*SAND, medium-coarse grained, 5% silt, 5% gravel, tan*		
	SS-10		5-5-7-8			*Same as above*	-50-	*END OF BORING*

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
--- No Soil Samples for Analysis

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **BH-02**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142265.90 E: 502787.39	*Ground Elevation:* 69.0	*Total Depth* 34.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/21/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/21/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: 4 1/4" HSA - 3" Calf. SS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
						End of boring at 20.0		*20.0'*
							-45-	
25								
							-40-	
30								
							-35-	
35								
							-30-	

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
---- No Soil Samples for Analysis

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **BH-03**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142776.30 E: 503060.74	*Ground Elevation:* 68.3	*Total Depth* 20.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/21/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/21/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: 4 1/4 "HSA - 3" Calf. SS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION (GRAPHIC Well Log Strata Log)
	SS-1		3-5-8-5	18"		*Silty SAND fine grained, greenish-gray*		*FILL & DISTURBED SOILS*
	SS-2		7-7-9-12	18"		*Same as above;brown orange silty sand lenses 5% clay*	-65-	
5	SS-3		3-12-26-27	18"		*Silty SAND, 5 % pebbles and cobble fragments*		
	SS-4		14-24-41-53	18"		*Same as above*		
	SS-5		14-23-27-22	20"		*Silty SAND 10% gravel, tan (SM)*	-60-	
10	SS-6		23-24-18-25			*NO RECOVERY*		
	SS-7		13-16-12-12			*Sandy SILT, greyish-brown (ML)*	-55-	
15	SS-8		6-7-6-10	19"		*SAND fine grained, blackish grey (SP)*		*16-20' Sample collected for grain size, vertical hydraulic conductivity and TOC*
	SS-9		6-6-9-11			*Same as above; small layer dark gray silt/clay*		
	SS-10		8-8-11-8	20"		*SAND, fine-medium grained*	-50-	*Grain Size % pass*

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons — Soil Samples from 16-20 feet were submitted for grain-size, vertical hydraulic conductivity, TOC, TCL organics, pesticides/PCBs and TAL metals

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **BH-03**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142776.30 E: 503060.74	*Ground Elevation:* 68.3	*Total Depth* 20.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/21/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/21/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: 4 1/4 "HSA - 3" Calf. SS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	Sample Recovery RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
								Gravel-5.5 *Sand-79.9* *Silt-14.1* *Clay-0.4* *Vertical Conductivity 0.6 ft/day* *TOC 0.5%* *END OF BORING 20.0'*
							-45-	
25								
							-40-	
30								
							-35-	
35								
							-30-	

SAMPLE NOTES:
SS = Soil Split Spoon, NX = NX Bedrock Core

NOTES: NOTES: HSA = Hollow Stem Augers, Calif SS = 3" California Split Spoons
--- Soil Samples from 16-20 feet were submitted for grain-size, vertical hydraulic conductivity, TOC, TCL organics, pesticides/PCBs and TAL metals

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **BH-04**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142465.35 E: 502964.93	*Ground Elevation:* 71.8	*Total Depth* 34.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/21/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/21/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: 4 1/4" HSA 3" Calf. SS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	Sample Recovery RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1			8"				
							70	FILL
	SS-2			20"		*Silty CLAY, 5% fine sand, brown-green*		
	SS-3		3-5-9-17	17"		*SILT grey, 5% grayish brown fine sand*		
5								
	SS-4		30-90/1"	7"		*Silty SAND, 10% cobbles, grey (SP)*	65	
	SS-5		15-21-22-19	2"		*Same as above*		
10								
	SS-6		10-14-21-20	20"		*SAND, fine grained 5% silt, 5% gravel, grey (SP)*		GLACIAL OUTWASH
							60	
	SS-7		12-24-19-22	18"		*Same as above*		
	SS-8		10-14-14-19	20"		*SAND, fine grained, brownish-grey (SP)*		
15								
	SS-9		16-20-20-20	18"		*Silty SAND, fine grained 5% dark gray firm clay, 5% gravel (SM)*	55	
	SS-10		10-12-13-20			*Same as above*		

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
— No Soil Samples for Analysis

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **BH-04**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 142465.35 E: 502964.93	*Ground Elevation:* 71.8	*Total Depth* 34.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/21/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/21/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: 4 1/4" HSA 3" Calf. SS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
						End of boring at 20.0'		*END OF BORING AT 20.0'*
							-50-	
25								
							-45-	
30								
							-40-	
35								
							-35-	

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
---- No Soil Samples for Analysis

GEOLOGIC LOG

SITE (EPA Site No. A-5)		SHEET 2 OF 2	BORING NO. **BH-05**
	JOB NO.: M&E 004609-0018		
	LOCATION: N: 143290.35 E: 502599.12	Ground Elevation: 65.5	Total Depth 20.0
	ENG/GEO: D. Berler	BEGUN : 8/22/91	
	DRILLER:	FINISHED: 8/22/91	
		Ground Water (Depth/Elev.): /	
	Drilling Fluid: None Used	Top of Rock (Depth/Elev.): /	
SPLIT SPOONS			

SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
	-45-	*Conductivity 0.04 ft/.day TOC 0.7% GLACIAL OUTWASH END OF BORING AT 20'*
	-40-	
	-35-	
	-30-	

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
---- Soil Samples from 10-16 feet were submitted for grain-size, vertical hydraulic conductivity, TOC, TCL organics, pesticides/PCBs and TAL metals

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

M&E

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **BH-06**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141550.87 E: 502977.63	*Ground Elevation:* 53.0	*Total Depth* 20.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/23/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/23/91	

Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /
Drilling Method: HOLLOW STEM AUGER 4 1/4" ID, 3" CALIF. SPLIT SPOONS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	Sample Recovery RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION (GRAPHIC Well Log Strata Log)
	SS-1		2-3-2-6			*NO SOIL RECOVERY - 6" solid waste*		
	SS-2		20-9-3-5			*6" solid waste (0-12), 6" dark gray-black organic rich silt*	-50-	*SOLID WASTE*
5	SS-3		2-2-8-13			*wet grey silt w/ solid waste, v.f. sand*		
	SS-4		8-21-23-19			*Silty SAND, wet, grey (SM)*		*6-10' samples submitted for grain size, vertical hydraulic conductivity TOC*
	SS-5		17-25-29-29			*SILT, 10% fine sand, 5% subrounded gravel, grey (ML)*	-45-	
10	SS-6		8-13-6-6			*SAND, medium grained, grey (SP)*		*Grain Size % pass Gravel-8.8 Sand-59.8 Silt-25.8 Clay-5.5*
						SILT, 10% medium grained sand, grey (ML)	-40-	*Vertical Conductivity 0.04 ft/day TOC 1%*
						Same as above		
15						*SAND, medium-coarse grained, tan (SP)*		*GLACIAL OUTWASH*
						Same as above	-35-	
								END OF

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
---- Soil Samples from 6-10 feet were submitted for grain-size, vertical hydraulic conductivity, TOC, TCL organics, pesticides/PCBs and TAL metals

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 2 OF 2	*BORING NO.* **BH-06**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 141550.87 E: 502977.63	*Ground Elevation:* 53.0	*Total Depth* 20.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* M. Lewis	*BEGUN* : 8/23/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:*	*FINISHED:* 8/23/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: HOLLOW STEM AUGER 4 1/4" ID, 3" CALIF. SPLIT SPOONS	*Drilling Fluid:* None Used	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION GRAPHIC Well Log Strata Log
								BORING AT 20.0'
							-30-	
25								
							-25-	
30								
							-20-	
35								
							-15-	

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons
---- Soil Samples from 6-10 feet were submitted for grain-size, vertical hydraulic conductivity, TOC, TCL organics, pesticides/PCBs and TAL metals

Metcalf & Eddy, Inc.

ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		*SHEET* 1 OF 2	*BORING NO.* **MW-14-01**
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	*JOB NO.:* M&E 004609-0018		
	LOCATION: N: 140536.44 E: 501482.02	*Ground Elevation:* 65.3	*Total Depth* 34.0
DRILL CONTRACTOR: LA FRAMBOISE	*ENG/GEO:* D. Berler	*BEGUN* : 8/26/91	
DRILL RIG: Mobile B-47 ATV	*DRILLER:* P. La Framboise	*FINISHED:* 8/26/91	
Hole Size: 6"	*Weather:* SUNNY & WARM	*Ground Water (Depth/Elev.):* /	
Drilling Method: 4 1/4" HSA	*Drilling Fluid:* TOWN WATER SUPPLY	*Top of Rock (Depth/Elev.):* /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-1		5-5-7-7	18"		*Cover Material; Silty SAND, fine-medium grained 5% clay, brown*	-65-	
	SS-2		3-4-4-8	2"		*Solid Waste*		
5	SS-3		8-21-17-18	12"		*Same as above*	-60-	
	SS-4		3-2-4-5	18"		*Same as above*		*Soil Samples from 4- 14 feet were submitted for grain size/vertical hydraulic conductivity and TOC*
	SS-5	2.0	4-3-4-2	0"		*Same as above*		
10	SS-6	13.5	8-6-9-9	0"		*NO RECOVERY*	-55-	*Grain Size % pass Gravel-8.1 Sand-60.7 Silt-27.6 Clay-3.5 Vertical Conductivity 0.29 ft/day TOC 14.9% SOLID WASTE*
	SS-7		3-5-6-4	0"		*Solid Waste: with SAND, fine grained, 5% silt*		
15	SS-8		5-9-7-8	0"		*Same as above*	-50-	
	SS-9		5-9-13-14	0"		*Same as above*		
	SS-10		10-10-10-12	12"		*Same as above*		

GRAPHIC: Well Log, Strata Log

SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons ---- Soil Samples from 4-14 feet were submitted for grain-size, TOC, TCL organics, pesticides/ PCBs and TAL metals

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT: ROSE HILL LANDFILL SITE (EPA Site No. A-5)		SHEET 2 OF 2	BORING NO. MW-14-01
SITE LOCATION: SOUTH KINGSTOWN, R.I. ROSE HILL LANDFILL	JOB NO.: M&E 004609-0018		
	LOCATION: N: 140536.44 E: 501482.02	Ground Elevation: 65.3	Total Depth 34.0
DRILL CONTRACTOR: LA FRAMBOISE	ENG/GEO: D. Berler	BEGUN : 8/26/91	
DRILL RIG: Mobile B-47 ATV	DRILLER: P. La Framboise	FINISHED: 8/26/91	
Hole Size: 6"	Weather: SUNNY & WARM	Ground Water (Depth/Elev.): /	
Drilling Method: 4 1/4" HSA	Drilling Fluid: TOWN WATER SUPPLY	Top of Rock (Depth/Elev.): /	

Depth (ft.) (bgs)	Sample Type/No.	TVO head space (ppm)	Blow Counts (per 6 in.) or Drilling Rate (min/ft)	Sample Recovery REC (ft.)	RQD (%)	SAMPLE DESCRIPTION	Elev. (USGS) (datum)	STRATIGRAPHIC DESCRIPTION
	SS-11	0.0	6-13-15-27	18"		*20-21' Same as above*	-45-	
	SS-12	0.0	10-14-14-13	15"		*21-22' Clayey SILT, light grey; possible natural grade (ML)* *SAND, fine grained, 5% silt, 5% clay, grey (SP)*		
25	SS-13	1.7	8-10-10-11	20"		*Silty SAND, fine grained 5% clay, wet, grey (SM)*	-40-	*GLACIAL LACUSTRINE*
	SS-14	0.0	8-5-10-14	18"		*Same as above*		
	SS-15	0.0	6-11-14-15	20"		*Same as above*		
30	SS-16	16.0	7-9-12-21	20"		*SILT, 5% fine sand, varved, grey (ML)*	-35-	
	SS-17	2.0	15-40-28-32	20"		*Silty SAND, poorly sorted, 5% gravel*		*ABLATION TILL*
35						*End of Boring at 34.0'*	-30-	*END OF BORING AT 34.0'*

GRAPHIC: Well Log, Strata Log

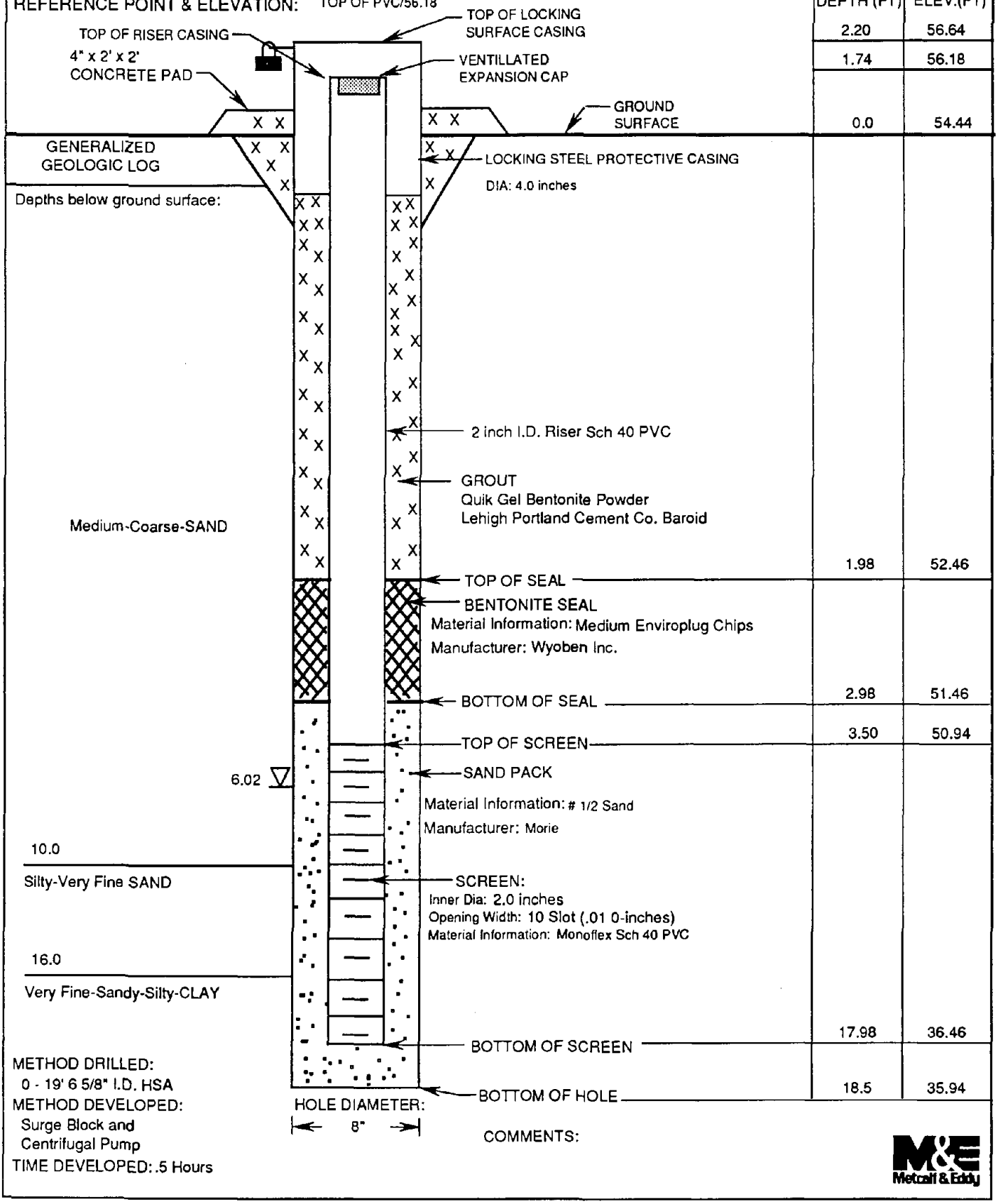
SAMPLE NOTES:
SS=Soil Split Spoon, NX=NX Bedrock Core

NOTES: HSA=Hollow Stem Augers, Calif SS=3" California Split Spoons — Soil Samples from 4-14 feet were submitted for grain-size, TOC, TCL organics, pesticides/PCBs and TAL metals

B-2 MONITORING WELL INSTALLATION LOGS

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW-01-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 143190.776 N 501643.992		
BEGUN: 7/22/91 FINISHED: 7/25/91	SUPERVISOR: Mark Lewis DRILLER: Vern Torttlet	WELL SITE: MW-01-01	WATER LEVEL: DEPTH/ELEV. 6.02/48.42

REFERENCE POINT & ELEVATION: TOP OF PVC/56.18



DEPTH (FT)	ELEV.(FT)
2.20	56.64
1.74	56.18
0.0	54.44
1.98	52.46
2.98	51.46
3.50	50.94
17.98	36.46
18.5	35.94

METHOD DRILLED:
0 - 19' 6 5/8" I.D. HSA
METHOD DEVELOPED:
Surge Block and
Centrifugal Pump
TIME DEVELOPED: .5 Hours

COMMENTS:

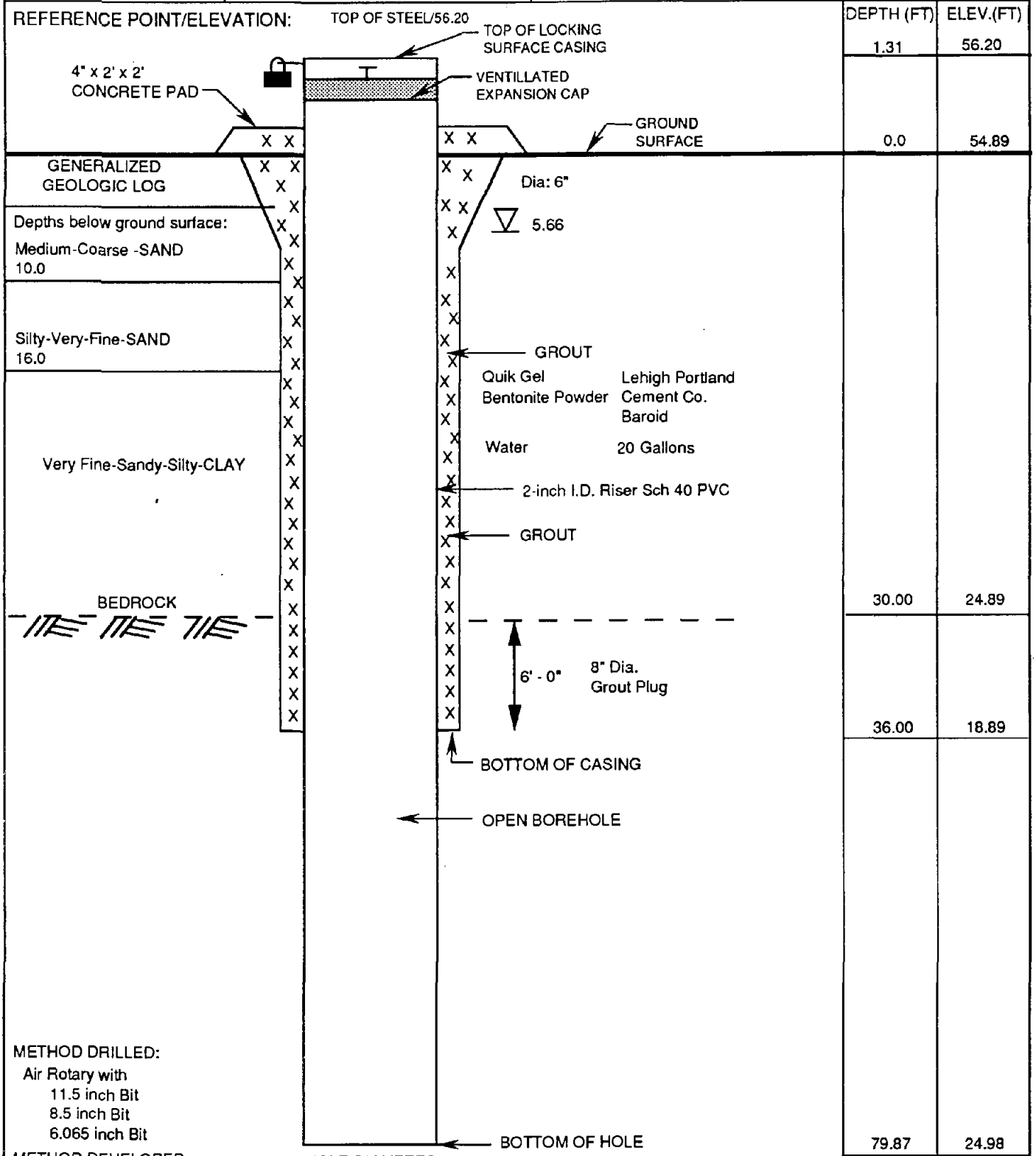
M&E Metcalf & Eddy

2736jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

BEDROCK WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW-01-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 143203.611N 501643.977E		
BEGUN: 7/26/91 FINISHED: 8/01/91	SUPERVISOR: Kevin Horten DRILLER: Joe Michaud	WELL SITE: MW-01-02	WATER LEVEL: DEPTH/ELEV. 5.66/50.54

REFERENCE POINT/ELEVATION: TOP OF STEEL/56.20



DEPTH (FT)	ELEV.(FT)
1.31	56.20
0.0	54.89
30.00	24.89
36.00	18.89
79.87	24.98

METHOD DRILLED:
Air Rotary with
11.5 inch Bit
8.5 inch Bit
6.065 inch Bit

METHOD DEVELOPED:
Air for 45 Minutes
Sarging with Submersible Pump

TIME DEVELOPED: 1.0 Hours

COMMENTS:

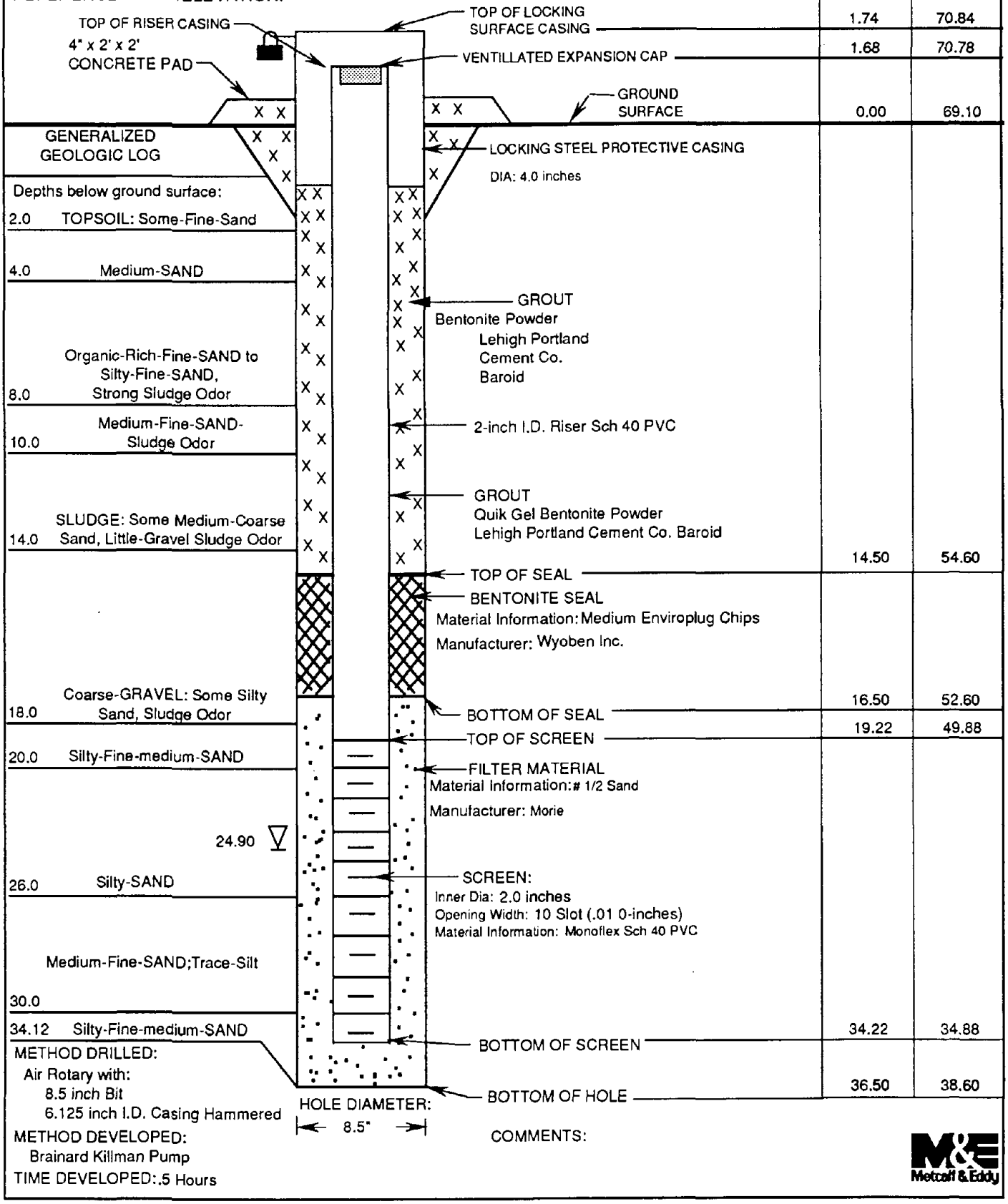
Metcalf & Eddy

BEDROCK MONITORING WELL CONSTRUCTION DETAIL

2119jp

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW02-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 142763.670N 503052.395		
BEGUN: 8/1/91 FINISHED: 8/1/91	SUPERVISOR: Kevin Horten DRILLER: Joe Michaud	WELL SITE: MW02-01	WATER LEVEL: DEPTH/ELEV. 24.90/44.20

REFERENCE POINT/ELEVATION: TOP OF PVC/70.78



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	1.74	70.84
VENTILLATED EXPANSION CAP	1.68	70.78
GROUND SURFACE	0.00	69.10
TOP OF SEAL	14.50	54.60
BOTTOM OF SEAL	16.50	52.60
TOP OF SCREEN	19.22	49.88
BOTTOM OF SCREEN	34.22	34.88
BOTTOM OF HOLE	36.50	38.60

METHOD DRILLED:
Air Rotary with:
8.5 inch Bit
6.125 inch I.D. Casing Hammered

METHOD DEVELOPED:
Brainard Killman Pump

TIME DEVELOPED: .5 Hours

COMMENTS:

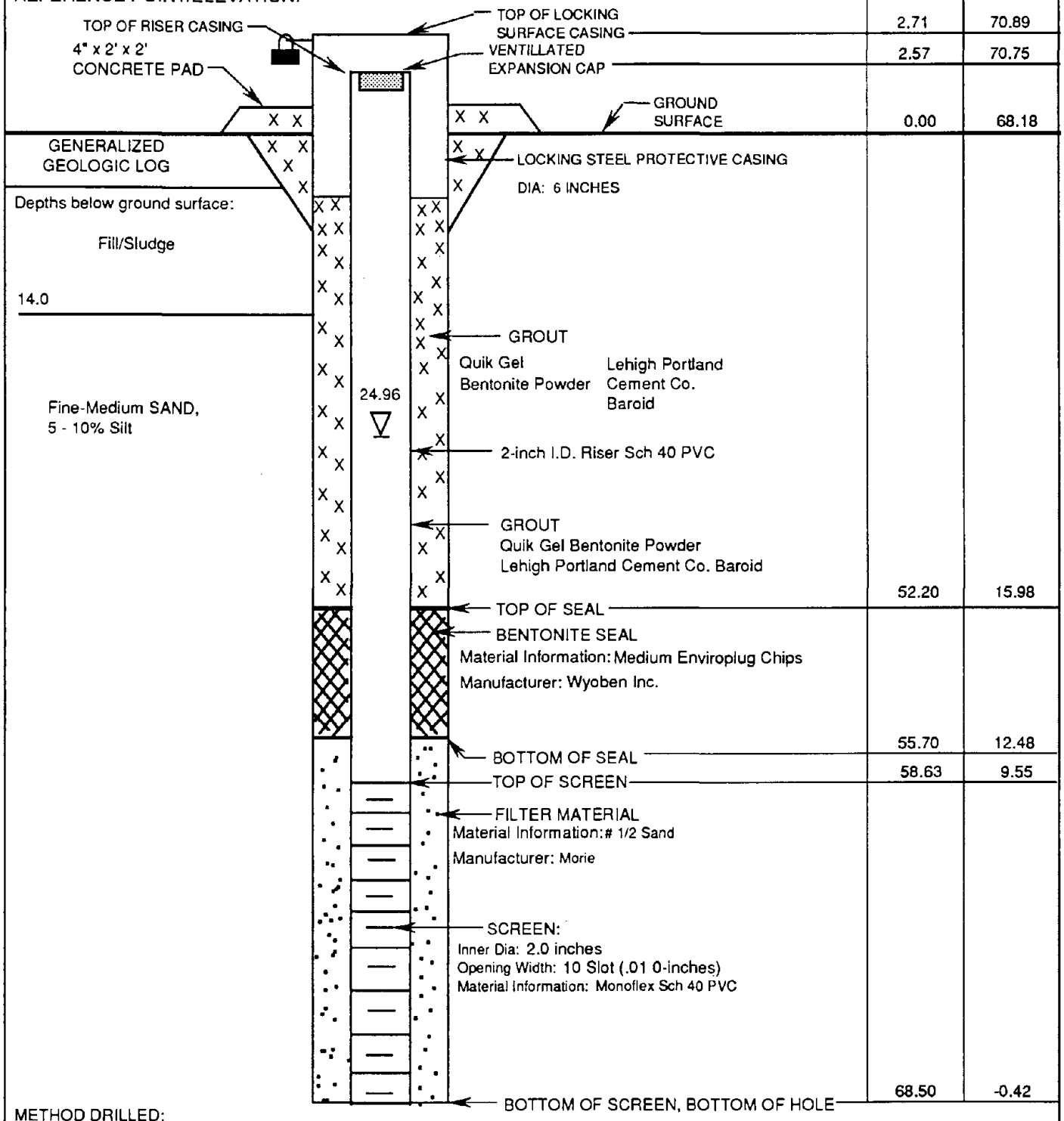
Metcalf & Eddy

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

2119jp

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW02-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 142766.708N 503067.914E		
BEGUN: 7/24/91 FINISHED: 8/02/91	SUPERVISOR: Mark Lewis DRILLER: Sal Spatafora	WELL SITE: MW02-02	WATER LEVEL: DEPTH/ELEV. 24.96/43.22

REFERENCE POINT/ELEVATION: TOP OF PVC/70.75



DEPTH (FT)	ELEV.(FT)
2.71	70.89
2.57	70.75
0.00	68.18
52.20	15.98
55.70	12.48
58.63	9.55
68.50	-0.42

METHOD DRILLED:
0-35', 6 5/8" ID HSA
35-68.63" 4" ID Casing Spun
METHOD DEVELOPED:
Brainard Killman Pump
TIME DEVELOPED:.5 Hours

HOLE DIAMETER: 8.0"

COMMENTS:

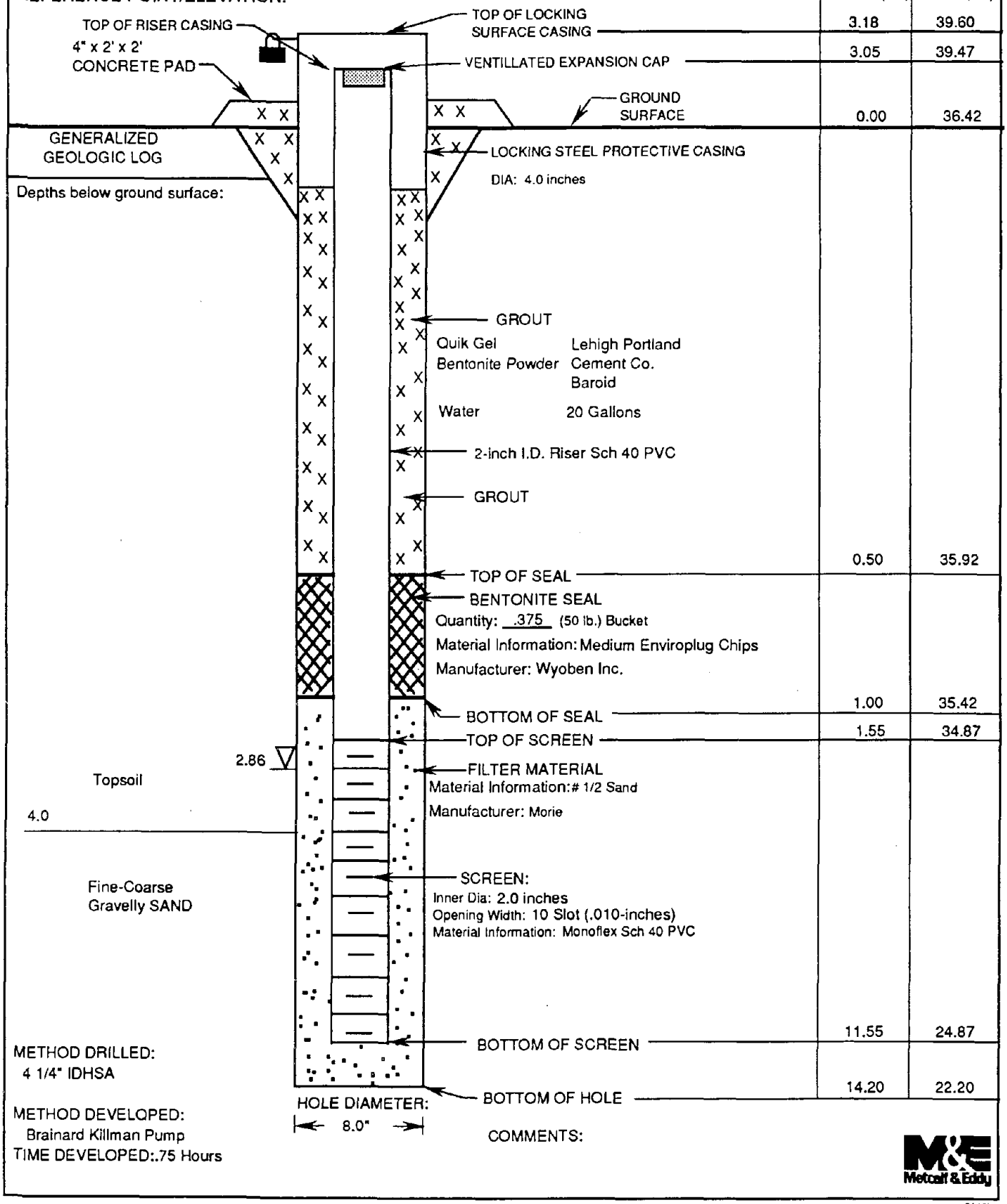
Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW-03-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141076.408N 502767.568E		
BEGUN: 8/16/91 FINISHED: 8/16/91	SUPERVISOR: D.H. Berler DRILLER: Tim Sabo	WELL SITE: MW-03-01	WATER LEVEL: DEPTH/ELEV. 2.86/36.59

REFERENCE POINT/ELEVATION: TOP OF PVC/39.47



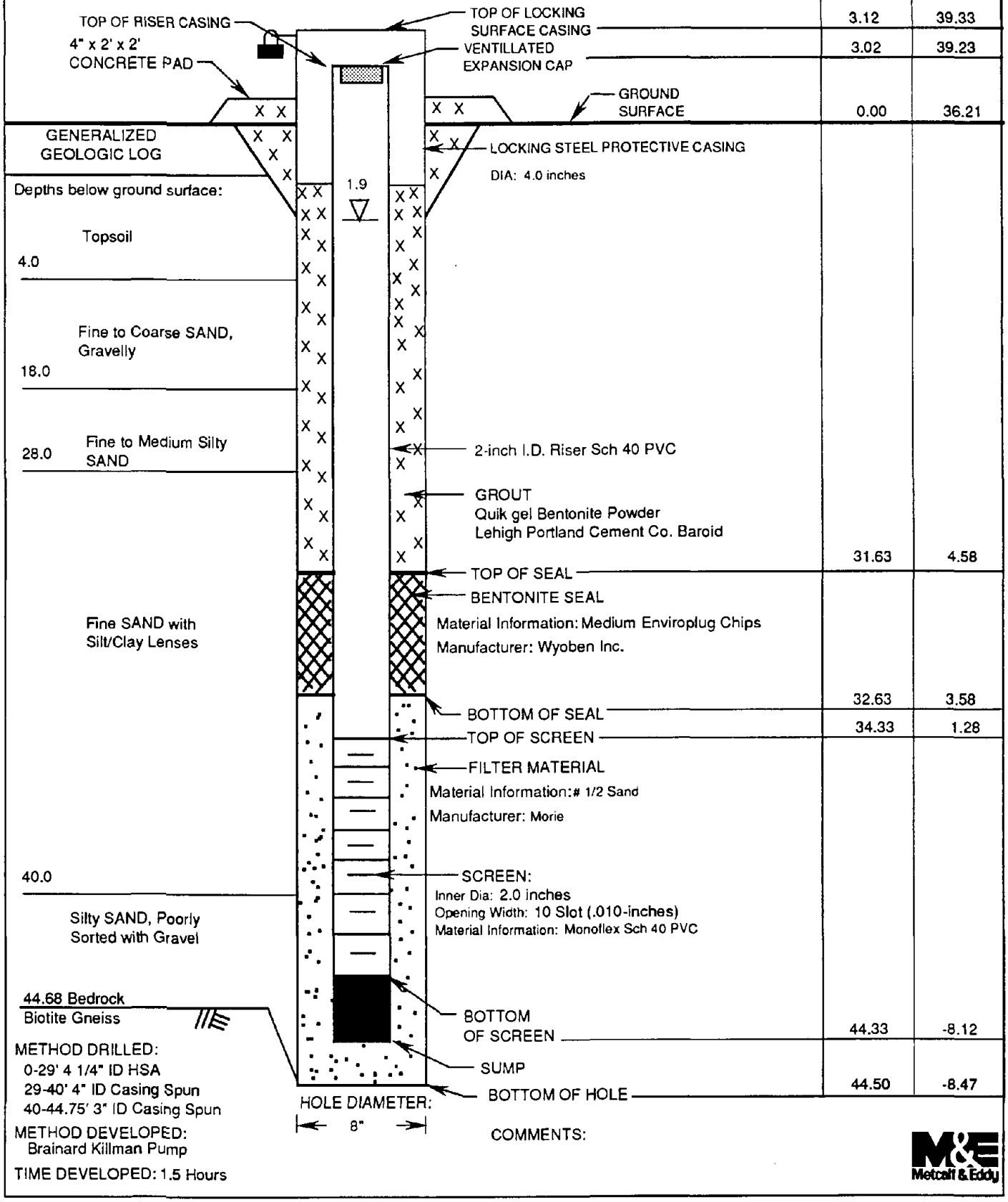
	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	3.18	39.60
VENTILLATED EXPANSION CAP	3.05	39.47
GROUND SURFACE	0.00	36.42
TOP OF SEAL	0.50	35.92
BOTTOM OF SEAL	1.00	35.42
TOP OF SCREEN	1.55	34.87
BOTTOM OF SCREEN	11.55	24.87
BOTTOM OF HOLE	14.20	22.20

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW03-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141077.247N 502779.745E		
BEGUN: 7/30/91 FINISHED: 8/16/91	SUPERVISOR: D.H. Berler, J. McKenna DRILLER: Tim Sabo	WELL SITE: MW03-02	WATER LEVEL: DEPTH/ELEV. 1.90/37.36

REFERENCE POINT/ELEVATION: TOP OF PVC/39.23



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	3.12	39.33
VENTILLATED EXPANSION CAP	3.02	39.23
GROUND SURFACE	0.00	36.21
TOP OF SEAL	31.63	4.58
BOTTOM OF SEAL	32.63	3.58
TOP OF SCREEN	34.33	1.28
BOTTOM OF SCREEN	44.33	-8.12
BOTTOM OF HOLE	44.50	-8.47

METHOD DRILLED:
0-29' 4 1/4" ID HSA
29-40' 4" ID Casing Spun
40-44.75' 3" ID Casing Spun

METHOD DEVELOPED:
Brainard Killman Pump

TIME DEVELOPED: 1.5 Hours

COMMENTS:

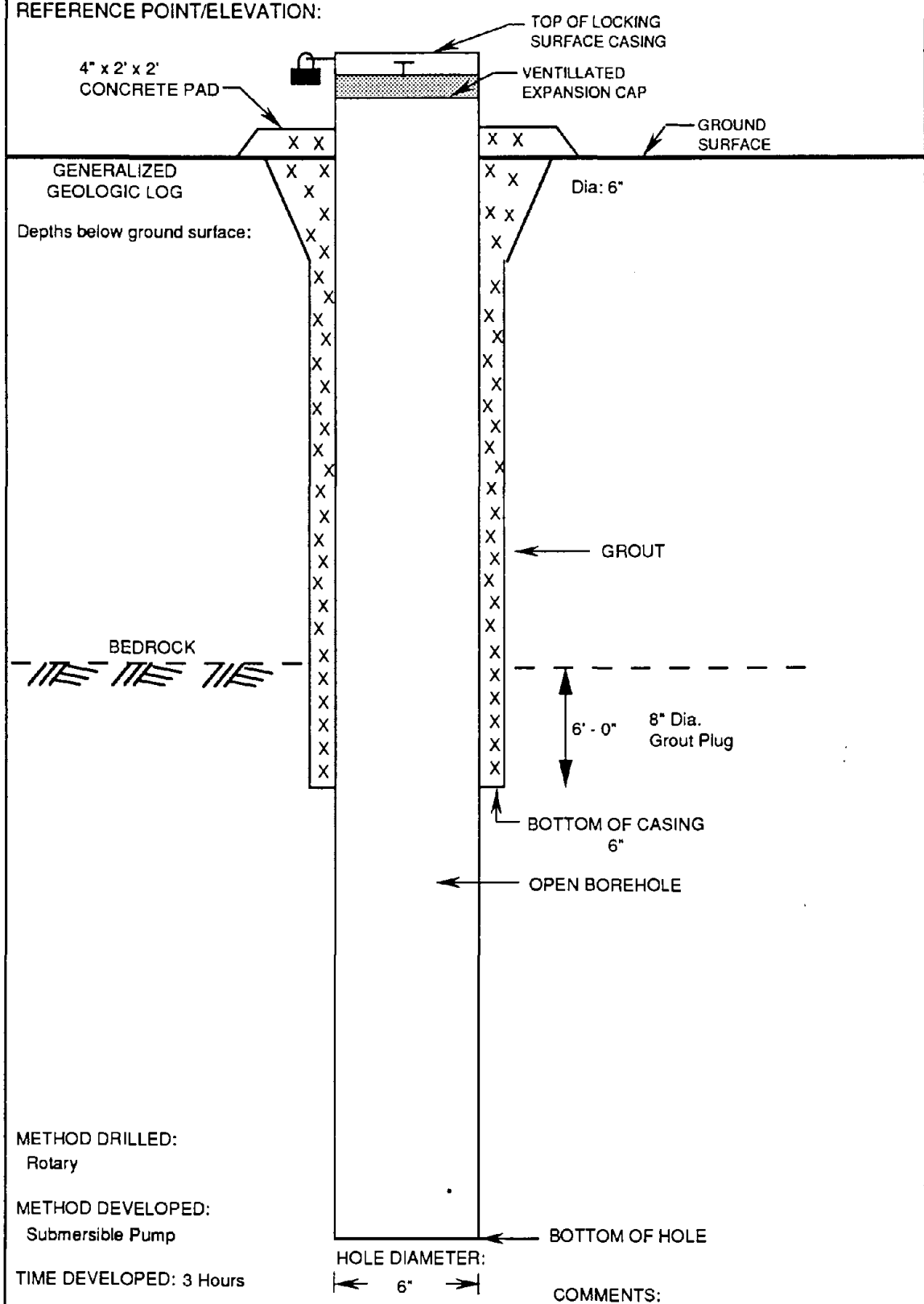
Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

EXTRACTION WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW03-03
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141082.593N 502739.950E		
BEGUN: 7/3/191 FINISHED:	SUPERVISOR: Berler DRILLER: Vern & Joe	WELL SITE: MW03-03	WATER LEVEL: DEPTH/ELEV. 2.21/39.66

REFERENCE POINT/ELEVATION:



DEPTH (FT)	ELEV.(FT)
1.11	42.98
0.0	41.87
44.00	-2.13
53.00	-11.13
143.40	-101.53

METHOD DRILLED: Rotary

METHOD DEVELOPED: Submersible Pump

TIME DEVELOPED: 3 Hours

COMMENTS:

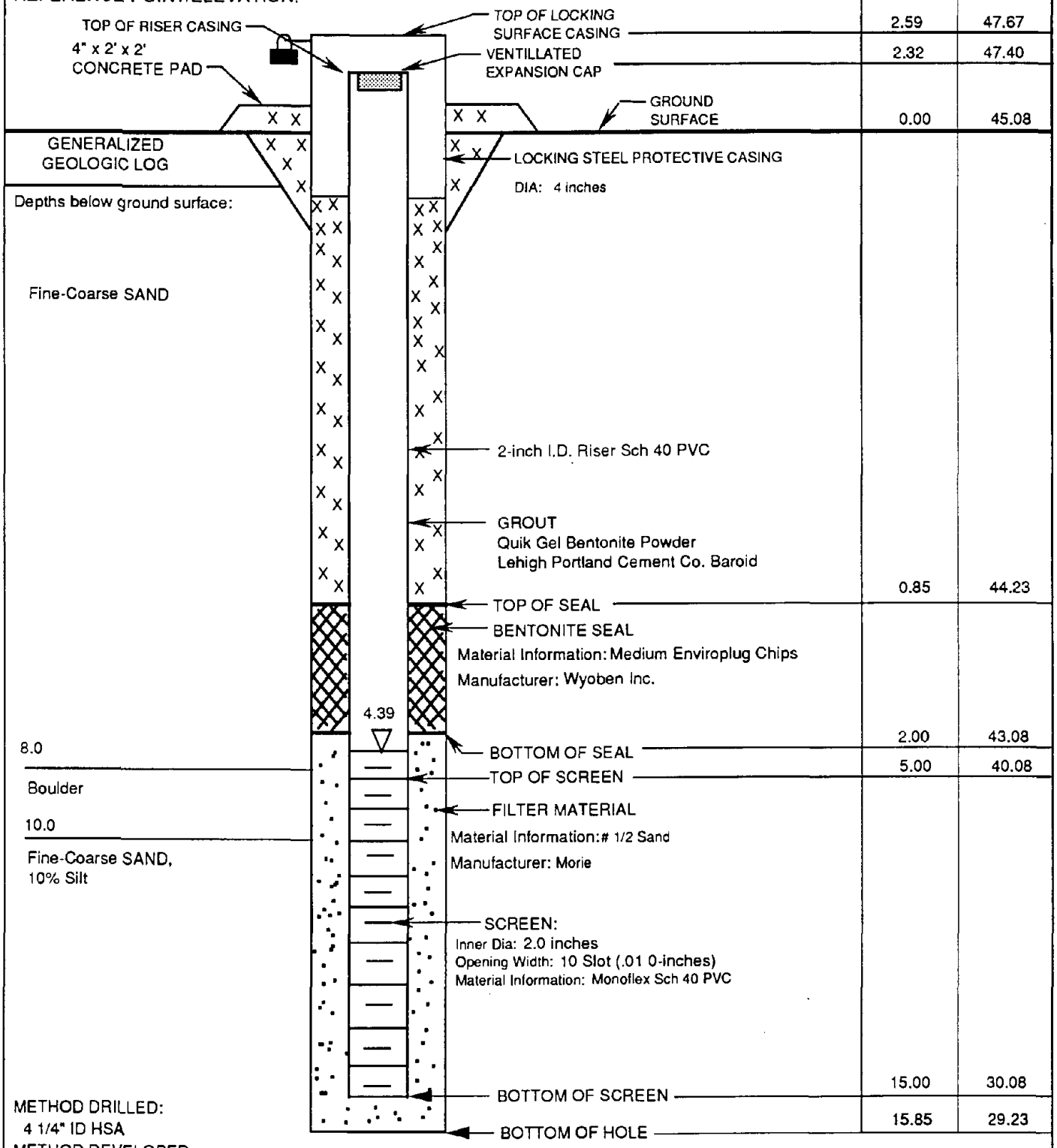
Metcalf & Eddy

BEDROCK MONITORING WELL CONSTRUCTION DETAIL

2119jp

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW-04-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141516.114N 502009.943E		
BEGUN: 8/22/91 FINISHED: 8/23/91	SUPERVISOR: D.J. Fitting DRILLER: Tim & Jeff	WELL SITE: MW-04-01	WATER LEVEL: DEPTH/ELEV. 4.39/40.61

REFERENCE POINT/ELEVATION: TOP OF PVC/47.40



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.59	47.67
VENTILLATED EXPANSION CAP	2.32	47.40
GROUND SURFACE	0.00	45.08
TOP OF SEAL	0.85	44.23
BOTTOM OF SEAL	2.00	43.08
TOP OF SCREEN	5.00	40.08
BOTTOM OF SCREEN	15.00	30.08
BOTTOM OF HOLE	15.85	29.23

METHOD DRILLED:
4 1/4" ID HSA
METHOD DEVELOPED:
Brainard Killman Pump
TIME DEVELOPED: .53 Hours

HOLE DIAMETER: 8"

COMMENTS:

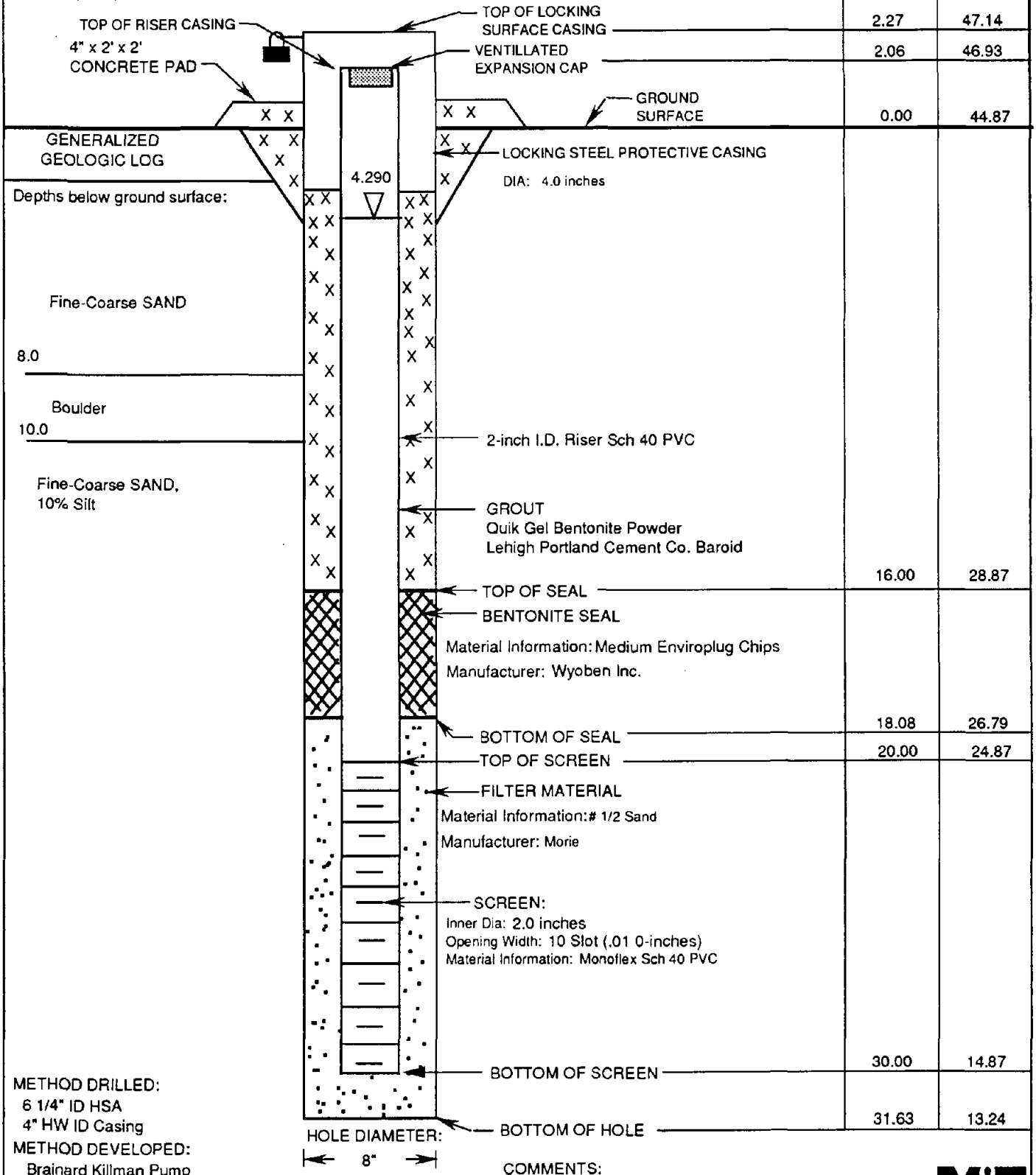
Metcalf & Eddy

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

2119jp

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW04-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141501.686N 502009.347E		
BEGUN: 8/21/91 FINISHED: 8/26/91	SUPERVISOR: McKenna DRILLER: Tim Salvo	WELL SITE: MW04-02	WATER LEVEL: DEPTH/ELEV. 4.28/40.65

REFERENCE POINT/ELEVATION: TOP OF PVC/46.93



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.27	47.14
VENTILLATED EXPANSION CAP	2.06	46.93
GROUND SURFACE	0.00	44.87
TOP OF SEAL	16.00	28.87
BOTTOM OF SEAL	18.08	26.79
TOP OF SCREEN	20.00	24.87
BOTTOM OF SCREEN	30.00	14.87
BOTTOM OF HOLE	31.63	13.24

METHOD DRILLED:
6 1/4" ID HSA
4" HW ID Casing

METHOD DEVELOPED:
Brainard Killman Pump

TIME DEVELOPED: 1.83 Hours

COMMENTS:

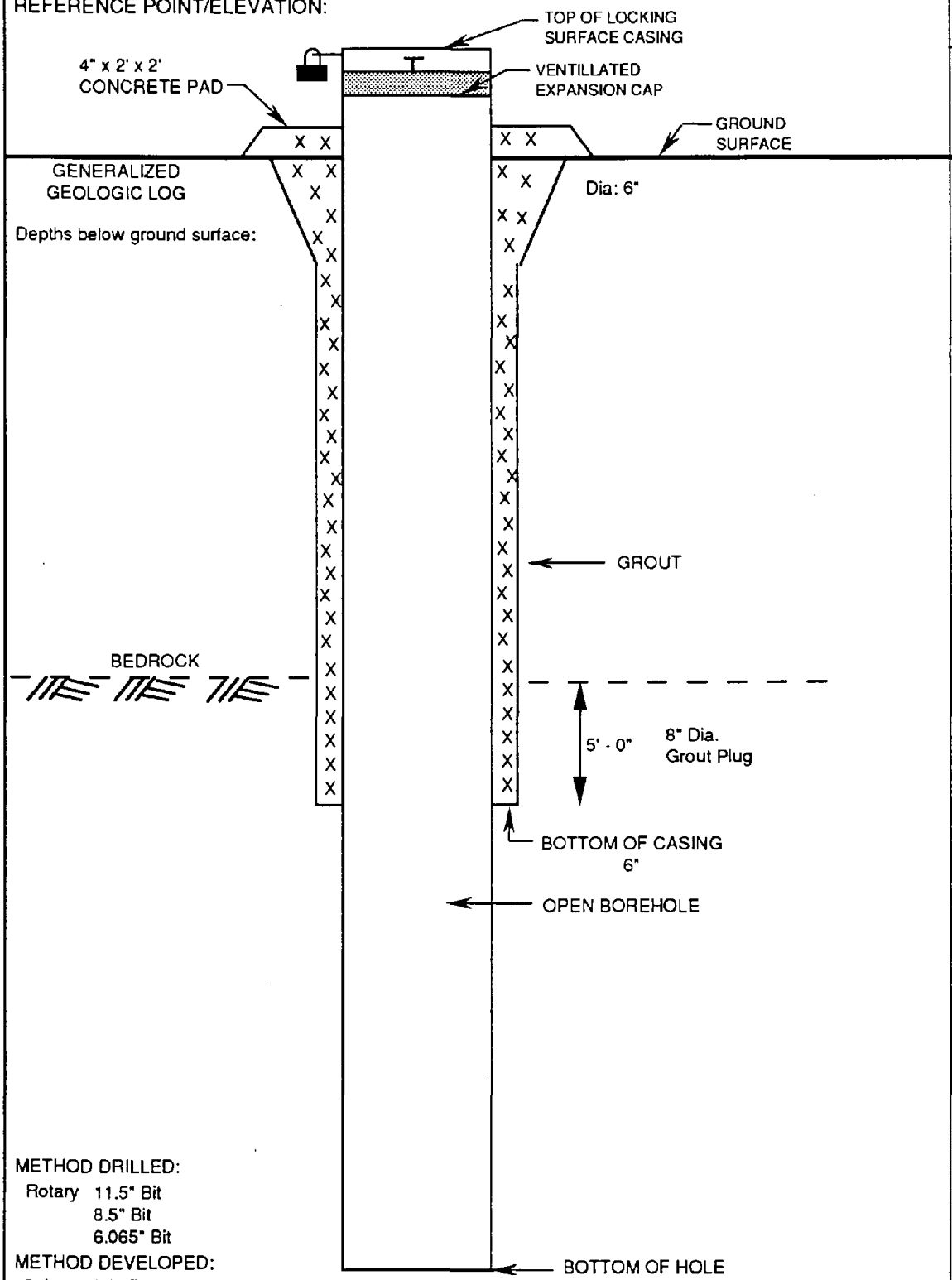
M&E Metcalf & Eddy

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

2119jp

EXTRACTION WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW04-03
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141485.221N 502004.464E		
BEGUN: 8/ /91 FINISHED: 8/16/91	SUPERVISOR: Berler DRILLER: Vern & Joe	WELL SITE: MW04-03	WATER LEVEL: DEPTH/ELEV. 6.60/38.66

REFERENCE POINT/ELEVATION:



DEPTH (FT)	ELEV.(FT)
1.37	46.63
0.0	45.26
35.3	9.96
39.9	5.36
45.3	-0.04
140.00	-94.74

METHOD DRILLED:
Rotary 11.5" Bit
8.5" Bit
6.065" Bit

METHOD DEVELOPED:
Submersible Pump

TIME DEVELOPED: 6.5 Hours

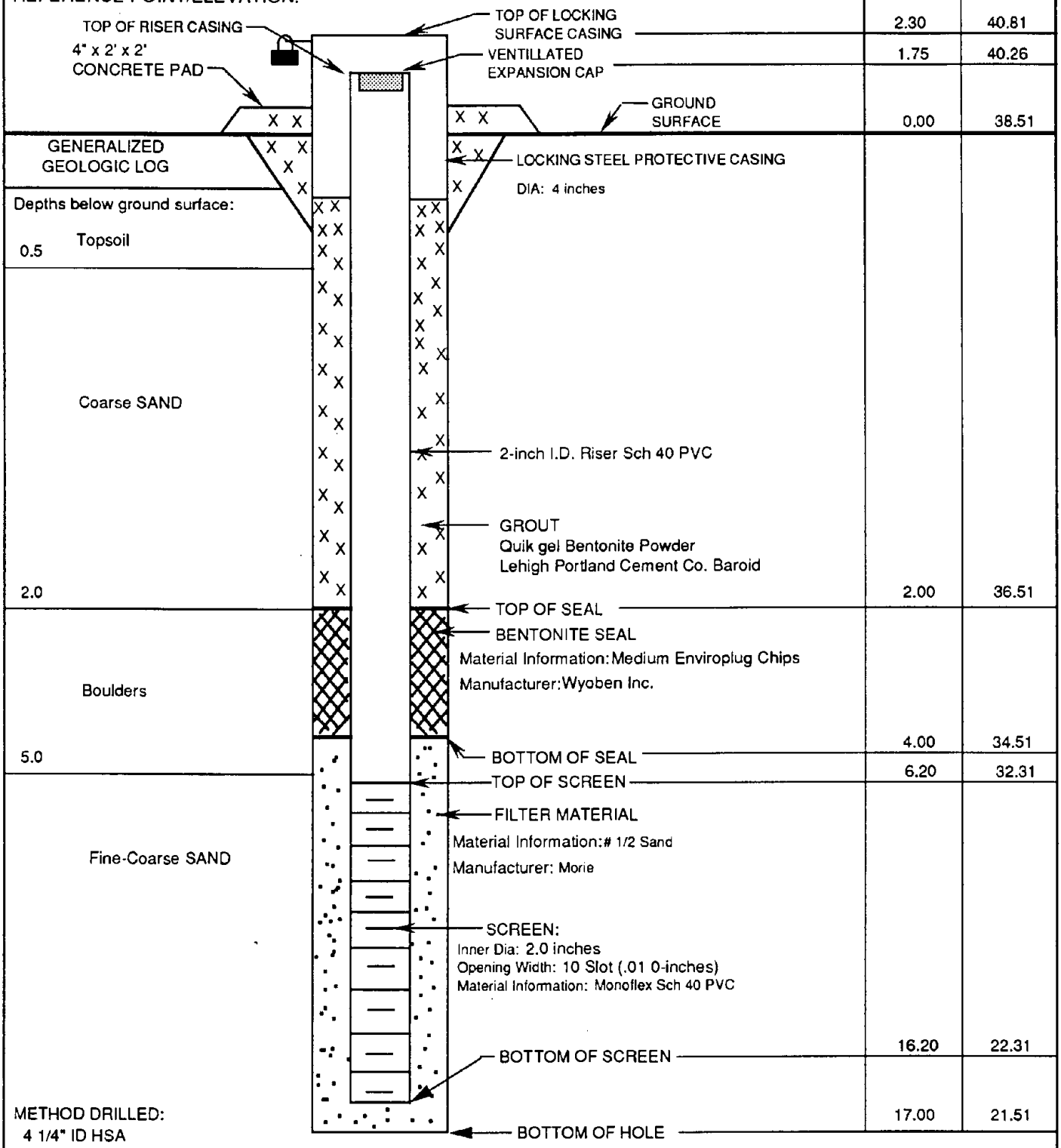
COMMENTS:

Metcalf & Eddy

BEDROCK EXTRACTION WELL AND BEDROCK MONITORING WELL CONSTRUCTION DETAIL 2119jp

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW05-01
DRILLING CONTRACTOR: East Coast	COORDINATES: 140370.823N 502800.516E		
BEGUN: 8/27/91 FINISHED: 8/29/91	SUPERVISOR: Kris Arena DRILLER: Tim Szabo	WELL SITE: MW05-01	WATER LEVEL: DEPTH/ELEV. 6.45/31.84

REFERENCE POINT/ELEVATION: TOP OF PVC/40.26



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.30	40.81
VENTILLATED EXPANSION CAP	1.75	40.26
GROUND SURFACE	0.00	38.51
2.0	2.00	36.51
5.0	4.00	34.51
BOTTOM OF SEAL / TOP OF SCREEN	6.20	32.31
BOTTOM OF SCREEN	16.20	22.31
BOTTOM OF HOLE	17.00	21.51

METHOD DRILLED: 4 1/4" ID HSA

METHOD DEVELOPED: Brainard Killman Pump

TIME DEVELOPED: 1 Hour

HOLE DIAMETER: 8"

COMMENTS:

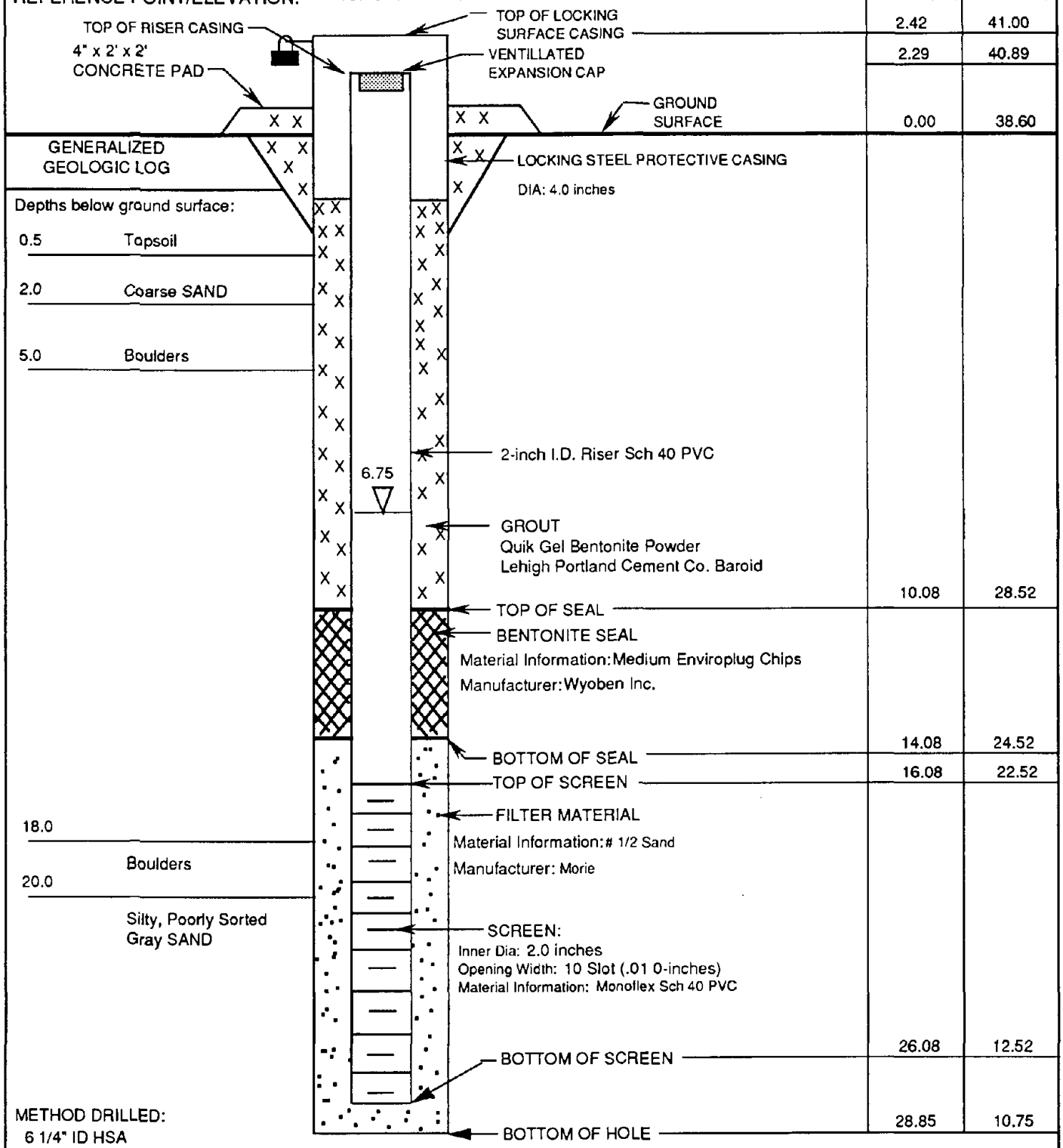
Metcalf & Eddy

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

2119jp

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW05-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140357.166N 502795.226E		
BEGUN: 8/27/91 FINISHED: 8/28/91	SUPERVISOR: Kris Arena DRILLER: Tim Szabo	WELL SITE: MW05-02	WATER LEVEL: DEPTH/ELEV. 6.75/31.85

REFERENCE POINT/ELEVATION: TOP OF PVC/40.89



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.42	41.00
VENTILLATED EXPANSION CAP	2.29	40.89
GROUND SURFACE	0.00	38.60
TOP OF SEAL	10.08	28.52
BOTTOM OF SEAL	14.08	24.52
TOP OF SCREEN	16.08	22.52
BOTTOM OF SCREEN	26.08	12.52
BOTTOM OF HOLE	28.85	10.75

METHOD DRILLED:
6 1/4" ID HSA
4" ID Casing Spun
METHOD DEVELOPED:
Centrifugal
TIME DEVELOPED: 1.1 Hours

HOLE DIAMETER: 8"

COMMENTS:

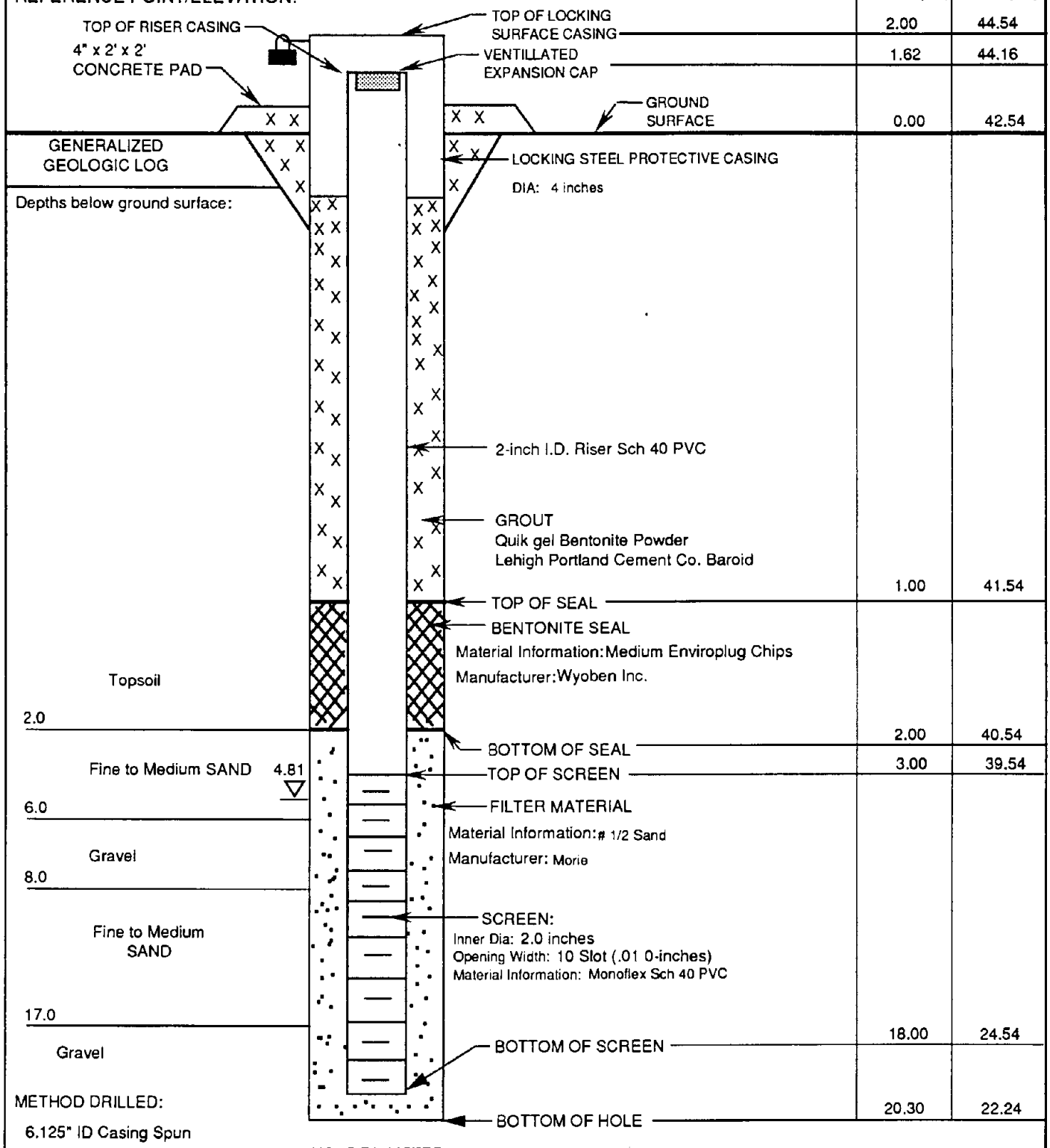
M&E Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW06-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140835.634N 502035.438E		
BEGUN: 8/27/91 FINISHED: 8/27/91	SUPERVISOR: D. Berler DRILLER: Tim Szabo	WELL SITE: MW06-01	WATER LEVEL: DEPTH/ELEV. 4.81/37.73

REFERENCE POINT/ELEVATION: TOP OF PVC/44.16



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.00	44.54
VENTILLATED EXPANSION CAP	1.62	44.16
GROUND SURFACE	0.00	42.54
TOP OF SEAL	1.00	41.54
BOTTOM OF SEAL	2.00	40.54
TOP OF SCREEN	3.00	39.54
BOTTOM OF SCREEN	18.00	24.54
BOTTOM OF HOLE	20.30	22.24

METHOD DRILLED:
6.125" ID Casing Spun

METHOD DEVELOPED:
Surge/Centrifugal
TIME DEVELOPED: 4.5 Hours

HOLE DIAMETER: 10"

COMMENTS:

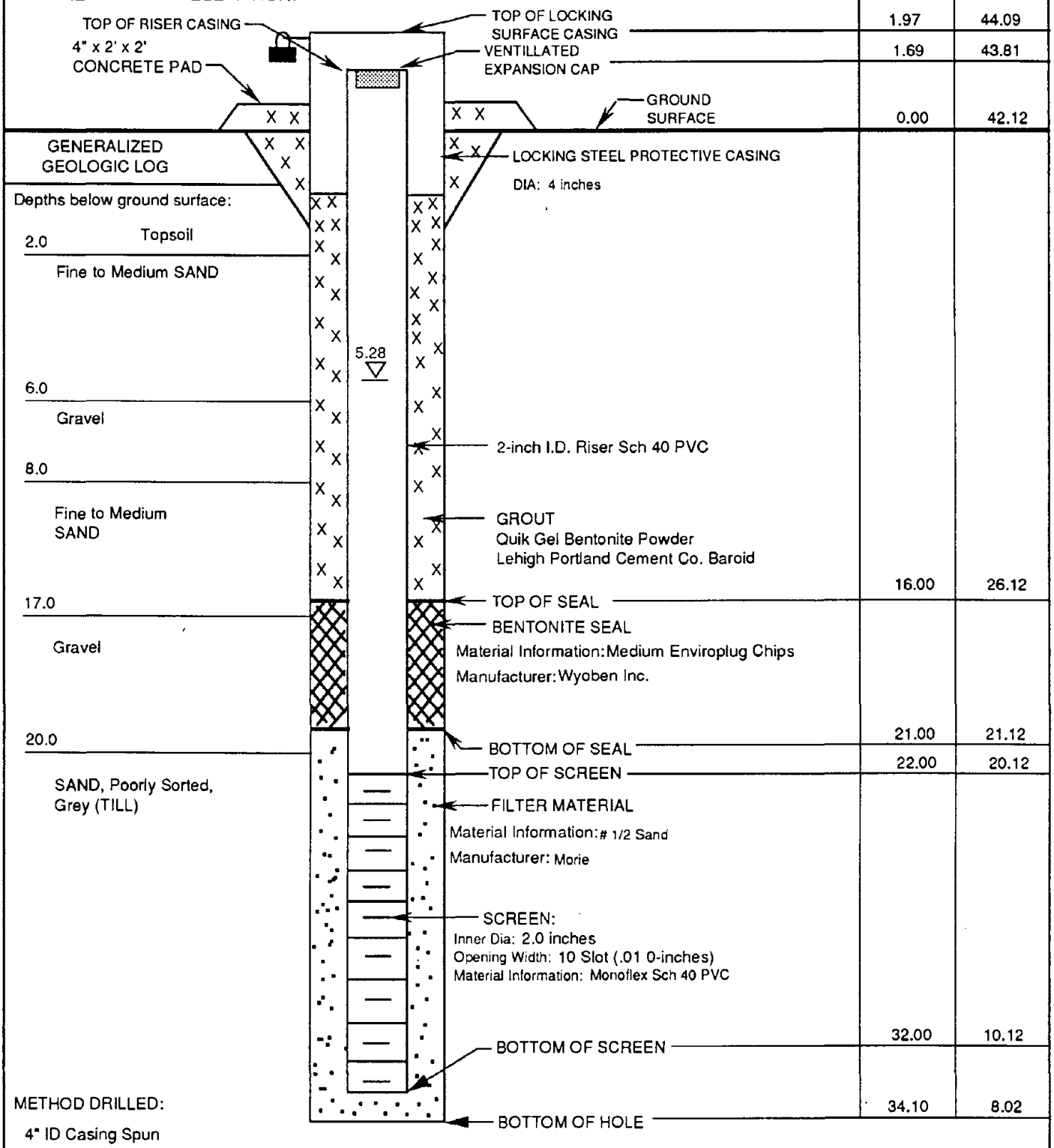
Metcalf & Eddy

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

2119JP

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW06-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140842.934N 502044.046E		
BEGUN: 8/22/91 FINISHED: 8/27/91	SUPERVISOR: D. Berler DRILLER: Tim Szabo	WELL SITE: MW06-02	WATER LEVEL: DEPTH/ELEV. 5.28/36.84

REFERENCE POINT/ELEVATION: TOP OF PVC/43.81



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	1.97	44.09
VENTILLATED EXPANSION CAP	1.69	43.81
GROUND SURFACE	0.00	42.12
TOP OF SEAL	16.00	26.12
BOTTOM OF SEAL	21.00	21.12
TOP OF SCREEN	22.00	20.12
BOTTOM OF SCREEN	32.00	10.12
BOTTOM OF HOLE	34.10	8.02

METHOD DRILLED:
4" ID Casing Spun

METHOD DEVELOPED:
Surge/Centrifugal

TIME DEVELOPED: 2.5 Hours

HOLE DIAMETER: 8"

COMMENTS:

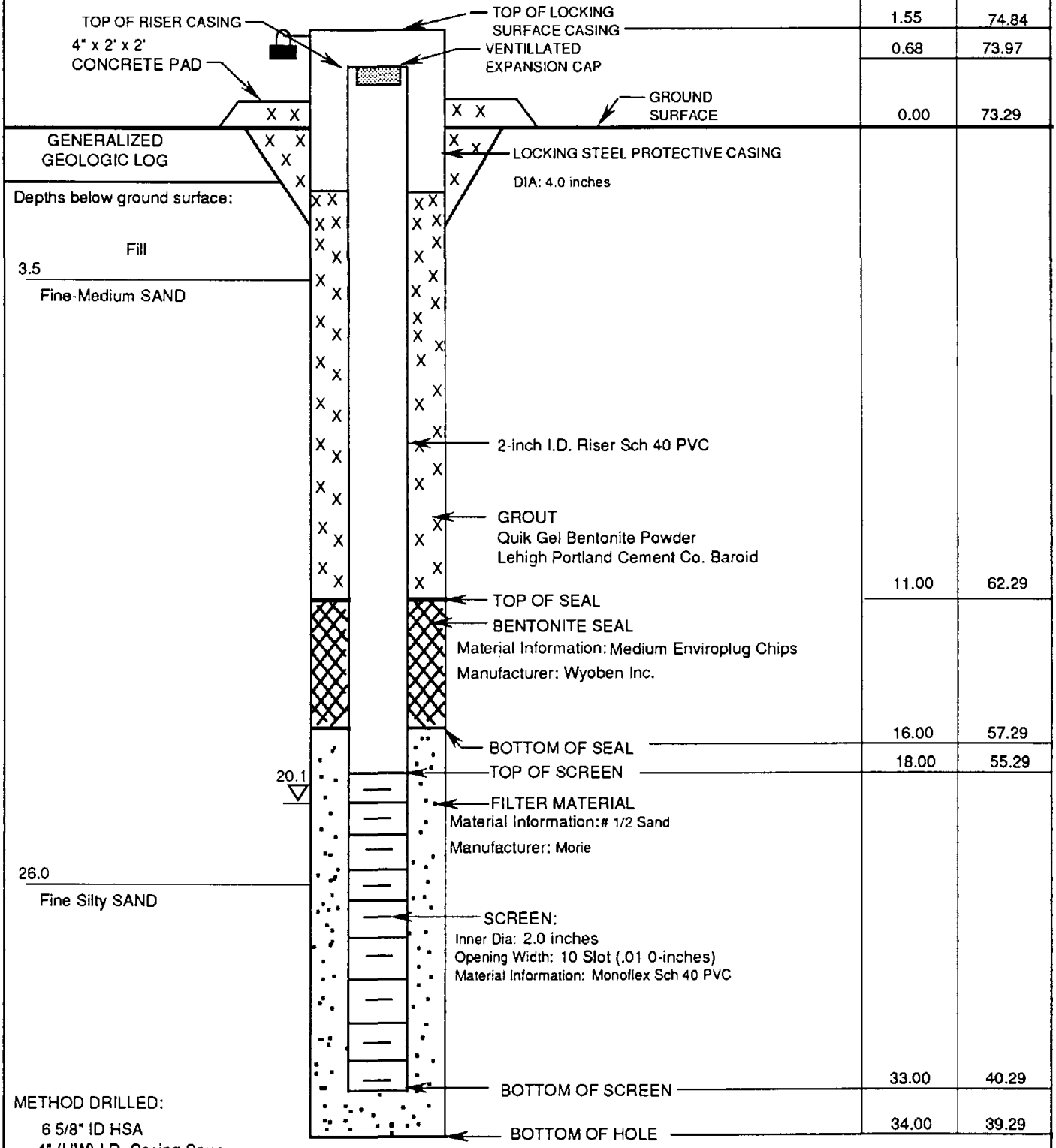
Metcalf & Eddy

2119JP

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW07-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141512.697N 500933.370E		
BEGUN: 8/15/91 FINISHED: 8/18/91	SUPERVISOR: Mark Lewis/Harten DRILLER: Sal Spatatora	WELL SITE: MW07-01	WATER LEVEL: DEPTH/ELEV. 20.1/53.19

REFERENCE POINT/ELEVATION: TOP OF PVC/73.97



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	1.55	74.84
VENTILLATED EXPANSION CAP	0.68	73.97
GROUND SURFACE	0.00	73.29
TOP OF SEAL	11.00	62.29
BOTTOM OF SEAL	16.00	57.29
TOP OF SCREEN	18.00	55.29
BOTTOM OF SCREEN	33.00	40.29
BOTTOM OF HOLE	34.00	39.29

METHOD DRILLED:
6 5/8" ID HSA
4" (HW) I.D. Casing Spun

METHOD DEVELOPED:
Brainard Killman Pump
TIME DEVELOPED: 0.33 Hours

COMMENTS:

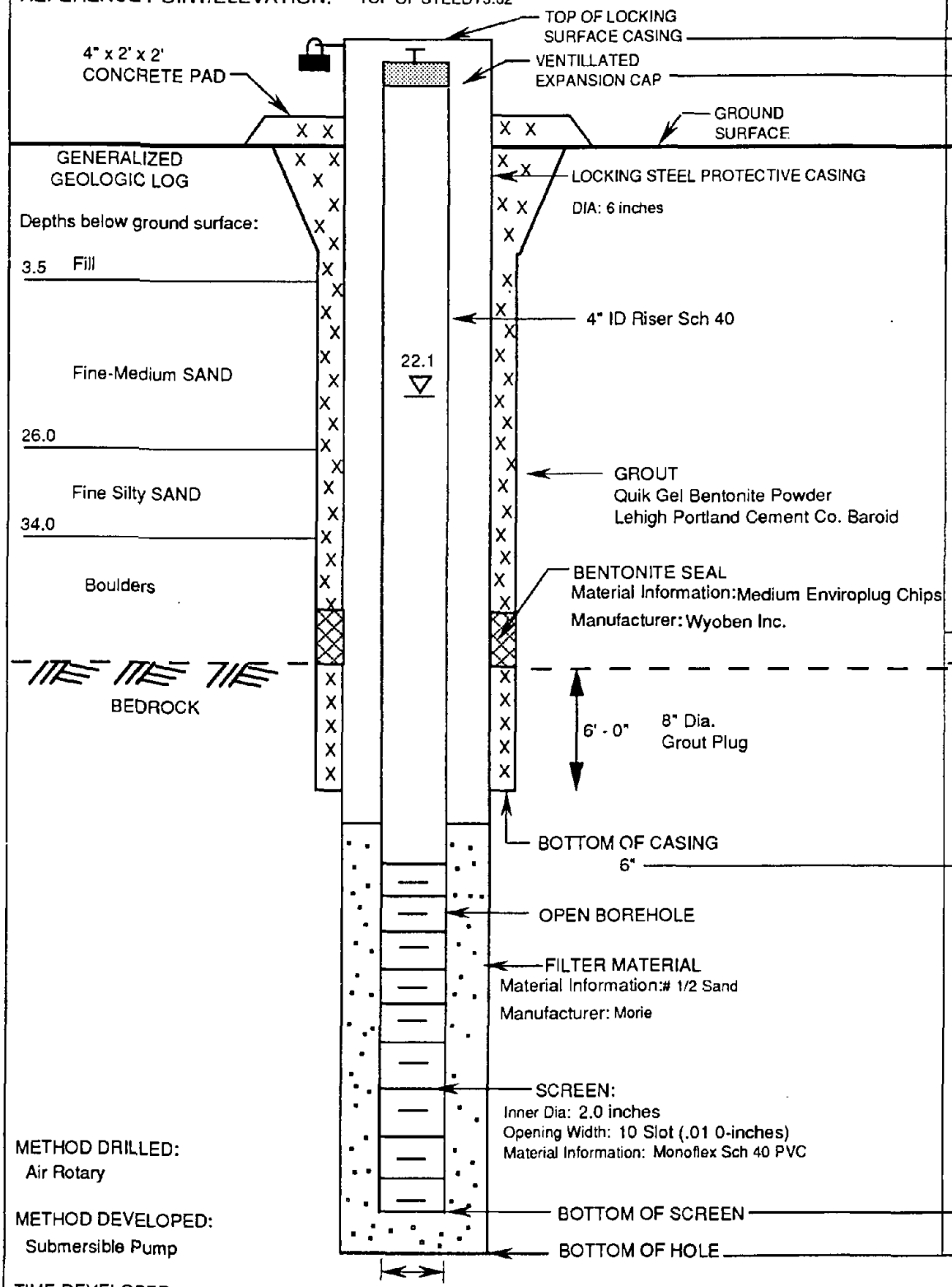
Metcalf & Eddy

2119JP

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

BEDROCK MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW-07-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141526.224N 500929.267E		
BEGUN: FINISHED:	SUPERVISOR: Berler DRILLER: Vern Tortlet	WELL SITE: MW-07-02	WATER LEVEL: DEPTH/ELEV. 22.1/51.24

REFERENCE POINT/ELEVATION: TOP OF STEEL/75.32



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.28	75.63
VENTILLATED EXPANSION CAP	1.97	75.32
GROUND SURFACE	0.0	73.35
BENTONITE SEAL (Material Information: Medium Enviroplug Chips; Manufacturer: Wyoben Inc.)	43.00	30.35
	44.00	29.35
BOTTOM OF CASING 6"	45.00	28.35
BOTTOM OF SCREEN	72.62	0.73
BOTTOM OF HOLE	85.7	-12.35

LOCKING STEEL PROTECTIVE CASING
DIA: 6 inches

4" ID Riser Sch 40

GROUT
Quik Gel Bentonite Powder
Lehigh Portland Cement Co. Baroid

OPEN BOREHOLE

FILTER MATERIAL
Material Information:# 1/2 Sand
Manufacturer: Morie

SCREEN:
Inner Dia: 2.0 inches
Opening Width: 10 Slot (.01 0-inches)
Material Information: Monoflex Sch 40 PVC

METHOD DRILLED: Air Rotary

METHOD DEVELOPED: Submersible Pump

TIME DEVELOPED: 2 Hours

COMMENTS:

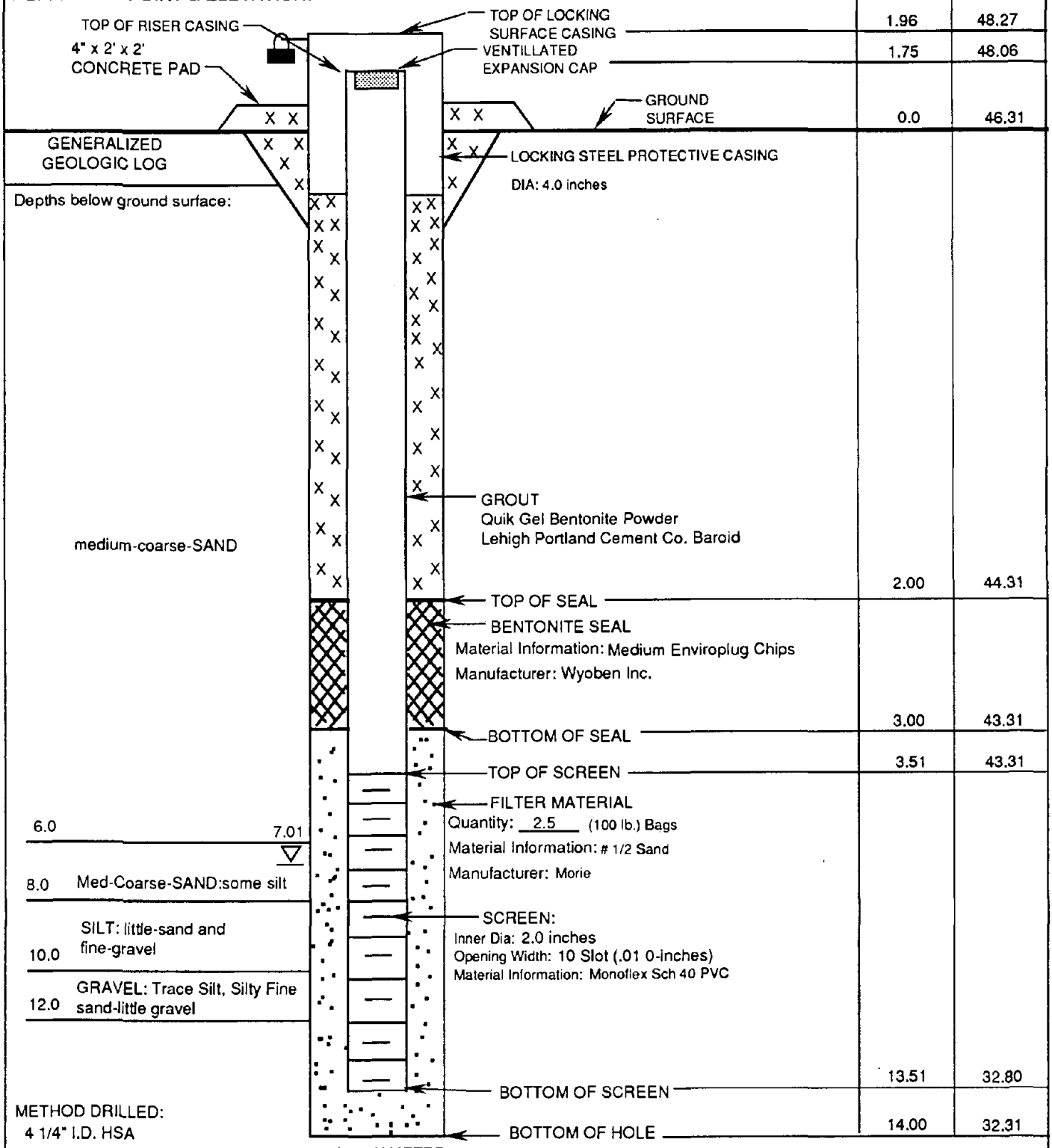
Metcalf & Eddy

BEDROCK MONITORING WELL CONSTRUCTION DETAIL

2736jp

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW08-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140542.511N 501073.472E		
BEGUN: 8/9/91 FINISHED: 8/12/91	SUPERVISOR: Mark Lewis DRILLER: Vern Torttlet	WELL SITE: MW08-01	WATER LEVEL: DEPTH/ELEV. 7.01/39.30

REFERENCE POINT & ELEVATION: TOP OF PVC/48.06



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	1.96	48.27
VENTILLATED EXPANSION CAP	1.75	48.06
GROUND SURFACE	0.0	46.31
TOP OF SEAL	2.00	44.31
BOTTOM OF SEAL	3.00	43.31
TOP OF SCREEN	3.51	43.31
BOTTOM OF SCREEN	13.51	32.80
BOTTOM OF HOLE	14.00	32.31

METHOD DRILLED:
4 1/4" I.D. HSA

METHOD DEVELOPED:
Surge Block and Centrifugal Pump

TIME DEVELOPED: .75 Hours

COMMENTS:

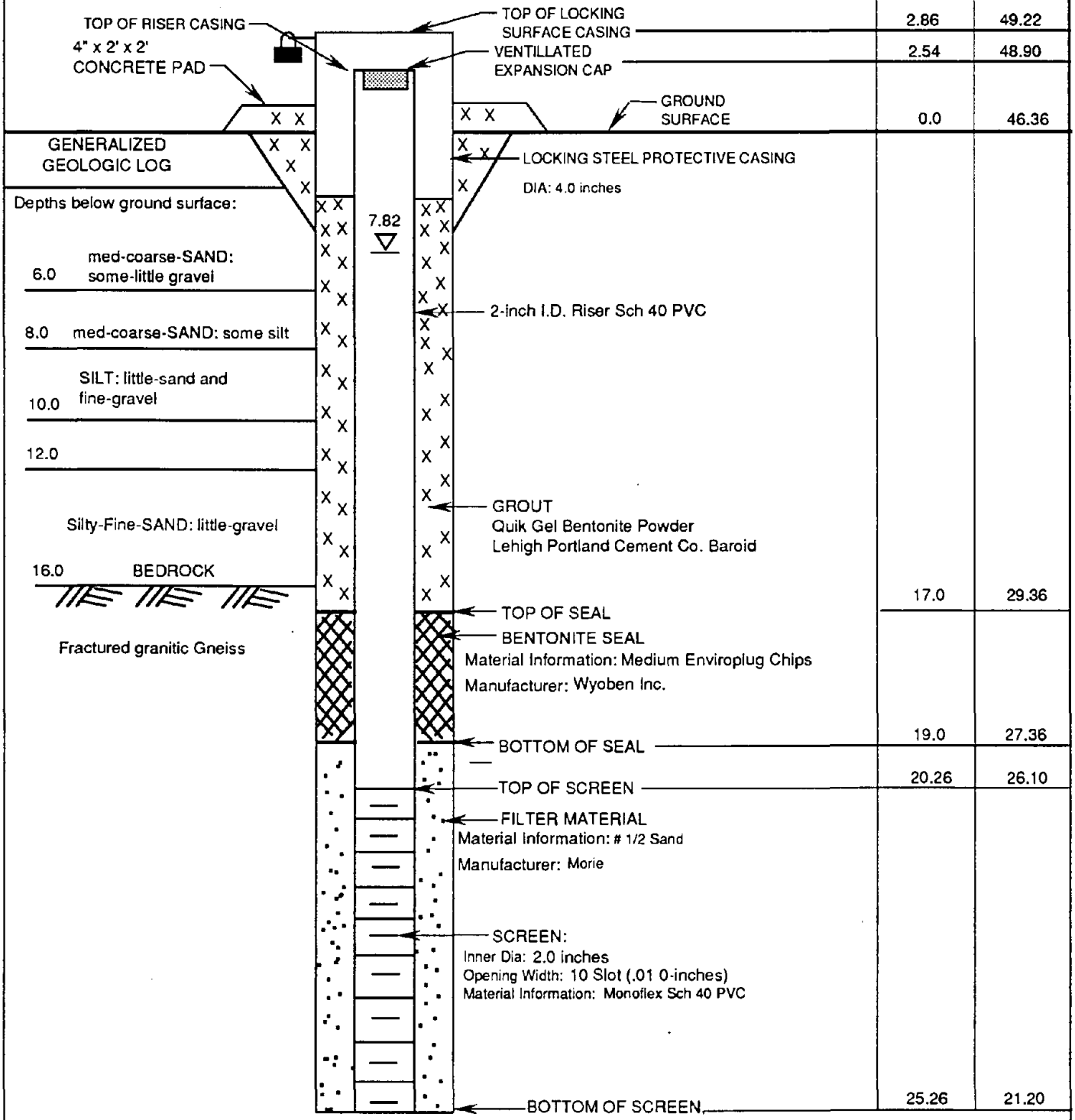
Metcalf & Eddy

2119jp

WELL CONSTRUCTION DETAIL

BEDROCK MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW08-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140559.225N 501063.855E		
BEGUN: 8/13/91 FINISHED: 8/15/91	SUPERVISOR: Mark Lewis DRILLER: Sal Spatafora	WELL SITE: MW08-02	WATER LEVEL: DEPTH/ELEV. 7.92/138.44

REFERENCE POINT & ELEVATION: TOP OF PVC/48.90



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.86	49.22
VENTILLATED EXPANSION CAP	2.54	48.90
GROUND SURFACE	0.0	46.36
TOP OF SEAL	17.0	29.36
BOTTOM OF SEAL	19.0	27.36
TOP OF SCREEN	20.26	26.10
BOTTOM OF SCREEN, BOTTOM OF HOLE	25.26	21.20

METHOD DRILLED:
4.0" I.D. HSA

METHOD DEVELOPED:
Brainard Killman Pump

TIME DEVELOPED: .5 Hours

HOLE DIAMETER:
8.0"

COMMENTS:

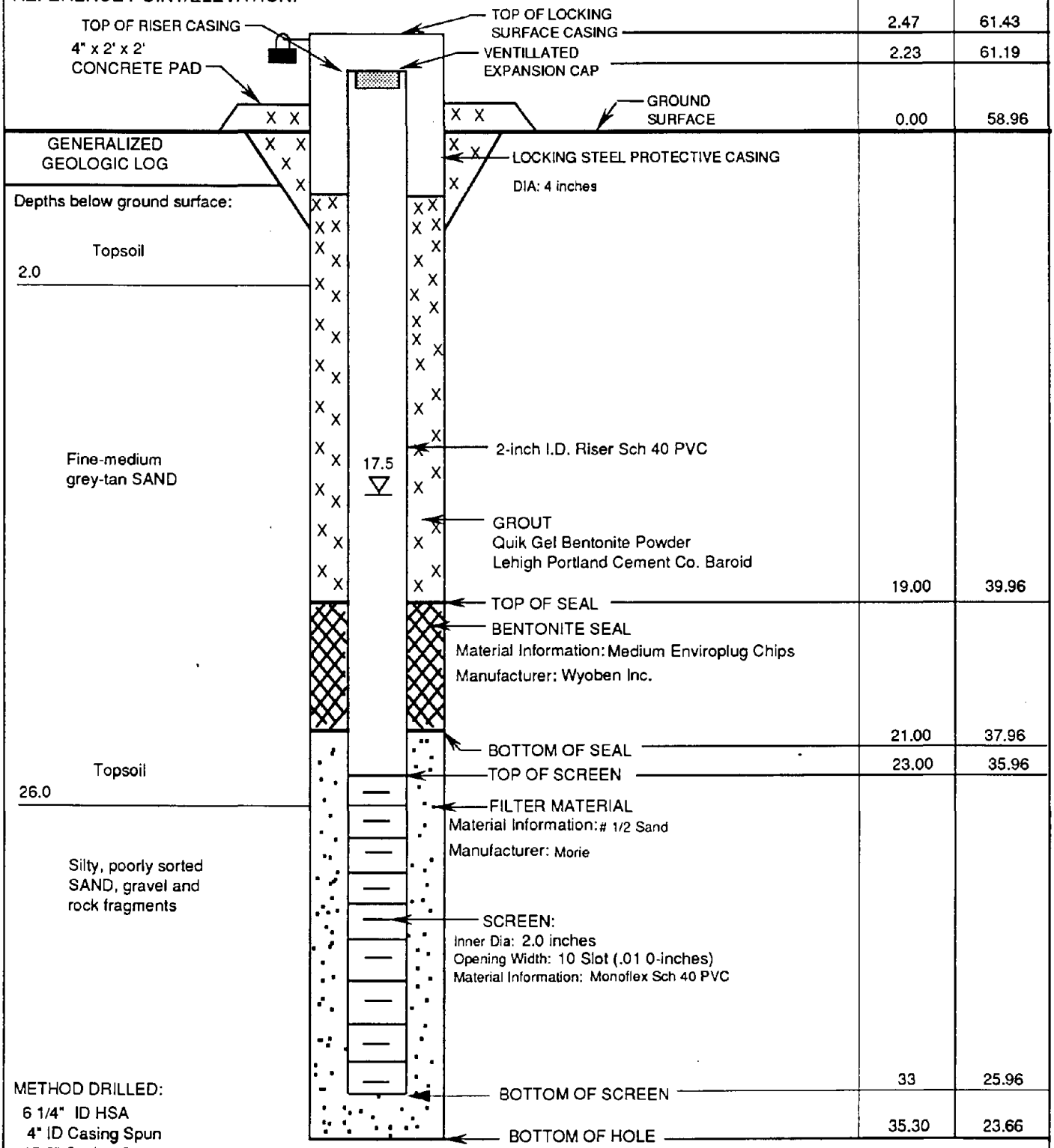
Metcalf & Eddy

2119jp

BEDROCK MONITORING WELL CONSTRUCTION DETAIL

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW09-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141797.919N 503548.172E		
BEGUN: 8/30/91 FINISHED: 8/30/91	SUPERVISOR: K. Arena DRILLER: Tim Szabo	WELL SITE: MW09-01	WATER LEVEL: DEPTH/ELEV. 17.5/41.46

REFERENCE POINT/ELEVATION: TOP OF PVC/61.14



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.47	61.43
VENTILLATED EXPANSION CAP	2.23	61.19
GROUND SURFACE	0.00	58.96
TOP OF SEAL	19.00	39.96
BOTTOM OF SEAL	21.00	37.96
TOP OF SCREEN	23.00	35.96
BOTTOM OF SCREEN	33	25.96
BOTTOM OF HOLE	35.30	23.66

METHOD DRILLED:
6 1/4" ID HSA
4" ID Casing Spun
15.5" Casing Spun
18.5" casing Spun

METHOD DEVELOPED:
Hand/Surge/Brainard Killman Pump

TIME DEVELOPED: 1 Hours

COMMENTS:

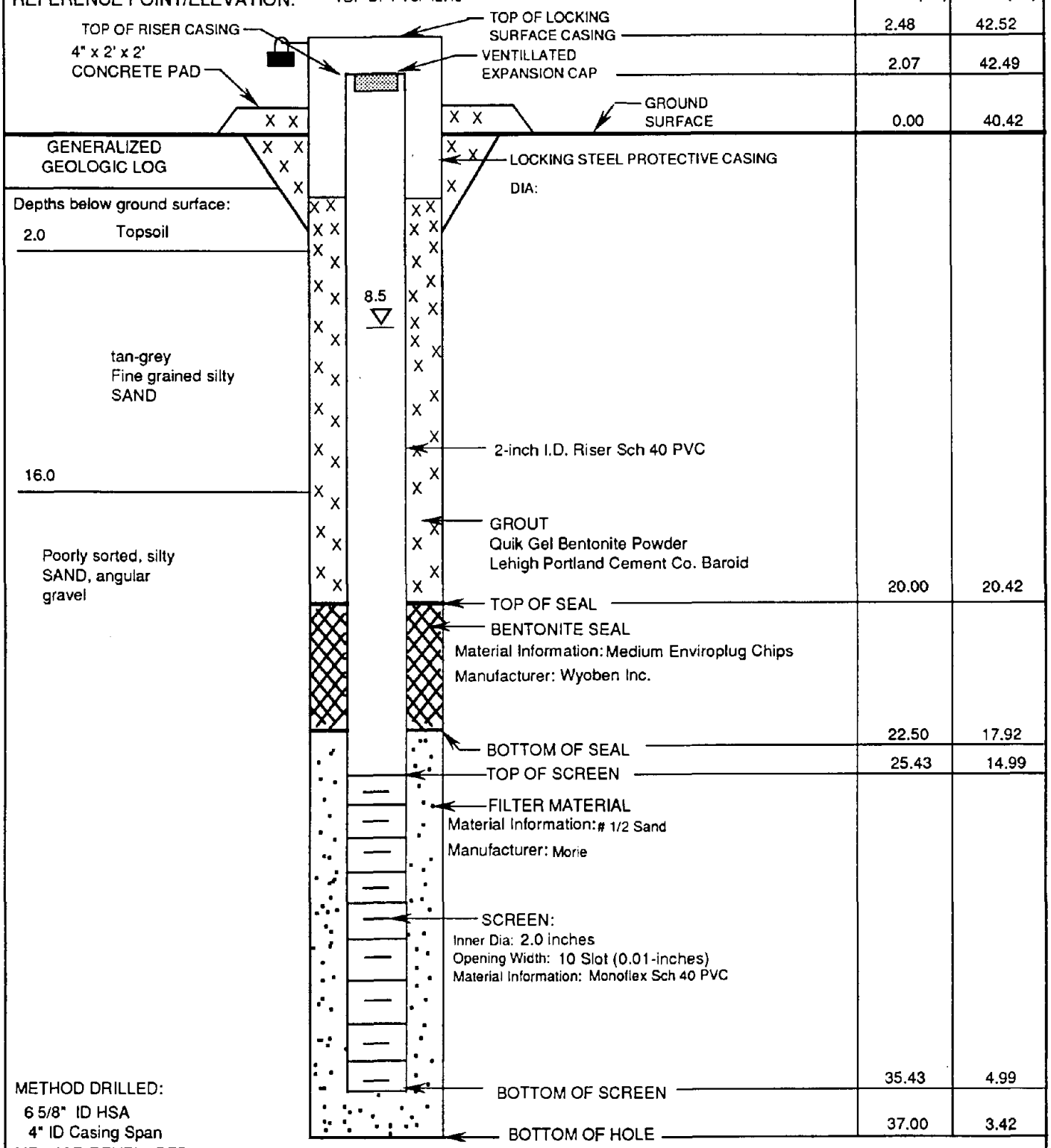
Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW10-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140125.137N 502936.521E		
BEGUN: 8/26/91 FINISHED: 8/26/91	SUPERVISOR: Lewis DRILLER: Sal Spatatora	WELL SITE: MW10-01	WATER LEVEL: DEPTH/ELEV. 8.5/31.92

REFERENCE POINT/ELEVATION: TOP OF PVC/ 42.49



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.48	42.52
VENTILLATED EXPANSION CAP	2.07	42.49
GROUND SURFACE	0.00	40.42
TOP OF SEAL	20.00	20.42
BOTTOM OF SEAL	22.50	17.92
TOP OF SCREEN	25.43	14.99
BOTTOM OF SCREEN	35.43	4.99
BOTTOM OF HOLE	37.00	3.42

METHOD DRILLED:
6 5/8" ID HSA
4" ID Casing Span

METHOD DEVELOPED:
Hand/Surge/Brainard Killman Pump/ Centrifugal

TIME DEVELOPED: 1.75 Hours

HOLE DIAMETER: 10"

COMMENTS:

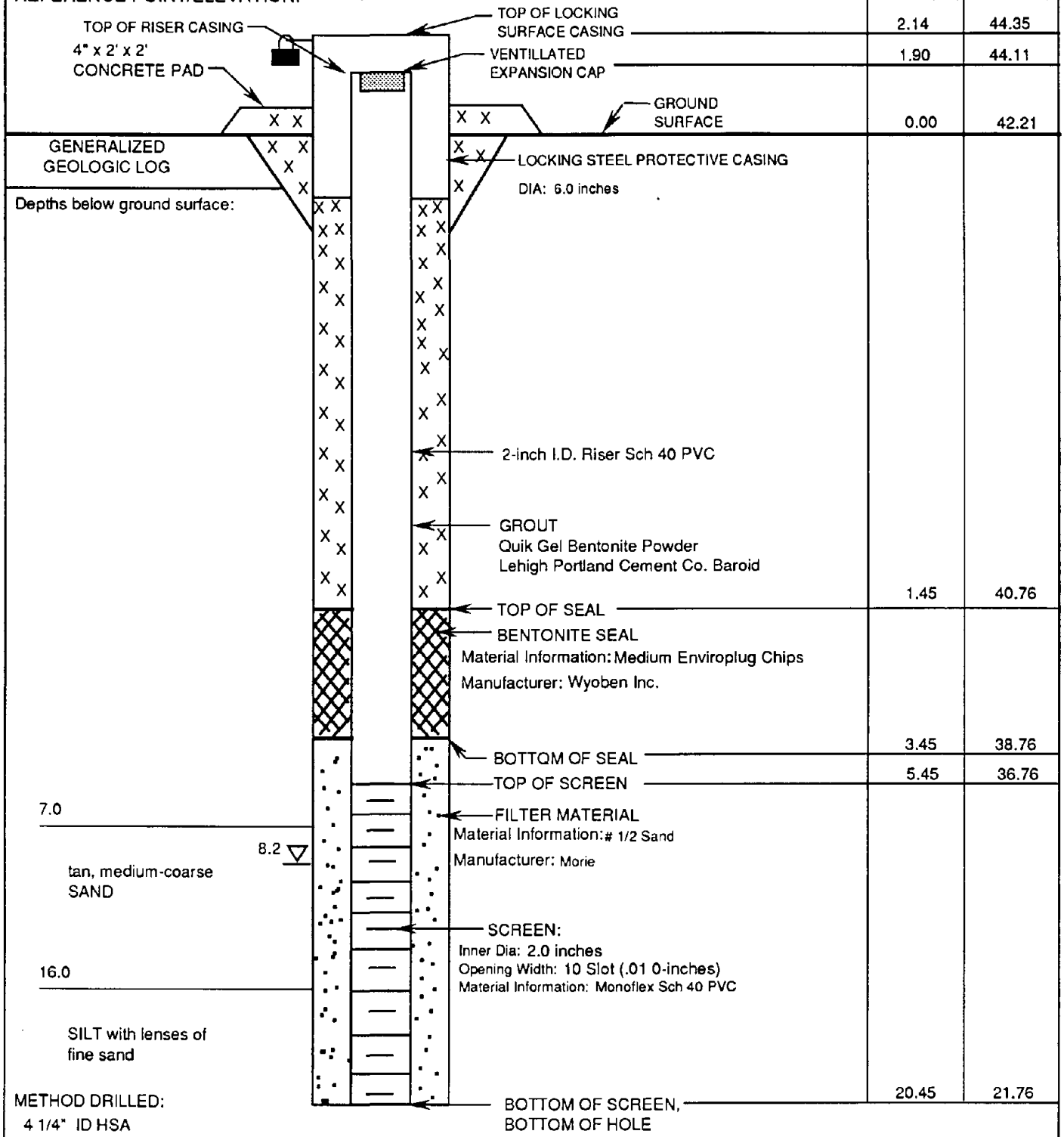
Metcalf & Eddy

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

2119p

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW11-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140515.714N 501977.612E		
BEGUN: 8/22/91 FINISHED: 8/22/91	SUPERVISOR: Lewis DRILLER: Sal Spatatora	WELL SITE: MW11-01	WATER LEVEL: DEPTH/ELEV. 8.2/34.01

REFERENCE POINT/ELEVATION: TOP OF PVC/44.11



DEPTH (FT)	ELEV.(FT)
2.14	44.35
1.90	44.11
0.00	42.21
1.45	40.76
3.45	38.76
5.45	36.76
20.45	21.76

METHOD DRILLED: 4 1/4" ID HSA

METHOD DEVELOPED: Brainard Killman Pump/Centrifugal

TIME DEVELOPED: 1.5 Hours

HOLE DIAMETER: 8"

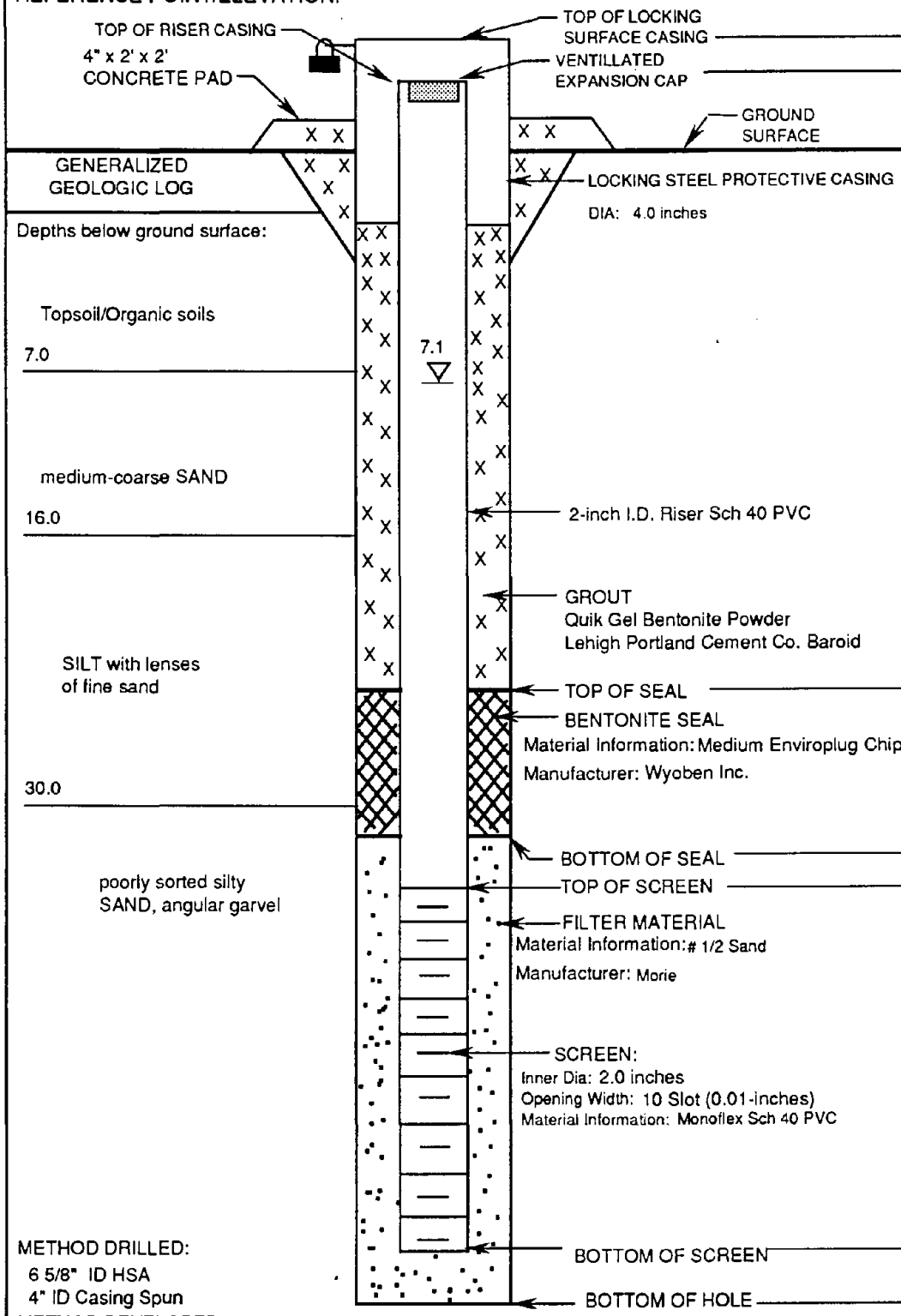
COMMENTS:

Metcalf & Eddy

2119jp

DEEP OVERBURDEN WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW11-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140508.049N 501954.032E		
BEGUN: 8/15/91 FINISHED: 8/22/91	SUPERVISOR: Lewis DRILLER: Sal Spatatora	WELL SITE: MW11-02	WATER LEVEL: DEPTH/ELEV. 7.1/34.21

REFERENCE POINT/ELEVATION: TOP OF PVC/43.60



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.58	43.89
VENTILLATED EXPANSION CAP	2.29	43.60
GROUND SURFACE	0.00	41.31
TOP OF SEAL	28.50	12.81
BOTTOM OF SEAL	31.00	10.31
TOP OF SCREEN	34.00	7.31
BOTTOM OF SCREEN	44.00	-2.69
BOTTOM OF HOLE	44.70	-3.39

METHOD DRILLED:
6 5/8" ID HSA
4" ID Casing Spun

METHOD DEVELOPED:
Brainard Killman Pump/Surge

TIME DEVELOPED: 0.75 Hours

COMMENTS:

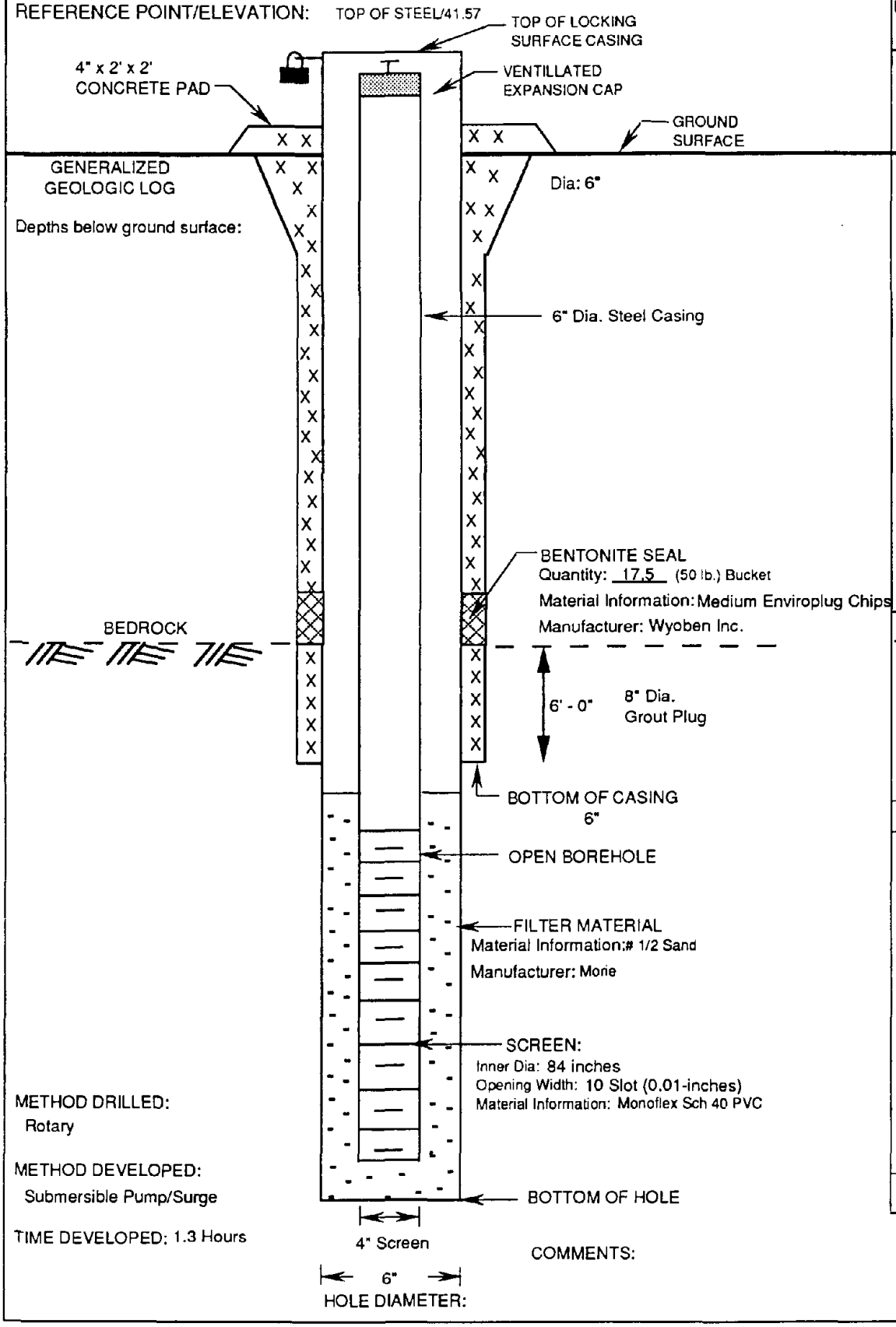
Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

BEDROCK MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW-11-03
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140499.650N 501941.617E		
BEGUN: 8/6/91 FINISHED: 8/11/91	SUPERVISOR: Harten DRILLER: Joe	WELL SITE: MW-11-03	WATER LEVEL: DEPTH/ELEV. 5.1/35.17

REFERENCE POINT/ELEVATION: TOP OF STEEL/41.57



DEPTH (FT)	ELEV.(FT)
1.71	41.98
0.0	40.27
44.00	-3.73
5.00	-4.73
46.00	-5.73
47.00	-6.73
77.00	-36.73
78.2	-37.93

METHOD DRILLED: Rotary

METHOD DEVELOPED: Submersible Pump/Surge

TIME DEVELOPED: 1.3 Hours

COMMENTS:

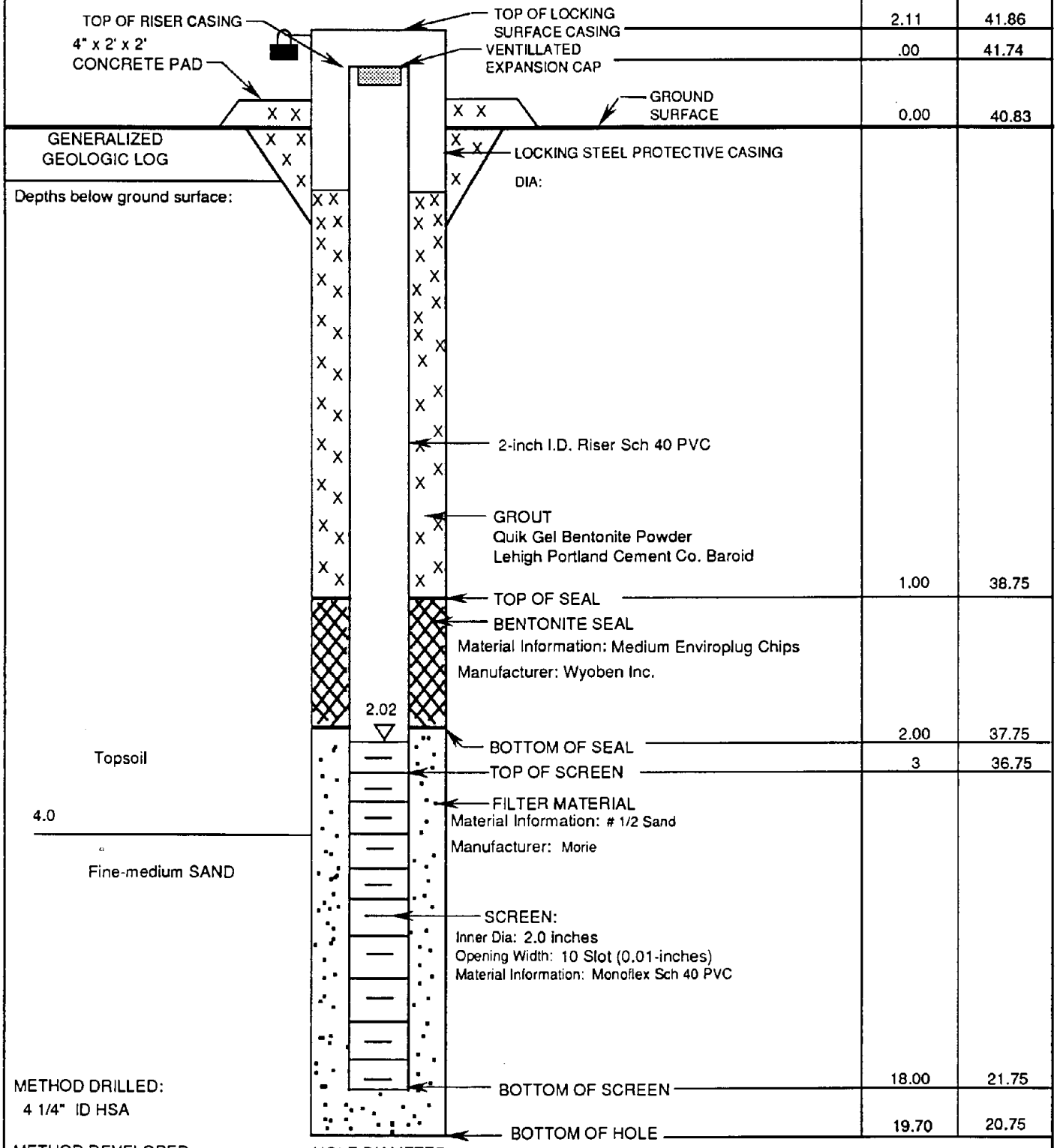
Metcalf & Eddy

2736jp

BEDROCK MONITORING WELL CONSTRUCTION DETAIL

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW12-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141419.845N 503060.135E		
BEGUN: 8/7/91 FINISHED: 8/14/91	SUPERVISOR: D. Berler DRILLER: Time Szabo	WELL SITE: MW12-01	WATER LEVEL: DEPTH/ELEV. 2.02/38.81

REFERENCE POINT/ELEVATION: TOP OF PVC/41.74



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.11	41.86
VENTILLATED EXPANSION CAP	.00	41.74
GROUND SURFACE	0.00	40.83
TOP OF SEAL	1.00	38.75
BOTTOM OF SEAL	2.00	37.75
TOP OF SCREEN	3	36.75
BOTTOM OF SCREEN	18.00	21.75
BOTTOM OF HOLE	19.70	20.75

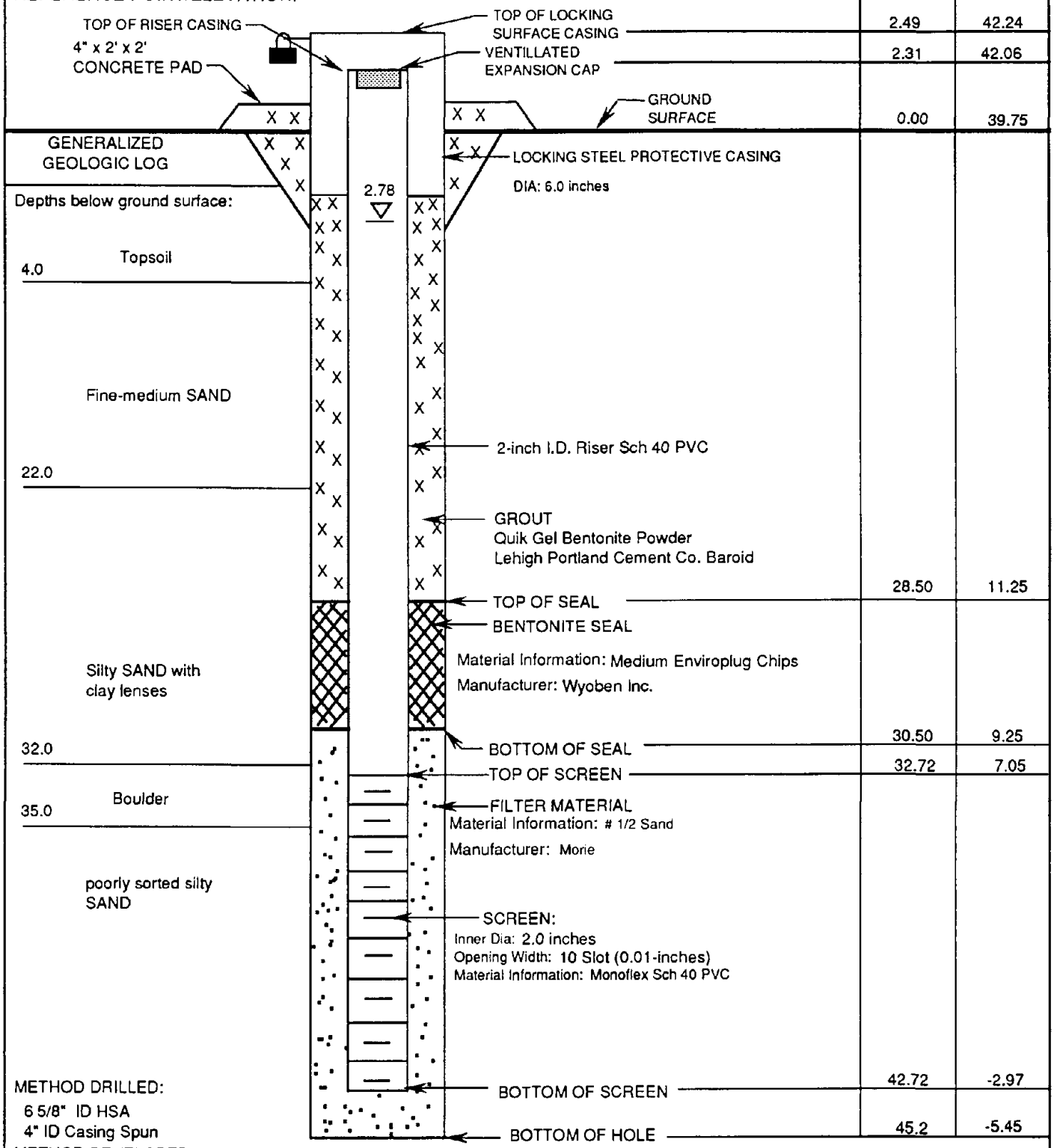
M&E Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW12-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141419.845N 503060.135E		
BEGUN: 8/14/91 FINISHED: 8/15/91	SUPERVISOR: D. Berler DRILLER: Time Szabo	WELL SITE: MW12-02	WATER LEVEL: DEPTH/ELEV. 2.78/36.97

REFERENCE POINT/ELEVATION: TOP OF PVC/42.06



	DEPTH (FT)	ELEV. (FT)
TOP OF LOCKING SURFACE CASING	2.49	42.24
VENTILLATED EXPANSION CAP	2.31	42.06
GROUND SURFACE	0.00	39.75
TOP OF SEAL	28.50	11.25
BOTTOM OF SEAL	30.50	9.25
TOP OF SCREEN	32.72	7.05
BOTTOM OF SCREEN	42.72	-2.97
BOTTOM OF HOLE	45.2	-5.45

METHOD DRILLED:
6 5/8" ID HSA
4" ID Casing Spun

METHOD DEVELOPED:
Brainard Killman Pump

TIME DEVELOPED: 1. Hour

COMMENTS:

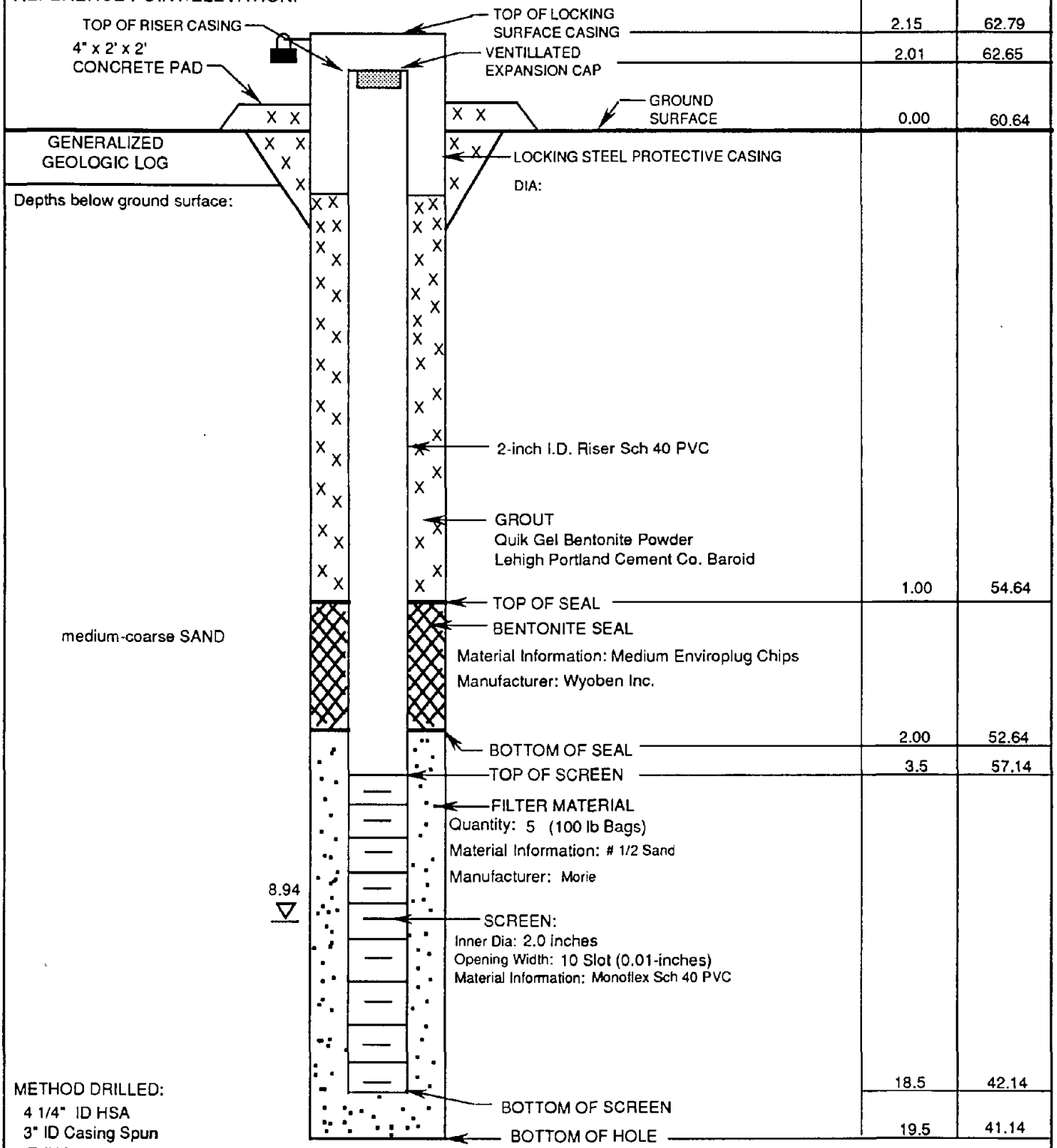
Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW13-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 142385.264N 501358.004E		
BEGUN: 7/22/91 FINISHED: 7/29/91	SUPERVISOR: D. Berier DRILLER: Brett & Al	WELL SITE: MW13-01	WATER LEVEL: DEPTH/ELEV. 8.94/51.70

REFERENCE POINT/ELEVATION: TOP OF PVC/62.65



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.15	62.79
VENTILLATED EXPANSION CAP	2.01	62.65
GROUND SURFACE	0.00	60.64
TOP OF SEAL	1.00	54.64
BOTTOM OF SEAL	2.00	52.64
TOP OF SCREEN	3.5	57.14
BOTTOM OF SCREEN	18.5	42.14
BOTTOM OF HOLE	19.5	41.14

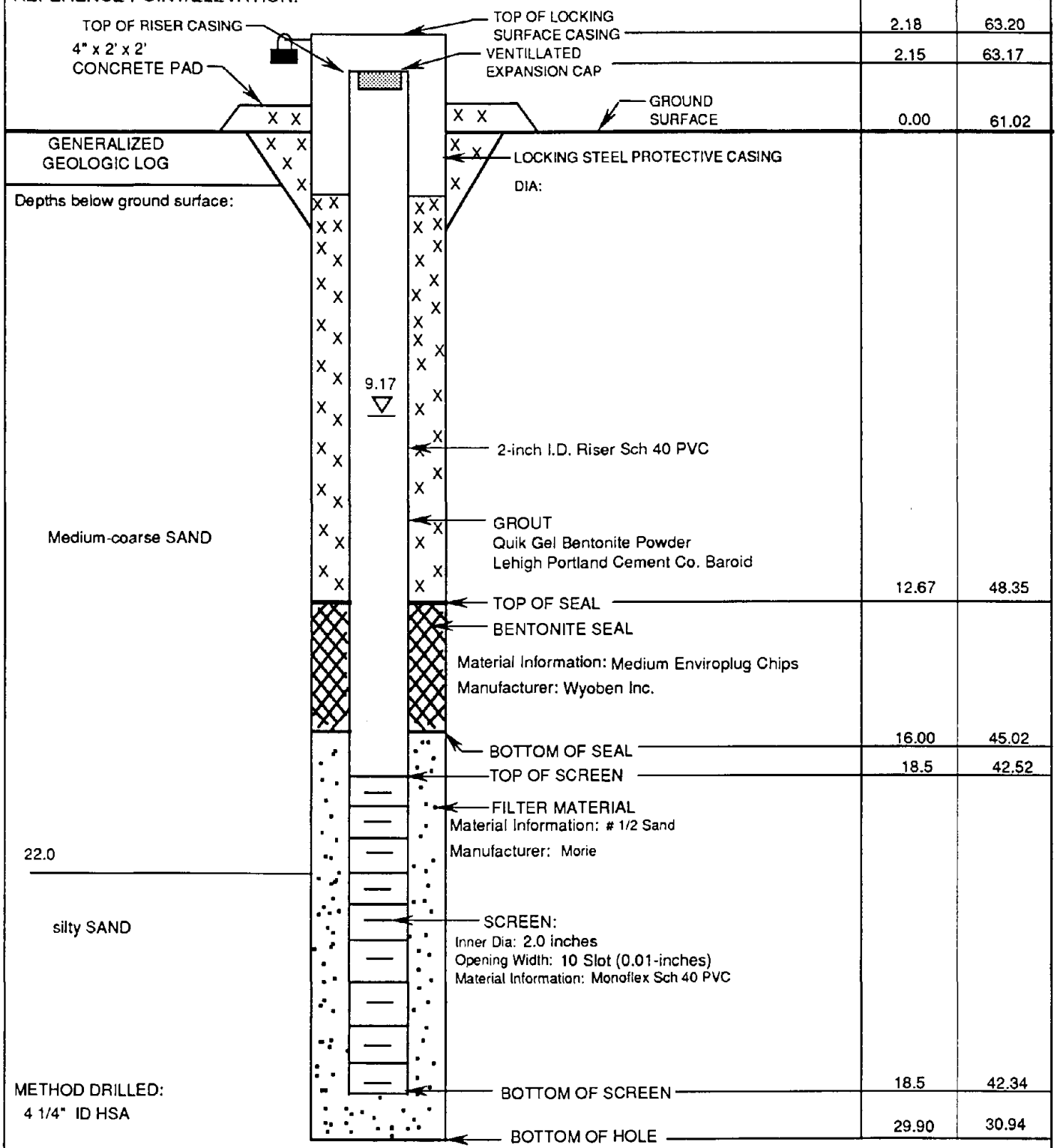
Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

DEEP OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW13-02
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 141419.845N 503060.135E		
BEGUN: 7/29/91 FINISHED: 7/30/91	SUPERVISOR: D. Berler DRILLER: Tim Szabo & Al	WELL SITE: MW13-02	WATER LEVEL: DEPTH/ELEV. 9.17/51.85

REFERENCE POINT/ELEVATION: TOP OF PVC/63.17



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.18	63.20
VENTILLATED EXPANSION CAP	2.15	63.17
GROUND SURFACE	0.00	61.02
TOP OF SEAL	12.67	48.35
BOTTOM OF SEAL	16.00	45.02
TOP OF SCREEN	18.5	42.52
BOTTOM OF SCREEN	18.5	42.34
BOTTOM OF HOLE	29.90	30.94

METHOD DRILLED: 4 1/4" ID HSA

METHOD DEVELOPED: Brainard Killman Pump

TIME DEVELOPED: 0.83 Hour

COMMENTS:

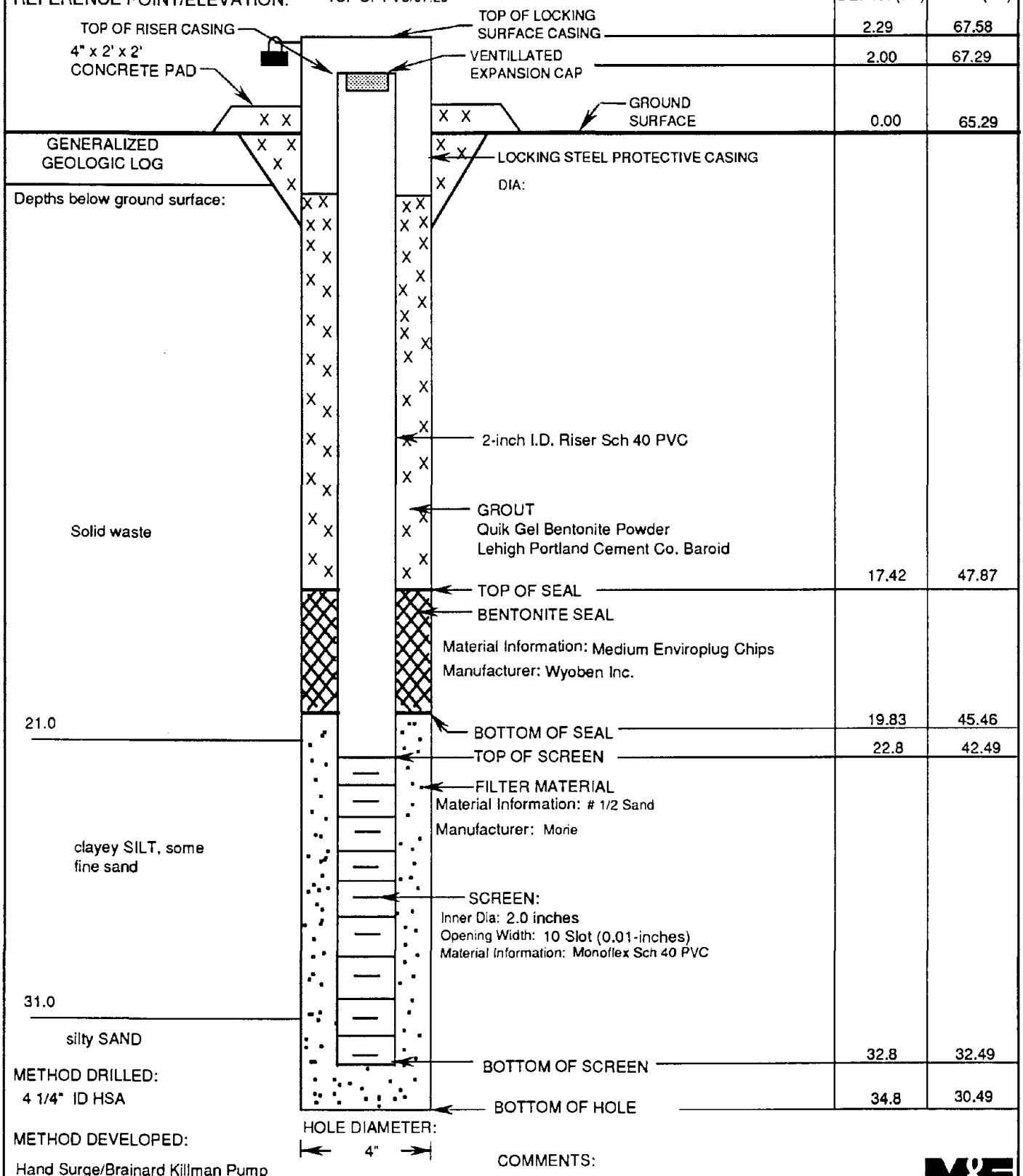
Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

SHALLOW OVERBURDEN MONITORING WELL INSTALLATION	PROJECT: Rose Hill	JOB NO. 004609	WELL NO. MW14-01
DRILLING CONTRACTOR: LaFramboise	COORDINATES: 140536.436N 501482.023E		
BEGUN: 8/26/91 FINISHED: 8/26/91	SUPERVISOR: D. Berler DRILLER: Sal Spatafora	WELL SITE: MW14-01	WATER LEVEL: DEPTH/ELEV. 27.7/37.65

REFERENCE POINT/ELEVATION: TOP OF PVC/67.29



	DEPTH (FT)	ELEV.(FT)
TOP OF LOCKING SURFACE CASING	2.29	67.58
VENTILLATED EXPANSION CAP	2.00	67.29
GROUND SURFACE	0.00	65.29
TOP OF SEAL	17.42	47.87
BOTTOM OF SEAL	19.83	45.46
TOP OF SCREEN	22.8	42.49
BOTTOM OF SCREEN	32.8	32.49
BOTTOM OF HOLE	34.8	30.49

METHOD DRILLED:
4 1/4" ID HSA

METHOD DEVELOPED:
Hand Surge/Brainard Killman Pump

TIME DEVELOPED: 3.5 Hours

Metcalf & Eddy

2119jp

OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

B-3 WELL DEVELOPMENT LOGS

ROSE HILL LANDFILL
J-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: NMW-01-01

Date: 8/15/91

Logged By: D. Simone

Method of Development: Grundfos pump

Static Water Level: 5.77 ft from TOPVC
6.02 ft from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	14:45	18.5	5.88	190	silty	3	10		
			6.80						
2	14:50	16.5	~~7.04~~	140	silty	3	20		
3	14:55	17.0	6.62	180	sli. silty	3	30		
4	15:00	17.0	6.17	180	" "	3	40		
5	15:05	16.	5.88	160	"	3	50		
6	15:10	16.5	5.78	150	"	3	60		getting clearer
7	15:15	16.50	5.93	145	"	3	70		

Total Development Time: 30 min

Total Volume Purged: 70 gal

Comments:

KOSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: NMW-01-02

Date: 8/15/91

Logged By: D Simone

Method of Development: Submersible pump

Static Water Level: See log book
24.40 ft from TOPVC
24.70 ft from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	16:05	12	7.18	155	Slightly turbid	5	25		relatively clear
									no iron
2	16:10	12	7.45	145	"	5	50		
3	16:15	11.5	8.12	145	"	5	75		
4	16:20	12	9.70	162	"	5	100		
		calibrated pH meter w 7 + 10 buffers							
			10.5	Also cutting pumping rate now					
At	16:20					1.5			
5	17:00		9.60	150		5	150		

Total Development Time: 55 min

Total Volume Purged: 150 gal

Comments:

ROSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: NMW-02-01

Date: 8/16/91

Logged By: H. Moradi-Pour

Method of Development: BK Pump

Static Water Level: 24.90 ft From Top of the pvc

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	11:03	15	5.97	240		≈2	10	NO	Silty water
2	11:10	16	6.08	230		≈2	20	NO	" "
3	11:15	14	6.11	220		≈2	30	NO	Sli. " "
4	11:20	15	5.94	200		≈2	40	NO	Sli. " "
5	11:25	15	6.10	200		≈2	50	NO	Almost clear
6	11:30	15	6.11	200		≈2	60	yes	Very clear, No silt

Total Development Time: 27 min

Total Volume Purged: 60 gal.

Comments: The final well vol. is very clear - took picture of the last sample

KOSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-02-02

Date: 8/16/91

Method of Development: B K Pump

Logged By: Hossein Moradipour

Static Water Level: 24.60' from Top of PV

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	14:32	14	6.85	340		≈ 2gpm	10	NO	very silty
2	14:42	15	6.83	170		"	30	NO	sli. "
3	14:47	14	6.15	160		"	40	NO	almost clear
4	14:52	14	6.14	160		"	50	NO	clear
5	14:58	15	6.14	160		"	60	NO	clear
6	15:04	15	6.16	160		"	70	YES	very clear

Total Development Time: 40 min

Total Volume Purged: 70 gal

Comments:

KOSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-03-01

Date: 8/22/91

Method of Development: BK Pump

Logged By: H. Moradipour

Static Water Level: 3.03 ft from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	8:47	12	7.08	680		5 gal/2 min	10 gal	NO	very murky, very silty
2	8:51	12	6.57	510		"	20	"	" "
3	8:58	12.5	6.82	730		"	30	"	murky, silty
4	9:01	12.5	6.09	640		"	40	"	" "
5	9:10	12.0	6.21	595		"	50	"	sli. murky, sli. silty
6	9:15	12.0	6.24	360		"	60	"	" " " "
7	9:18	12.5	6.29	580		"	70	"	almost clear
8	9:21	12.5	6.37	440		"	80	"	" "
9	9:26	12.5	6.27	520		"	90	"	" "
10	9:31	12.0	6.35	480		"	100	YES	clear "

Total Development Time: 45 min

Total Volume Purged: 100 gallons

Comments:

KOSE HILL LANDFILL SUMMER 1991
U-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-03-02

Date: 8/22/91

Method of Development: BK Pump

Logged By: H. Moradi

Static Water Level: 2.0 ft from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	10:34	11	11.30	500		5 gal/min	10	NO	High pH, very silty, murky
2	10:41	11.5	10:34	460		"	20	"	" " "
3	10:46	11.5	11:12	420		"	30	"	" " "
4	11:15	11.5	10:57	400		"	40	"	High PH, sli. silty
5	11:21	11.0	10:54	400		"	50	"	" " "
6	11:29	11.5	9.57	340		"	60	"	" " "
7	11:33	11.0	9.84	390		"	70	"	" " "
8	11:38	11.5	9.94	300		"	80	"	" " "
9	11:42	11.5	9.90	320		"	90	"	High PH, Almost clear water
10	11:47	11.0	9.79	300		"	100	"	" " clear water
11	11:55	11.5	9.48	280		"	110	yes	" " " "

Total Development Time: 1.5 hrs

Total Volume Purged: 110 gallons

Comments: Due to High PH, PH meter was calibrated twice during well development to make sure it was working properly.

KOSE HILL LANDFILL SUMMER 1991
U-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: 6 Inch MW-03-03

Date: 8/22/91

Method of Development: Submersible Pump

Logged By: H. Moradian

Static Water Level: 2.21 from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	15:59	13	5.53	120		2 gpm	26	NO	clear water / No silt
2	16:15	13	6.87	120		"	58	"	" "
3	16:30	12.5	6.49	130		"	88	"	" "
4	16:45	13	6.80	140		"	118	"	" "
5	17:00	13	6.44	140		2.5 gpm	155.5	"	" "
6	17:15	12.5	6.46	140		2.5 gpm	193	"	" "
7	17:30	13.0	6.77	140		2.5-3.00 gpm	235.5	"	" "
8	17:45	13.0	6.86	140		3 gpm	280.5	"	" "
9	18:00	13	6.90	140		"	325.5	"	" "
10	18:15	12.5	6.97	140		3-3.5 gpm	375.5	"	" "
11	18:30	13.0	7.09	140		3.5 gpm	428.0	"	" "
12	18:45	13.0	7.06	150		"	480.5	"	" "
13	19:00	13.0	7.05	150		"	533	"	" "
14	19:15	13.0	6.48	150		3.5-4	591.5	"	" "
15	19:25	13	6.95	150		4 gpm	631.5	"	" "
16									

Total Development Time: 3.5 hrs

Total Volume Purged: 632 gallons

Comments:

Pg. 1 of 1

ROSE HILL LANDFILL
V-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: W-04-01

Date: 8/26/91

Logged By: S Blatfish

Method of Development: BK pump

Static Water Level: 14.77' from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	12:12	18.1	5.2	365	—	15 / 36 (42)	10		12:12 - 11:36 - 36 min purge
	12:19	15.8	6.22	280	—		10		very brown = 1000 mg/l SS
	12:28	16.0	6.31	230	—		10		cleaner lt. brown
	12:35	15.7	6.40	230	—		10		"
	12:44	15.3	6.44	230	—		10		" - slt. color
							50		no sus matter
									no PID anywhere

Total Development Time: 32 min purge, 10 min surge.

Total Volume Purged: 50 gal

Comments:

Pg. 1 of 1

ROSE HILL LANDFILL SUMMER 1991

V-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-04-02

Date: 8/26/1

Logged By: [signature]

Method of Development: BK pump

Static Water Level: 4.71' fm TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	3 pm	19.3	7.26	620	—	≤.5gpm	10		gray, thick w/ solids
2	3:10	12.6	6.86	700	—		10		gray
3	3:20	12.4	6.82	740			10		lite gray
4	3:33	12.3	6.79	820			10		lighter gray
5	3:44	12.5	6.77	820			10		
6	3:56	12.5	6.76	840			10		
7	4:06	12.5	6.76	845			10		
8	4:16	12.3	6.81	850			10		still lite gray.
9	4:27	12.2	6.80	850			10		
10	4:50	12.2	6.81	850			10		
							100		

Total Development Time: 1 hr 50 min purge 7 min surge

Total Volume Purged: 100 gal

Comments: never got clear.

Pg. 1 of 1

ROSE HILL LANDFILL SUMMER 1991

V-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: 04-03

Date: 8/20/11

Logged By: S Blatfuta

Method of Development: Sub Pump

Static Water Level: 16-23'

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
begin	9:17								
1	9:29	18	8.2	220	—	.5gpm	5		slight brown
									rate slowed quickly
2	9:43	18	8.3	220	—	↓	10		constantly readj. up
									to .5 gpm.
3	9:55	18	8.4	220	—		15		
	10:10	pump off					(17.5 gal)		
~~4~~	~~11:00~~								
	10:24	pump on							
	10:26	— off		—	Surge	for 8 min.		— all levels of	
						water	—	difficult work.	
	10:40	pump ON							
	10:55	pump off			circuit	blew			
	11:00	—	ON						
			8.51	220					40.8' to water
	12:20						pid-0		60.48' to water (20.4
	1:38								88.38' to water (29.9
	2:17	17	8.65	230	—		pid-0		~~112~~ (23.62
	3:06	17	9.2	230	—				112' to water brown col
	3:53	16	9.21	220					124.7' to water (127)
									Slight color no solids
									no PID.
							17.59		
						+	150		
							167.5 gal		total est from flow
									rate

Total Development Time: ≈ 6.5 hrs.

Total Volume Purged: 167.5 gal

Comments:

Pg. 1 of 1

V-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW05-01

Date: 9-3-91

Logged By: Mark Lewis

Method of Development: Submersible pump

Static Water Level: DS ~~18.20~~ mm TO PVC 6.88 ft

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	11:55	—	—	—	—	1	4	N	
2	11:59	14.0	5.69	60		1	6	N	
3	12:05	—	—	—	—	1	12	N	
4	12:06	14.0	5.88	65	~~Mod silt~~	1	13	N	mod. silt
5	12:11	14.0	5.97	65	—	1	18	N	mod. silt
6	12:18	14.0	6.02	65	—	1	25	N	very slight silt
	Boosting		flow	rate	@12:22	3	30	N	very silty
7	12:25	12.0	6.08	65	—	3	36	N	
8	12:30	12.0	6.11	65		3	51	N	very silty
9	12:34	12.0	6.10	65		3	63	N	slight → mod. silty
10	12:37	12.0	6.10	65		3	72	N	
11	12:39	Boosting		flow at	12:39	4			
12	12:39	—	—	—	—		78		Siltiness increasing lt. silty
13	12:42	12.0	6.10	65	—	4	90		
14	12:46	12.5	6.10	65	—	4	112		
15	12:50	11.5	6.10	65	—	4	128		Silt decreasing mod. silty
16	12:52	11.0	6.12	65	—	4	136		
17	12:54	11.5	6.12	65		4	144		
18	12:56	12.0	6.11	65		4	152		Clear - no silt
	12:57	Stopped pump					156		

Total Development Time: 1 hour

Total Volume Purged: 156 gallons

Comments:

V-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW 05-02

Date: 9/3/91

Logged By: Mark Lewis

Method of Development: Centrifugal pump

Static Water Level: ~~29.09~~ 7.40 ft from TOPVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
—	14:50	—	—	—	—	2.0	2.0		
1	15:03	12.5	5.97	75	—	2.0	4.0		Mod. silty
2	15:07	13.0	6.08	75	—	2.0	12.0		Mod. silty
~~3~~ 15:0	~~15:20~~					↑4.0	18.0		slightly silty
3	15:15	11.5	6.13	70	—	4.0	38.0		
4	15:20	11.5	6.17	75	—	4.0	58.0		
	15:25				—				hand surging
5	15:25	11.5	6.20	75	—	4.0	78		Mod. silty
			hand surging						
6	15:29	11.0	6.20	75	—	4.0	94		
7	15:34	11.5	6.22	75	—	4.0	114		Slightly silty
8	15:38	11.5	6.24	75	—	4.0	~~132~~ 130		
9	15:41	11.5	6.28	75	—	4.0	142		
	15:42			Increased to		5.0gpm	146		
10	15:45	11.0	6.28	75	—		161		
11	15:46		Increased		to	~~5.0~~	~~161~~ 166		
			just above 5.0, sucking air						
12	15:51	10.5	6.29	75		5.0	186		
13	15:55	11.5	6.31	75			206		
—	15:56		Shut off pump			5.0	~~191~~ 211		

Total Development Time: 1 hour 5 min

Total Volume Purged: 211

Comments:

J-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW06-01

Date: 8/29/91 - 8/30/91

Logged By: Mark Lewis

Method of Development: Surge/centrifugal

Static Water Level: 5.57 (below PVC)

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
8/29/91	15:15	–	–	–	–	–	3	No	hand surged
	16:06	22.0	6.69	310	–		4.1		pumping w/ centrifugal
	16:10	22.5	6.51	340	–		5.2		
	16:12	—	–	–	–	0.5	6.2		very silty
	16:25	–	–	–	–	0.75	–		Can't pump faster
	16:26	21.0	6.75	330	–	–	10.2		
	16:30	23.0	6.79	330	–	0.75	16.5		
	16:35	22.0	6.76	340	–	0.75	22.0		
	16:36	–	–	–	–	0.50	21.0		
	16:37				–		21.5		Shut off pump for gas
		Hand surging while pump off							
	17:12						23.5		Restarted pump
	17:17					0.4	25.5		
	17:18	27.0	6.78	380	–	0.4	26.9		
	17:29	26.0	6.68	350	–	0.4	30.3		
	17:37	22.0	6.77	430	–	0.75	36.3		
	17:39	–	–	–	–	0.66	37.6		Water becoming silty
	17:43	21.0	6.52	460	–	0.9	41.2		
	17:47	20.5	6.87	480	–	0.9	44.8		
	17:55	19.5	6.81	500	–	1.25	54.5		
	17:59	19.5	6.80	510	–	1.25	59.5		
	18:00	19.0	6.83	540	–	1.25	61.0		Clear water
	18:00	Stopped pump for day					61.0		
8-30-91	09:30								Began surging by hand
	10:00								Centrifugal pump on
	10:07	28.0	6.26	230	–	1.6	61.0		
	10:12	21.5	6.17	210	–	1.0	67.0		
	10:17	21.5	6.24	260	–	1.0	74.0		
	10:23	21.0	6.35	280	–	1.0	79.0		water very silty

Total Development Time: ~~3 hours~~ ~~3 hrs 40 min~~ DS

Total Volume Purged: ~~61 gal~~ ~~79 gallons~~ DS

Comments:

U-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW06-01

Date: 8/29-8/30/91

Logged By: Mark Lewis

Method of Development: Surge/centrifugal

Static Water Level: 5.57' below PVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	10:28	20.5	6.39	370	—	0.9	83.5	No	
	10:35	20.5	6.50	340	—	0.8	89.1		
	10:40	—	6.53	370	—	0.8	93.1		
	10:47	20.5	6.56	390	—	0.8	98.7		Slightly less silty
	10:54	20.0	6.58	410	—	1.0	105.7		silt increasing
	10:58	19.5	6.58	460	—	1.0	109.7		
	11:02	Flow stopped. Surging to re-establish							
	11:06	20.0	6.66	400		0.8	112.9		
	11:10	20.5	6.63	450	—	0.8	116.1		
	11:14	20.5	6.66	460	—	0.8	119.3		
	11:20	20.0	6.68	480	—	0.75	122.8		
	11:25	21.0	6.69	490	—	0.75	127.5		
	11:27	20.5	6.70	500	—	0.75	130.0		nearly clear
	11:30	20.5	6.70	500	—	0.75	132.3		
	11:35	Stopped pump							

Total Development Time: 4.6 hours

Total Volume Purged: 132.3 gal

Comments:

J-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW06-02

Date: 8/29/91

Logged By: Mark Lewis

Method of Development: Surging / centrifugal

Static Water Level: 5.7' (below TOC)

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	11:40	24.0	7.02	420	–	1	5	No	
	11:45	19.0	6.97	590	–	1	10		
	11:50	19.0	6.99	610	–	1	15		
	11:55	18.0	6.96	625	–	1	20		
	12:00	19.0	6.97	630	–	1	25		
	12:10	19.0	6.99	610	–	1	35		
	12:16	19.0	7.02	640	–	1	41		
	12:20	19.0	7.05	650	–	1	45		
	12:25	15.0	7.13	620	–	1	55		Increased flow to 2 gpm
									water still silty gray
	12:30	15.0	7.12	610		2.25	65		water cleaning up
	12:35	15.0	7.14	610		2.25	85		
							103		Increased to 3.5 gpm then 4.0 gpm
	12:41	14.0	7.17	600		4.0	123		
	12:48	14.5	7.21	550		4.0	151		Silt increasing
	12:53	15.0	7.22	570		4.0	171		
	12:58	15.0	7.21	620		4.0	191		Water running clear
	13:03	14.5	7.19	620		4.0	211		
	13:08	15.0	7.22	610		4.0	231		
	13:11	Stopped	pump				250		
				Total	gallons	= 250			

Total Development Time: 2.5 hours

Total Volume Purged: 250 gallons

Comments:

ROSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-07-01

Date: 8/23/91

Method of Development: B.K Pump

Logged By: H Moradipour

Static Water Level: 21.34 from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped +/- (gal)	Photo Taken	OBSERVATIONS
1	14:28	14	5.75	850		2gpm	10	No	very murky, very silty
2	14:32	14	5.97	900		~	20	NO	sli. murky, sli. silty
3	14:36	14	6.02	890		~	30	NO	clear water
4	14:41	14	6.05	860		~	40	NO	~ ~
5	14:48	14	6.06	850		~	50	NO	~ ~

Total Development Time: 20 minutes

Total Volume Purged: 50 gallons

Comments:

ROSE HILL LANDFILL SUMMER 1991
V-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-07-02

Date: 8/23/91 / 8/27/91

Method of Development: Submersible Pump

Logged By: H. Moradipour

Static Water Level: 32.06' from TOC

	Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	1	9:14	17	8.49	105		0.5	19	NO	clear water / slow recharge
	2									
	3									
				by. S. Hatfield + Sim Gerow.						8/27/91
after 1 gal	1	2:04p	15	9.96	7000	—	1gpm	1	—	turbid grey/green plus dusty film.
	2	2:39	14	10.3	7100	—				
46.6'		3:25	13	12.5	7600			18.5 g		
		3:38	—	12.1	8400			5 g		sampled but analyzed a few minutes later!
		3:39	—	12.15	~~85~~ 7600	—		15 g		
		3:40		12.1	7500			20 g		
final sample →		4:03		12.1	8200			24 g		stopped bailing at 54.1' to water = (20 ft standing water)

Total Development Time: 2 hrs. ~~[illegible]~~

Total Volume Purged:

Comments: used 1000 std. for cond, on 10K switch film on all samples — looked like cement water.

S. Hatfield

ROSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-08-01

Date: 8/21/91

Method of Development: B.H. Pump

Logged By: H. Moradipour

Static Water Level: 7.01 ft from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	16:45	22	5.50	200		5 gal/2 min	10		murky, silty
2	16:56	21.5	5.81	260		10 "	20		" "
3	17:04	21.0	5.94	190		"	30		sli. murky, sli. silty
4	17:09	21	5.89	190		"	40		" " " "
5	17:17	20.5	6.10	200		"	50		" " " "
6	17:25	21	6.02	190		"	60		sli. clear
7	17:32	21	6.08	180		"	70		clear

Total Development Time: 11 min

Total Volume Purged: 70 gal

Comments:

Pg. 1 of 1

ROSE HILL LANDFILL
V-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-08-02

Date: 8/21/91

Logged By: H. Moradipour

Method of Development: B.K. Pump

Static Water Level: 7.66 ft from TOPVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	18:02	17	9.41	740		5 gal/min	10	no	sli. murky, sli. silty
2	18:11	17	9.80	440		"	20		" " " "
3	18:17	16.5	9.81	330		"	30		sli. clear, little silt
4	18:23	17.0	9.73	300		"	40		" " " "
5	18:29	17.0	9.61	300		"	50		clear water

Total Development Time: 30 minutes

Total Volume Purged: 50 gallons

Comments:

J-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-09-01

Date: 9-9-91

Logged By: Mark Lewis

Method of Development: Surge/B-K

Static Water Level: 17.67' below PVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	10:00	–	–	–	–	–	–	No	Began hand surging.
	10:10	–	–	–	–	–	–		Hand surging ✓ complete
	10:20	–	–	–	–	–	–		Began B-K ✓ pumping
	10:21	–	~~10.4~~	~~150~~ 124	–	–	35		✓ very silty
	10:31	13.3	9.8	~~9.5~~ 9.3	–	–	20		clearer
	10:37	13.0	8.8	85	–	–			slightly silty
	10:42	12.9	8.5	90	–	–	40		✓ clear
	10:45	12.9	8.2	80	–	–	46		clear
	10:48	12.9	8.1	80			53		clear
	10:49	Stopped		pumping			56		

Total Development Time: 1 hour

Total Volume Purged: 56 gallons

Comments:

Pg. 1 of 1

V-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW10-01

Date: 9/4/91

Logged By: Mark Lewis

Method of Development: hand surge/B-K/centrifugal

Static Water Level: 9.10 below PVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	15:10	22.0	6.39	100	—	—	0	No	Begin hand surge/pumping w/ B-K
	15:15	11.5	6.63	80	—	—	6		water very silty
	15:22	12.0	6.47	80	—	—	12		
	15:31	12.0	6.40	75	—	—	18		
	Redrop B-K w/ centrifugal pump. Hand surge 3 additional gallons								
	15:50	—	—	—	—	—	21.0		Started centrifugal
	15:52	—	—	—	—	12	45.0		
	15:53	—	—	—	—	2.25	~~64.25~~ 57.0		Gated back flow
	15:54	—	—	—	—	2.25	59.25		
	15:56	12.5	6.41	80	—	2.25	64.75		moderately silty
	15:58	12.5	6.41	80	—	2.25	70.25		
	16:03	12.0	6.40	80	—	~~4.5~~ 2.25	81.5		Boosting flow to 4.5
	16:06	12.0	6.37	80	—	4.5	101.5		
	16:08	Boosting flow to 6.25 gpm					110.5		
	16:12	11.5	6.37	80	—	6.25	135.5		
	16:17	11.5	6.39	80	—	6.25	166.75		
	16:20	—	—	—	—		185.5		Hand surge. Water becoming silty
									Water about 8' above bottom
	16:24	—	—	—	—	7.0	210.5		
	16:26	11.5	6.26	75	—	7.0	234.5		
	16:29	11.0	6.19	75	—	7.0	255.5		Water clearing. Slightly silty. About 4' above bottom
	16:33	11.0	6.24	75	—	7.0	283.5		
	16:37	11.5	6.22	75	—	7.0	311.5		
	16:40	11.0	6.24	75	—	7.0	332.5		
	16:43		Shut Down				353.5		

Total Development Time: 1.75 hours

Total Volume Purged: 353.5 gallons

Comments: Water ran clear/silt free at end of development

Pg. 1 of 1

J-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW11-01

Date: 8-28-91

Logged By: Jim Fitting

Transcribed by: Mark Lewis

Method of Development: B-K pump / centrifugal

Static Water Level: 10.29' below PVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	14:28	–	–	–	–	–	–	No	Started pumping
	14:31	16.0	7.10	480	–	–	6		
	14:37	14.0	6.58	680	–	–	12		
	14:43	14.0	6.49	763	–	–	18		
	14:47	13.0	6.48	678	–	–	24		
	14:51	13.0	6.47	680	–	–	30		
	14:55	13.0	6.46	680	–	–	36		
	15:00	13.0	6.52	680	–	–	35.42		
	15:04	14.0	6.48	684	–	–	48		
	15:14	13.0	6.47	668	–	–	54		
	15:18	–	–	–	–	–	60		Stopped pumping w/ BK
	16:34						60		" started centrifugal
									Flow rate 3.5 gpm
	16:42					1.5	8.8		well ran dry
	17:00					1.5	11.5		throttled back to 1.5 gpm
	17:02					0.6	11.8		throttled back again
	17:10						12.2.8		pump air of gas
	17:20						12.28		restarted at 0.75 gpm
	17:57						150		Stopped pump

Total Development Time: ~~[illegible]~~ 1.5 hours

Total Volume Purged: ~~[illegible]~~ 150 gallons (estimated)

Comments:

J-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW 11-02

Date: 8-28-91

Logged By: Jim Fitting

Transcribed by Mark Lewis

Method of Development: B-K pump/surge

Static Water Level: 7.48' below PVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	11:21	15.5	7.20	1230	–	–	3	No	
	11:27	12.5	6.75	1420	–	–	7	No	
	11:34	13.0	6.62	1400	–	–	12	No	
	11:39	11.0	6.57	1400	–	–	18	No	
	11:41	11.0	6.56	1400	–	–	24	No	
	11:44	11.0	6.56	1400	–	–	30	No	
	11:46	11.0	6.56	1400	–	–	36	No	
	11:49	11.5	6.56	1380	–	–	42	No	
	11:50		Stopped		pumping		48	No	

Total Development Time: 0.75 hours

Total Volume Purged: 48 gallons

Comments:

V-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW11-03

Date: 8/28/91

Method of Development: Surge/4" submersible

Logged By: ~~Mark Lewis~~ Jim Fitting

Transcribed by Mark Lewis

Static Water Level: 6.92' below PVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Water Level Photo Taken	OBSERVATIONS
	09:25	—	~~8.75~~	—	—	-	86		Start development
	09:35	14.5	8.75	723	—	8	86	55	
	09:35	-	—	—	—	1.3	86	55	cut back flow
	09:37	-	—	—	—	0.9	88.6	56	
	09:40		—	-	-	0.38	91.3	57	
	09:42	-	-	-	-	0.38	92.1	57	
	09:44	-	-	-	-	0.38	92.9	57.60	
	09:45	—	9.45	690	19.0	0.38	93.3		
	09:48	-	—	-	—	0.38	94.4	58.10	
	09:55	-	-	-	-	0.38	97.0	58.99	
	09:56						97.4		Pump off
		WELL	RECOVERY						
	09:58							59.22	
	10:01							58.33	
	10:05							57.56	
	10:12							56.53	
	10:19							55.63	
	10:26							55.70	
	10:32							53.82	
	10:44							52.38	

Total Development Time: Drawdown at 0930 → water at 53' below casing 1.25 hours

Total Volume Purged: 97.4 gallons

Comments:

Pg. 1 of 1

KOSE HILL LANDFILL
V-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-12-~~02~~ 01 PS

Date: 8/26/91

Logged By: R. BURSAW

Method of Development: BK pump

Static Water Level:

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
						50 ~~gal~~/1.45			
1	1430	14.3	6.57	320		"	10		dark, very silty
2	1440	13.5	5.35	300		"	20		" " "
3	1445	13.5	5.63	300		"	30		slightly dark, sli. silty
4	14:53	13.0	5.72	305		"	40		" " "
5	15:08	13	5.44	300		"	50		" " "
6	15:17	13.5	5.46	300		"	60		sli. clear, ~~g~~
7	15:24	13.5	6.01	320		"	70		clear water

Total Development Time:

Total Volume Purged:

Comments:

KOSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW-12-~~01~~ 02 DS

Date: 8/20/91

Method of Development: B.K Pump

Logged By: H M for R. Bursaw

Static Water Level: 2.9' from TOC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	15.20	14	7.77	200			0		
2	15.35	13.5	7.39	180			15		
3	15:50	"	6.42	150			29.16		
4	16:05	"	6.50	140			60		
5	16:15	"	6.40	140			70		
6	16:25	"	6.41	140			80		

Total Development Time: 1 hour

Total Volume Purged: 80 gallons

Comments:

ROSE HILL LANDFILL
V-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No. NMW-13-01

Date: 8/14/91

Logged By: D. Lemone

Method of Development: Bailer + BK pump

Static Water Level: 9.20 ft from TOPVC

Sample No.	Time	PARAMETERS Temp (°C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
						~~2.5~~ 05			
1	13:30	13.5	6.90	480	Silty	1 well vol.	3		
2	13:40	13.5	6.42	320	Silty	2nd vol	6		
3	14:00				Silty	3rd vol	9		
Stopped to decon (steam clean) BK pump.									
4	15:10	13.3	6.75	410	Silty	2.5 gal/min	15		
5	15:05	13.4	6.02	200	Settling clearer	"	20		
6	15:10	13.5	5.95	300	"	"	26		
7	15:15	13.5	5.98	390	"	"	31		
8	15:20	13.5	5.96	~~390~~ 220 05	"	"	43	X	Same photo
9	15:25	12.0	6.05	~~320~~ 310 05	Same as last sample 7100 NTU		56	X	Final 2 samples no settling silt turbidity similar to town water from hydrant. Not possible to get down to 100 NTUs

Total Development Time: 1 hour.

Total Volume Purged: 56 gallons

Comments: Clear as drinking H_2O

ROSE HILL LANDFILL
U-004609.0018

SUMMER 1991

MONITORING WELL DEVELOPMENT

Well I.D. No.: VMW-13-02

Date: 8/14/91

Method of Development: B/L pump

Logged By: D Simone

Static Water Level: 9.49 ft from TOPVC

Sample No.	Time	PARAMETERS Temp (° C)	pH	Cond'y (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
1	1800	10.5	6.03	360	Silty	3	10		
2	1815	9.0	5.93	350	Silty	3	20		
3	1818	9.0	5.92	360	Silty	3	30		
4	1822	9.0	6.13	340	[illegible]	3	[illegible]		getting slightly clearer
5	1825	9.0	6.16	330	Silty	3	50		
6	1830	9.0	6.22	320	Silty	3	60		
7	1835	9.0	6.28	315	Silty	3	70		getting slightly clearer
8	1840	9.0	6.35	310	Silty	3	80		no change
9	1845	9.0	6.26	300	Silty	3	90		no change
10	1850	9.0	6.36	295	Silty	3	100		no change

Total Development Time: 50 minutes

Total Volume Purged: 100 gallons

Comments:

J-004609.0018

MONITORING WELL DEVELOPMENT

Well I.D. No.: MW14-01

Date: 9-4-91

Logged By: Mark Lewis

Method of Development: hand surging/B-K pump

Static Water Level: —

Sample No.	Time	PARAMETERS Temp (°C)	pH	Condy (umhos)	Turbidity (NTU)	Pumping Rate (gpm)	Volume Pumped (gal)	Photo Taken	OBSERVATIONS
	09:00	—	—	—	—	—	1	No	Began hand surging
	10:15	—	—	—	—	—	1	No	Centrifugal on
	10:34	—	—	—	—	—	2	No	Centrifugal off
	10:45	—	—	—	—	—	2	No	Began pumping w/B-K
	10:50	17	6.92	1800	—	—	4.5		
	10:55	Pumped well dry, allowing to recharge							
	11:05	Began pumping again					5.0		Water very turbid silty
	11:50	Began pumping again					5.0		
	11:50	17.0	7.49	1750	—	—	5.25		Sample taken when pump starting
	11:55	15.5	7.37	1750	—	—	6.75		Sample taken when well nearly dry
	12:09	17.0	7.26	1800	—	—	7.0		
	12:14	17.0	7.35	1700	—	—	7.25		
	12:21	17.0	7.23	1700	—	—	8.0		
	12:34	17.0	7.31	1800	—	—	8.5		
	12:35	Stopped pumping					8.5		
	Water level at 12:44 31.74'								

Total Development Time: 3.5 hours

Total Volume Purged: 8.5 gallons

Comments:

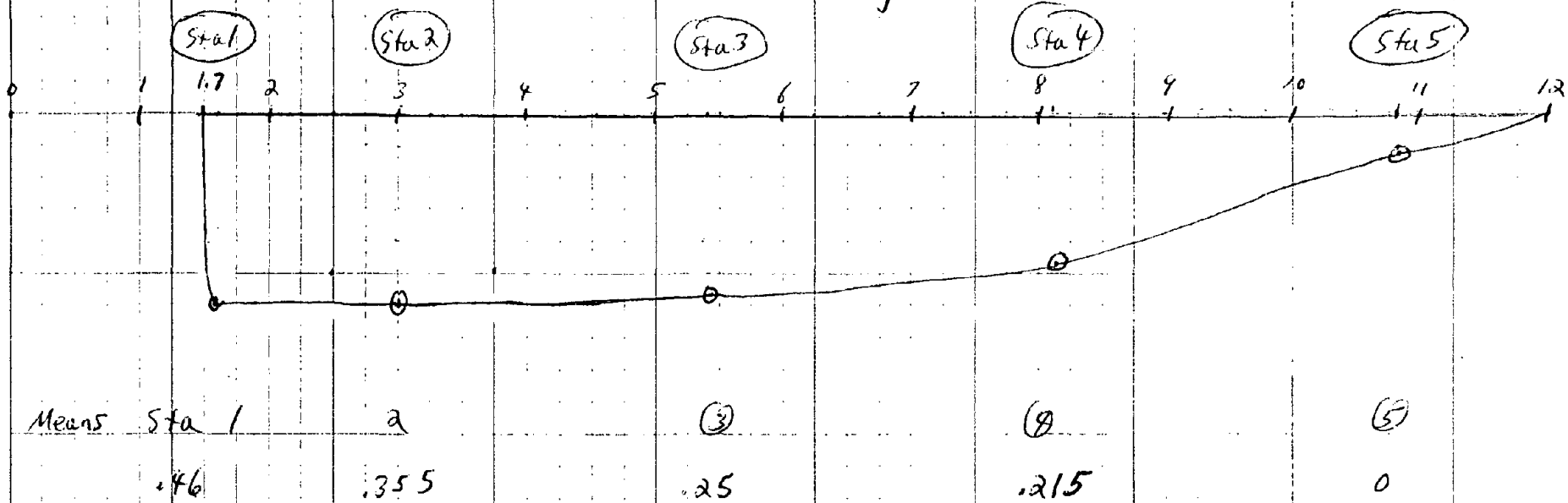
B-4 SURFACE WATER BUDGET ANALYSIS

Project ____ Page ____ of ____
Subject ____ Acct. No. ____
Detail ____ Comptd. By ____ Date ____
Ck'd. By ____ Date ____

Date: 6/18/41

Scale .8 inches = 1.0 feet
1.0 inches = 1.25

56-01 Round I
Velocity Measurements Feet/sec
Marsh McBirney



Means	Sta 1	2	3	4	5
	.46	.355	.25	.215	0

Mean = .256 ft/sec

Area using digitizer = ① 11.66 ② 11.78 Mean = 11.72

$Q = VA$ $Q = (.256\ ft/sec)(11.72\ ft^2) = \boxed{3.0\ ft^3/sec}$

METCALF & EDDY, ENGINEERS
NONREPRODUCIBLE GRID FORM 145

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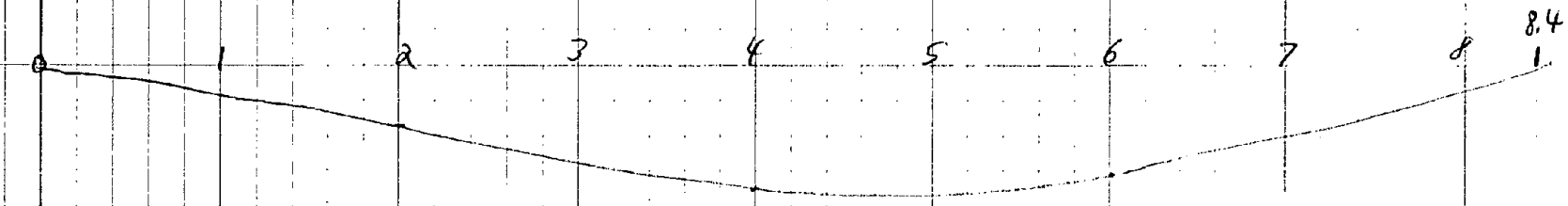
Date 6/18/91

S6-05: upstream of S6-05 where channel is narrower.
No flow was measureable @ S6-05

Scale 1" = 1 foot
$(1")^2 = 1 ft^2$

Velocity Meas. ft/sec
Marsh McBirney Flow Meter



Mean velocities	Sta 1	Sta 2	3
	0	.41	1.5

Mean Velocity .87 ft/sec

Areas ① 3.71 ft^2 ② 3.54 ft^2 ③ 3.68 ft^2

Mean Area = 3.66 ft^2

$Q = (.87 ft/sec)(3.66 ft^2) = \boxed{3.18 ft^3/sec}$

METCALF & EDDY, ENGINEERS

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S6-07 Date 6/18/91

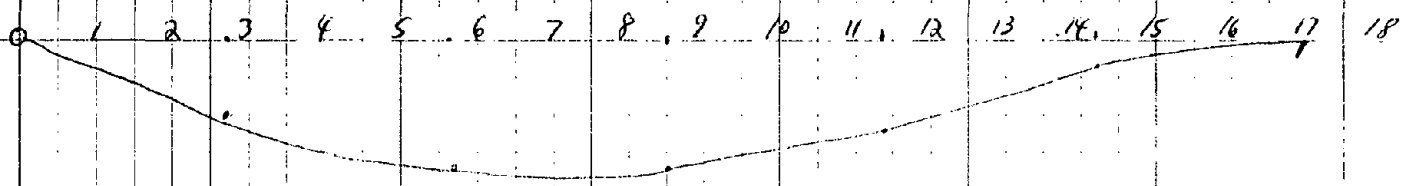
Scale: .4" = 1 foot

1.0" = 2.5 feet

$(1.0)^2 = (6.25 ft^2)$

Velocity Meas: ft/sec

Marsh McBirney



Mean velocities	1	2	3	4	5
	.03	.255	.40	.23	0.0

Mean velocity = .183 ft/sec

Areas ① 18.07 ② 18.02 Mean = 18.045

$Q = (.183 ft/sec)(18.045 ft^2) = \boxed{3.30 ft^3/sec}$

METCALF & EDDY, ENGINEERS

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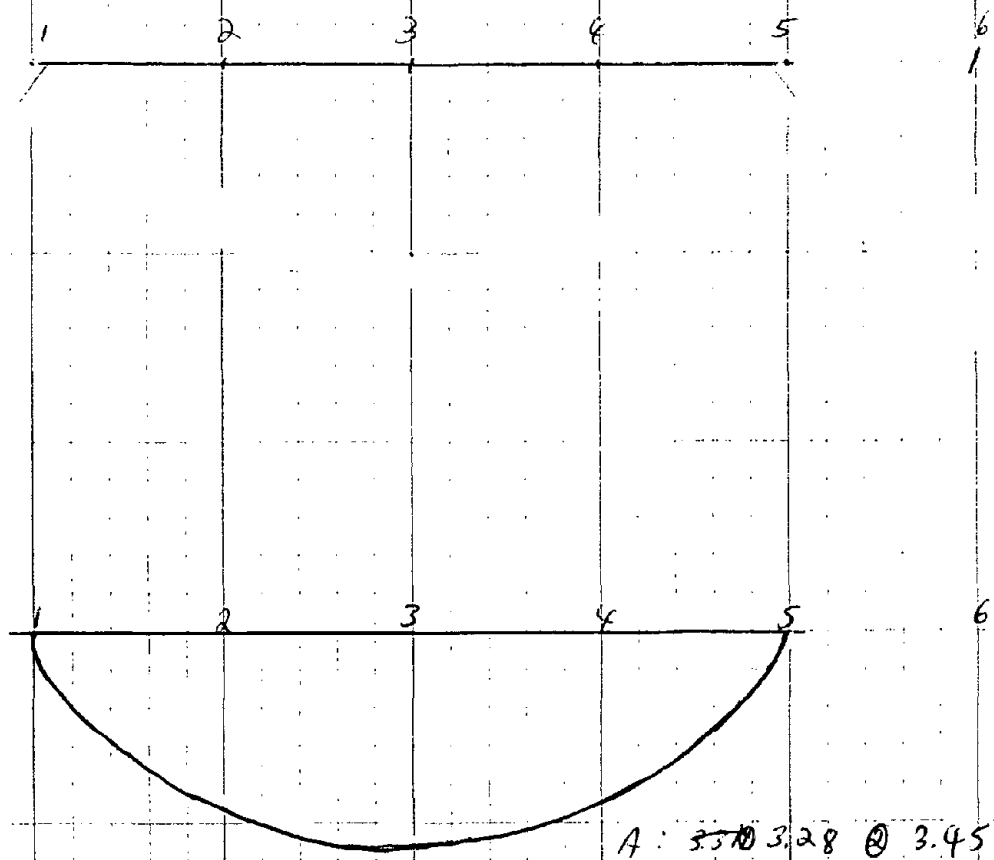
S6-06: No velocity measurements were possible so measurements were taken on the downstream side of the Saugatuck, at one of two 5' culverts, using a drogue

Scale: 1" = 1.0 feet



A: ~~3.10~~ 3.28 ② 3.45 ③ 3.29 Mean = 3.34

velocity = 24'/28" = .86 ft/sec

(.86 ft/sec)(3.34 ft²) = $\boxed{2.87\ ft^3/sec}$ = Q

$\boxed{Q \times 2 = Q_{total} = 5.74\ ft^3/sec}$

$$Area = Arccos\left(\frac{r-h}{r}\right)r^2 - (r-h)\sqrt{2rh-h^2} =$$

Radians

$$Arccos\left(\frac{2.5-1.1}{2.5}\right)2.5^2 - (2.5-1.1)\sqrt{2(2.5)(1.1)-(1.1)^2} = 6.60 - 1.4\sqrt{4.25} = 3.21$$

METCALF & EDDY, ENGINEERS
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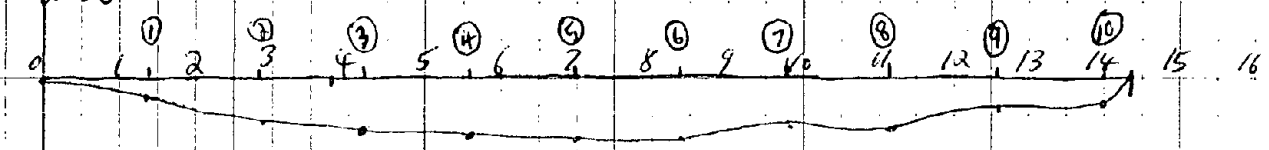
S6-03 6/18/91

Notes velocity was too slow to measure with pygmy so a drogue (bottle) was used instead

.4" = 10 feet $(1)^2 = 6.25$
1.0" = 2.50 ft



Velocity @ 3.9' on the ~~tron~~ x-section using a 125 ml plastic bottle was 5'/378" = .013 ft/sec

Areas: ① 8.51 ② 8.34 Mean = 8.425 ft²

(.013 ft/sec)(8.425 ft²) = $\boxed{.11 \text{ ft}^3/\text{sec} = Q}$

NONREPRODUCIBLE GRID FORM 143
METCALF & EDDY, ENGINEERS

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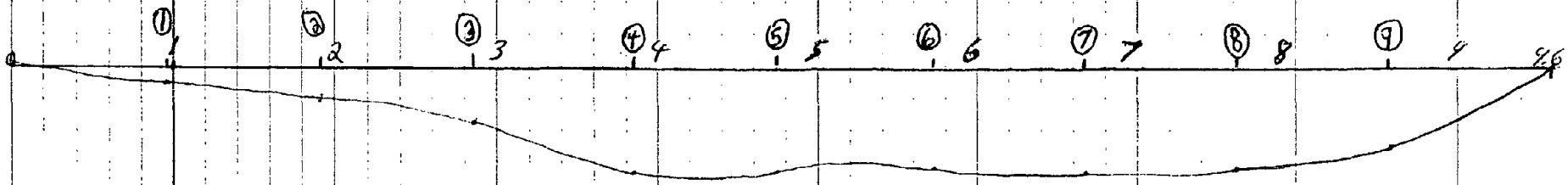
56 -08 6/18/91

Scale: 1" = 1.0 feet

Notes: velocity was too low to measure with pygmy meter so drogue (40 ml glass vial 50% filled with water was used)



Velocity measured @ 3.0 ~~feet on the x section~~, 5.0 and 7.0'

Mean Velocities	3.0'	5.0'	7.0'
	2'/26.43"	2'/27.58"	2'/40.57

Mean Velocity for x-section = .066 ft/sec Areas ① 4.35 ② 4.30 Mean = 4.325

$$Q = (.066\ ft/sec)(4.325\ ft^2) = .285\ ft^3/sec$$

METCALF & EDDY, ENGINEERS

NONREPRODUCIBLE GRID FORM 145

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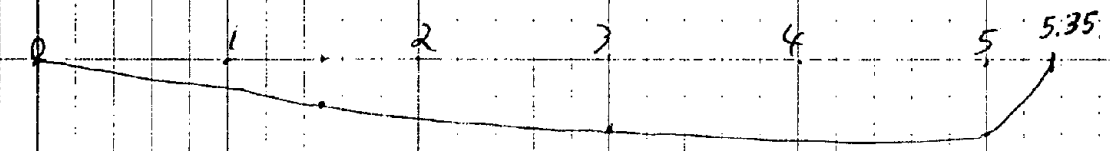
56-09 Date: 6/18/91

Notes: flow was to low for the use of the Pygmy meter so a bottle was used as a drogue!

Scale 1.0" = ~~[illegible] feet~~ 1.0 feet



	Sta 1	Sta 2	Sta 3
Velocity Means @ each station	2'/20.87"	2'/8.39	2'/11.29
	.09'/sec	.24 ft/sec	.18 ft/sec

Velocity mean For X-section .17-feet/sec

Areas ① 1.62 ② 1.67 Mean = 1.645 ft²

$$Q = (.17\,ft/sec)(1.645\,ft^2) = .28\,ft^3/sec$$

METCALF & EDDY, ENGINEERS
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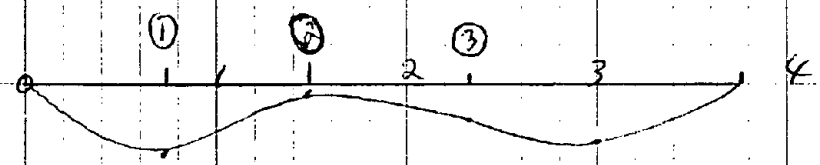
S6 – 10

Date 9/12/91

Scale 1.0" = 1.0 feet

Flying water



	①	③
Mean Beeps / 1-minute	12	12

Mean X-sectional velocity

Mean Beeps = 12 $\quad V = \frac{K \cdot P}{T} + C$

V = meters/sec

K = constant = .687 m/s

P = Beeps/~~minute~~ ~~second~~

C = starting threshold offset .038

T = Time in Seconds

$$V = \left(\frac{(.687)(12)}{60\ \text{sec}} + .038\right)\frac{3.28\ \text{ft}}{1\ \text{meter}}$$

$$\boxed{V = .57\ \text{feet/sec}}$$

3.28

Areas ① .76 ② .71 Mean = .735 ft²

$$Q = (.57\ \text{ft/sec})(.735\ \text{ft}^2) = .42\ \text{ft}^3/\text{sec}$$

METCALF & EDDY, ENGINEERS

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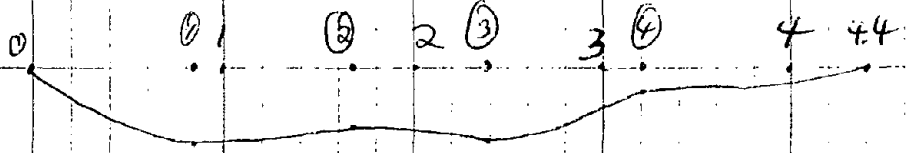
56-12 Date: 6/18/91

Scale 1.0" = 1.0'

Pygmy Meter



	①	②	③	④
Mean Beeps @ each Station per 60 sec	13.5	27.5	5.0	To Shallow for measurement

Mean Beeps over X sectional Area = 15.33/60 sec

Mean velocity over x sectional Area $= \frac{2.253P}{T} + .125 = V$

$$V = \frac{(2.253)(15.33)}{60} + .125 = .70 \text{ ft/sec}$$

Areas ① 1.17 ② 1.10 Mean Area = 1.135 ft²

$$Q = (.70 \text{ ft/sec})(1.135 \text{ ft}^2) = .79 \text{ ft}^3/\text{sec}$$

METCALF & EDDY, ENGINEERS
NONREPRODUCIBLE GRID FORM 143

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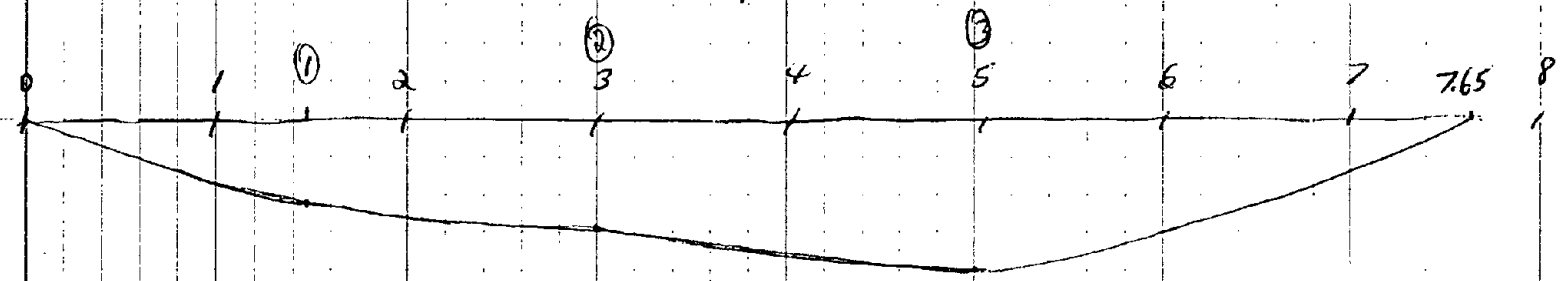
S6-04 Date: 6/18/91

Scale 1.0" = 1.0 feet

Notes: Flow was too low to use Pygmy meter so a vial was used Drogue



Velocities (mean)s Sta ① ② ③

2'/24.23 2'/32.52 2'/86.515

Mean Velocity over X sectional area = $\boxed{.056\ ft/sec}$ Areas ① 3.83 ② 3.94 Mean Area = 3.88 ft²

$$\boxed{Q = (.056\ ft/sec)(3.88\ ft^2) = .22\ ft^3/sec}$$

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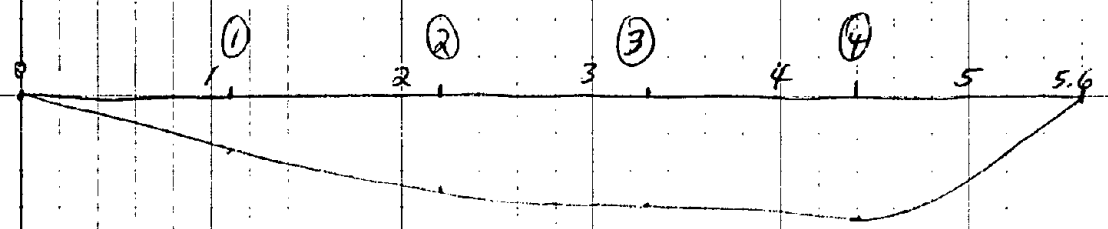
S6-11 Date: 6/18/91

Scale 1.0" = 1.0-feet Note: Slow to low for flying meter so a drogue (3. vial filled with water was used.



Mean Velocities	Stas 1	2	3	4
ft/sec	2'/32.67	2'/26"	2'/11"	2'/20"
	.061	.08	.18	.1

Areas 1 2.39 2 2.36 Mean Area = 2.375 ft²

Mean Velocity = .10 ft/sec

$$Q = (.10\ ft/sec)(2.375\ ft^2) = .2375\ ft^3/sec$$

METCALF & EDDY, ENGINEERS
NONREPRODUCIBLE GRID FORM 145

MINI-PIEZOMETER GROUNDWATER ELEVATIONS

ROUND II DATES:9/30

MINI-PIEZOMETERS	(A) ELEVATIONS OF SURFACE WATERS DETERMINED FROM STAFF GUAGES (FT.)	(X) DISTANCE FROM SURFACE WATER TO TOP OF MINI-PIEZOMETER CASING (FT.)	(Y) DEPTH TO GROUND WATER IN MINI-PIEZOMETER FROM TOP OF MINI-PIEZOMETER RISER (FT.)	(X-Y=Z) LOSS(-),GAIN(+) OR EQUAL(=) (FT.)	(A+Z=ELE.) ELEVATION OF MINI-PIEZOMETER GROUNDWATER (FT.)
MP-01	47.195	3.26	3.219	0.041	47.236
MP-03	40.563	3.239	3.208	0.031	40.594
MP-07	29.503	2.583	4.088	-1.505	27.998
MP-08	49.237	2.724	2.458	0.266	49.503
MP-09	57.179	1.338	1.458	-0.12	57.059
MP-10	68.524	3.13	3.187	-0.057	68.467
MP-11	30.571	2.172	2.005	0.167	30.738
MP-12	42.679	2.922	3.594	-0.672	42.007

SEEPAGE METERS		HEIGHT OF WATER IN SEEPAGE METER TUBE ABOVE (+) OR BELOW (-) THE SURFACE WATER (FT.)	ELEVATION OF SEEPAGE METER GROUNDWATER
SM-01	47.195	-0.114	47.081
SM-05	33.33	0.771	34.101
SM-07	29.503	NOT VISIBLE	------

NOTES:MEASUREMENTS CONVERTED FEET:
FROM INCHES DIVIDED BY 12-INCHES/FT.

MINI-PIEZOMETER GROUNDWATER ELEVATIONS

ROUND II DATES:10/01

MINI-PIEZOMETERS	(A) ELEVATIONS OF SURFACE WATERS DETERMINED FROM STAFF GUAGES (FT.)	(X) DISTANCE FROM SURFACE WATER TO TOP OF MINI-PIEZOMETER CASING (FT.)	(Y) DEPTH TO GROUND WATER IN MINI-PIEZOMETER FROM TOP OF MINI-PIEZOMETER RISER (FT.)	(X-Y=Z) LOSS(-),GAIN(+) OR EQUAL(=) (FT.)	(A+Z=ELE.) ELEVATION OF MINI-PIEZOMETER GROUNDWATER (FT.)
MP-01	47.143	1.687	5.406	-3.719	43.424
MP-03	40.553	3.203	3.177	0.026	40.579
MP-07	28.493	2.604	2.553	0.051	28.544
MP-08	49.227	2.745	2.719	0.026	49.253
MP-09	57.166	1.354	1.27	0.084	57.25
MP-10	68.493	2.963	2.963	0	68.493
MP-11	30.566	2.203	1.239	0.964	31.53
MP-12	42.658	2.927	3.63	-0.703	41.955

SEEPAGE METERS		HEIGHT OF WATER IN SEEPAGE METER TUBE ABOVE (+) OR BELOW (-) THE SURFACE WATER (FT.)	ELEVATION OF SEEPAGE METER GROUNDWATER
SM-01	47.143	0.047	47.19
SM-05	33.288	09:23=.042, 17:51=.604	09:23=33.33, 17:51=32.684
SM-07	28.493	0.031	28.524

NOTES:MEASUREMENTS CONVERTED FEET:
FROM INCHES DIVIDED BY 12-INCHES/FT.

METCALF & EDDY, ENGINEERS

Round II Date 4/30/91

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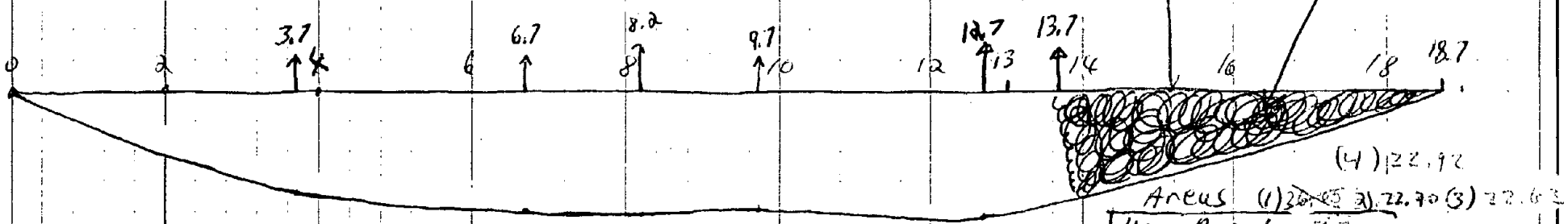
56-01

Notes: Pygmy meter was used

Scale 1" = 2.0'



Mean Area: 22.75

Stations	3.7	6.7	9.7	12.7
Beeps/min Depths	20% No Flow	4	2	12
	50% Insufficient			
	80% Areas for Drogue	1	2	9
Average Beep @ Each station		2.5	2	10.5
V (velocity @ each station Based on Beeps (X)		.22 ft/sec	.20 ft/sec	.52 ft/sec

Mean Velocity (ft./sec): .31 ft/sec

$$\text{velocity} = \frac{K \cdot P}{T} + C$$

$$U = (.01145X + .038)(3.28\,ft/meter)$$

U = meters/sec
K = constant = .687
P = Beeps
C = Starting Threshold Offset = .038
T = Time in Secs.

$$Q = UA = (.31\,ft/sec)(22.75) = 7.052\,ft^3/sec$$

METCALF & EDDY, ENGINEERS

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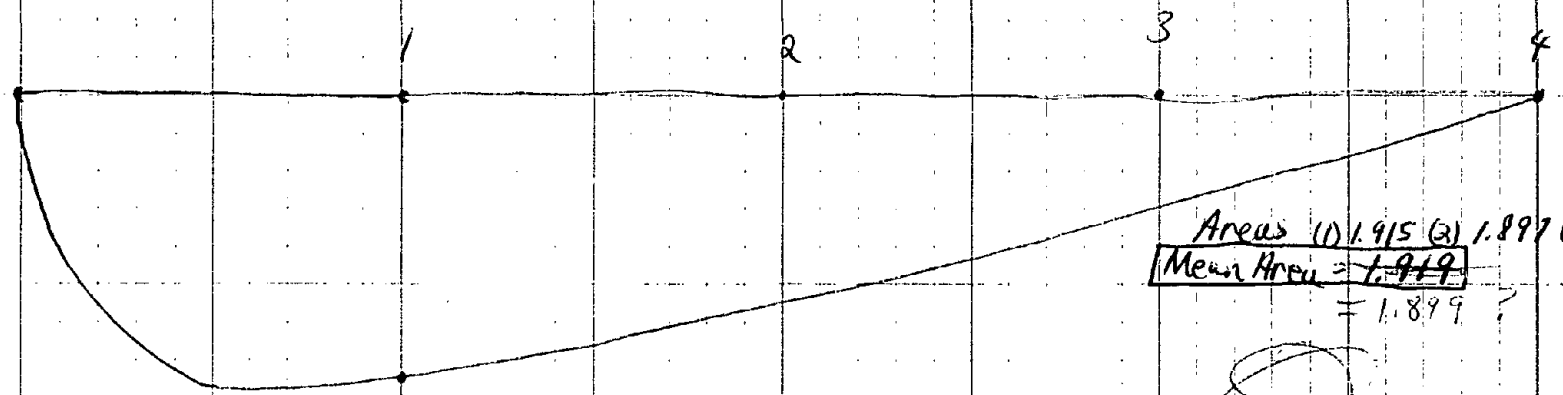
S6-03-A Drogue Measurements

Scale: 2" = 1.0 ft.
1" = .5 ft

Notes: Location @ SD/SW-04
Drogue and Meter Measurements made



Areas (1) 1.915 (2) 1.897 (3) 1.885
Mean Area = ~~1.919~~
= 1.899

Drogue Measurements Drogue Times (sec)	Drogue Distance (feet)	Velocity (ft/sec)	Mean Velocity
19	10	.526	.487 ft/sec
20	10	.500	
23	10	.435	

$$Q = VA = (.487\ ft/sec)(\cancel{1.919}\ 1.899\ ft^2) = \cancel{.934}\ .924\ ft^3/sec$$

METCALF & EDDY, ENGINEERS

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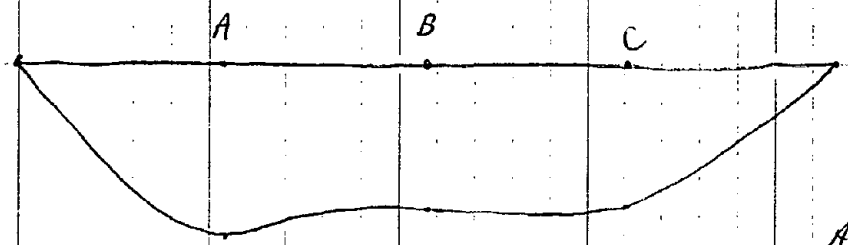
S6-03-B

Notes: Location ~ ~~100~~ 104 ft. downstream of S6-03
Marsh McBirney meter used

Scale 2" = 1-foot
1" = .5 ft



(4) .640
Areas (1) .690 (2) .689 (3) .677

Mean Area = .686

	A	B	C
Velocities (ft/sec)	0.23	0.25	0.35
Mean Velocity (ft/sec)	0.28		

$Q = VA = (0.28\,ft/sec)(.686\,ft^2) = .192\,ft^3/sec$

METCALF & EDDY, ENGINEERS

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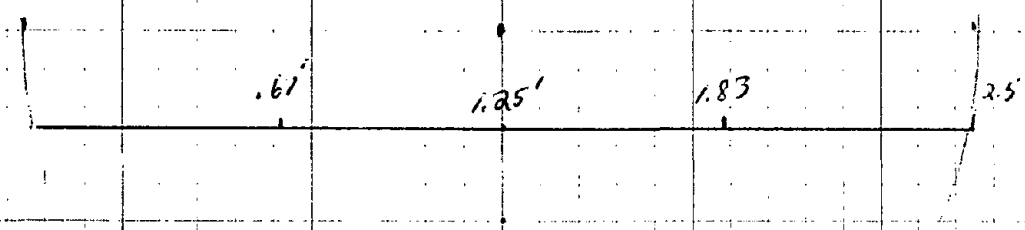
56-04 A Meter Measurements Marsh McBirney

Scale: 2.0" = 1.0 ft.
1.0" = .5 ft

Notes: (1) Drogue and Meter Measurements Made
(2) Location @ 30-inch diameter culvert



(4) 1.833
Areas (1) 1.835 (2) 1.842 (3) ~~1.736~~

$\boxed{\text{Mean Area} = 1.837}$

	1	2	3
Velocities	.19	.14	.02
Mean Velocity	.117 ft/sec		

$Q = VA = (.117\ ft/sec)(1.83\ ft^2) = .215\ ft^3/sec$

$$\text{Area} = \text{Arccos}\left(\frac{r-h}{r}\right)r^2 - (r-h)\left(\sqrt{2rh-h^2}\right) = \text{Arccos}\left(\frac{1.25-1.0}{1.25}\right)(1.25)^2 - (1.25-1.0)\left(\sqrt{2(1.25)(1.0)-(1.0)^2}\right) = \cancel{1.2.27}\ 1.835$$

$r = 1.25\ ft$
$h = 1.0\ ft$

$(1.36)(1.56625) - (.25)(1.22) = 1.835$

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S6-04 B Drogue Measurements

Notes: use same x-sectional area as S6-04 A

Drogue Times	Drogue Distance	Vel.	Mean Velocity
64	32 feet	.500	.474 ft/sec
63	"	.508	
77	"	.415	

$Q = VA = (.474 ft/sec)(1.207) = .571 ft^3/sec$

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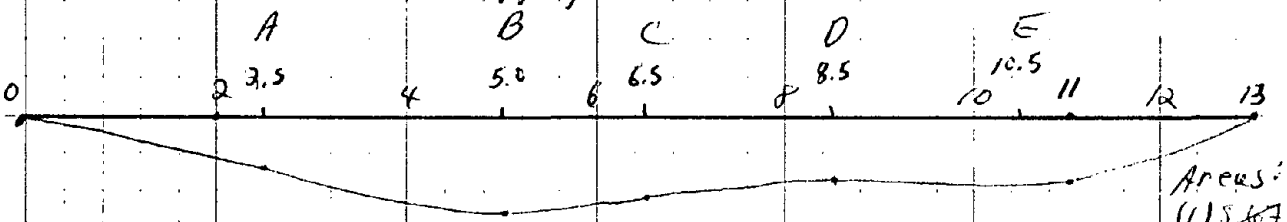
56-05

Scale 1.0" = 2.0 feet

Notes: velocity measurements taken ≈ 90 feet upstream at the same location as measurements taken during Round I
Pygmy Meter Used



Areas: (ft²) (1) 8.17
(1) 5.67 (2) 6.31 (3) 8.14
Mean Area: 8.21 ft²

Stations		A	B	C	D	E
Beeps	Depths 20%	20	50	41	15	
	50%	15		33		
	80%		37		10	
Average Beeps @ each station		17.5	43.5	37	12.5	
(V) Velocity @ each station Based on Beeps (X)		.78 ft/sec	1.26 ft/sec	1.51 ft/sec	.59 ft/sec	

(3.0 ft/5 sec Drogue Velocity = .6 ft/sec)

Mean Velocity, ft/sec: 1.05 ft/sec

$$\text{Velocity} = \frac{K \cdot P}{T} + C$$

$$V = \frac{(.687\,m)(X)}{(60\ sec)} + .038 = V\ m/sec \times 3.28\ ft/meter$$

$$V = \frac{.687X}{60} + .038$$

$$V = (.01145X + .038)(3.28\ ft/meter)$$

$$Q = VA = (1.05\ ft/sec)(8.21\ ft^2) = 8.62\ ft^3/sec$$

V = meter/sec
K = Constant = .687 m
P = Beeps
C = Starting Threshold Offset = .038
T = Time in secs

METCALF & EDDY, ENGINEERS

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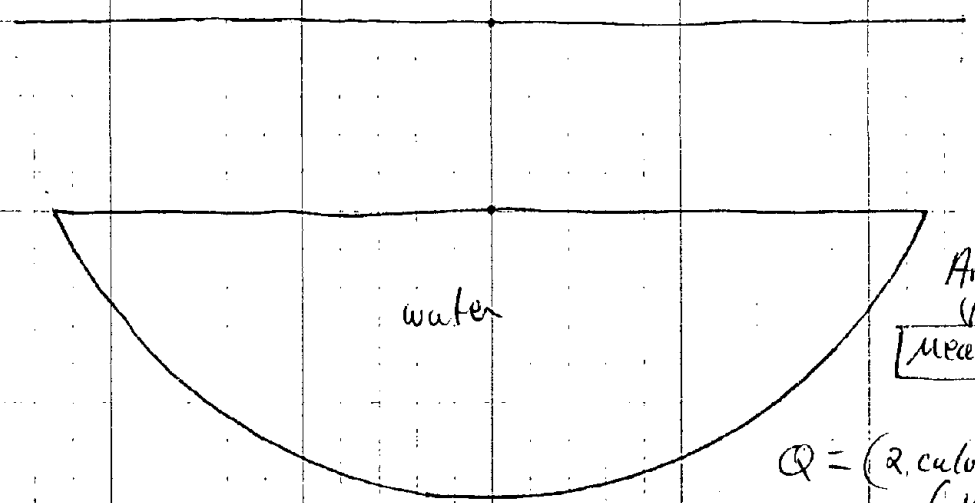
56-06

Scale: 1.0 inches = 1.0 ft. Notes Drogue studies @ culverts



Areas
(1) 4.989 (2) 4.980 (3) 4.832
Mean Area: 4.934 ft²

Drogue velocities
Trials: 1 49 sec
24 ft/x secs 2 40 sec
3 42 sec
Mean Time
24 ft/x secs. 43.67 sec

Mean Velocity: 24 ft/43.67 sec = .55 ft/sec

$Q = (2 \text{ culverts})(\text{Area of one culvert})(\text{Velocity})$

$Q = 2(.55 \text{ ft/sec})(4.934)$

$Q = 5.427 \text{ ft}^3/\text{sec}$

$\text{Area} = \text{Arc Cos}\left(\frac{r-h}{r}\right) r^2 - (r-h)\sqrt{2rh-h^2}$

$r = 2.5 \text{ ft.}\ h = 1.5 \text{ ft.}$

$\text{Arc Cos}\left(\frac{2.5-1.5}{2.5}\right)(2.5)^2 - (2.5-1.5)\sqrt{2(2.5)(1.5)-(1.5)^2}$

$(1.16)(6.25) - (1)(2.29) = 4.95 \text{ ft}^2 = A_1$

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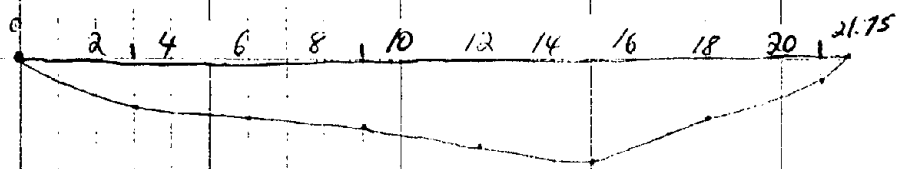
56-07

Notes: Drogue Measurements were Made

Scale 1.0" = 5.0 feet



Areas (ft^2): (4) 36.077
(1) ~~33.18~~ (2) 35.587 (3) 35.768

$\boxed{\text{Mean Area} = 35.811\ ft^2}$

Drogue Stations		3	6	9	12	15	18	21
Trials	1	27	22	11	7	6	9	45
3ft/X secs	2	23	15	9	7	7	9	41
Means Q Each Station 3ft/sec(X)		25	18.5	10	7	6.5	9	43

Mean of X section = 3'/17 secs

Velocity Mean = 3ft/17sec = $\boxed{.18\ ft/sec}$

$Q = VA = (.18\ ft/sec)(35.811\ ft^2) = 6.446\ cfs.$

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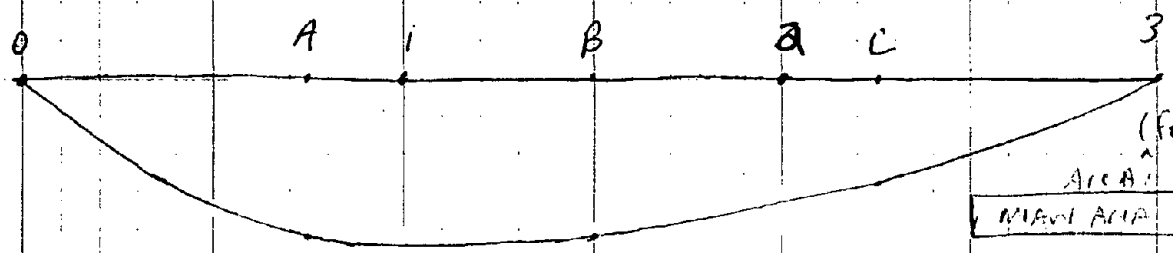
56-08 A Drogue Measurements

Notes: Drogue and Pygmy meter measurements were made

Scale 2" = 1.0 ft
1" = 0.5'



(ft²)
Area A: (1) 0.901 (2) 0.887 (3) 0.894
MEAN AREA: 0.894 ft²

Drogue Measurements

Drogue Times (sec)	Drogue Distance (ft)	Velocity (ft/sec)	Mean Velocity (ft/sec)
7	3	.428	.45
6.5	3	.461	
6.5	3	.461	

$Q = VA = (.45\ ft/sec)(0.894\ ft^2) = 0.402\ ft^3/sec$

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S6-08B
Notes: Pygmy Meter Measurements
Refer to S6-08A for pygmy metering stations

Stations	A	B	C
Beeps/min	6	10	16
Average Beeps/min	10.67		

$$\text{Velocity} = \frac{K \cdot P}{T} + C$$

V = meters/sec

K = Constant = .687 m

P = Beeps

C = Starting threshold offset = .038

T = Time in seconds

$$V = \frac{(.687\,m)(10.67)}{60\,sec} + .038$$

$$V = 0.160\,m/sec = (0.160\,m/sec)(3.28\,ft/meter)$$

$$= .52\,ft/sec$$

$$Q = VA = (.52\,ft/sec)(.894\,ft^2) = .465\,cfs$$

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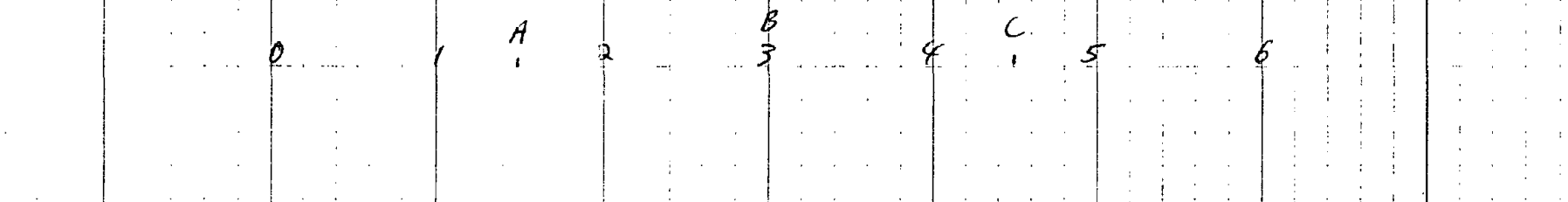
Scale 1" = 1.0 feet

S6-09A
Note: measurements were taken 45 feet downstream of S6-09



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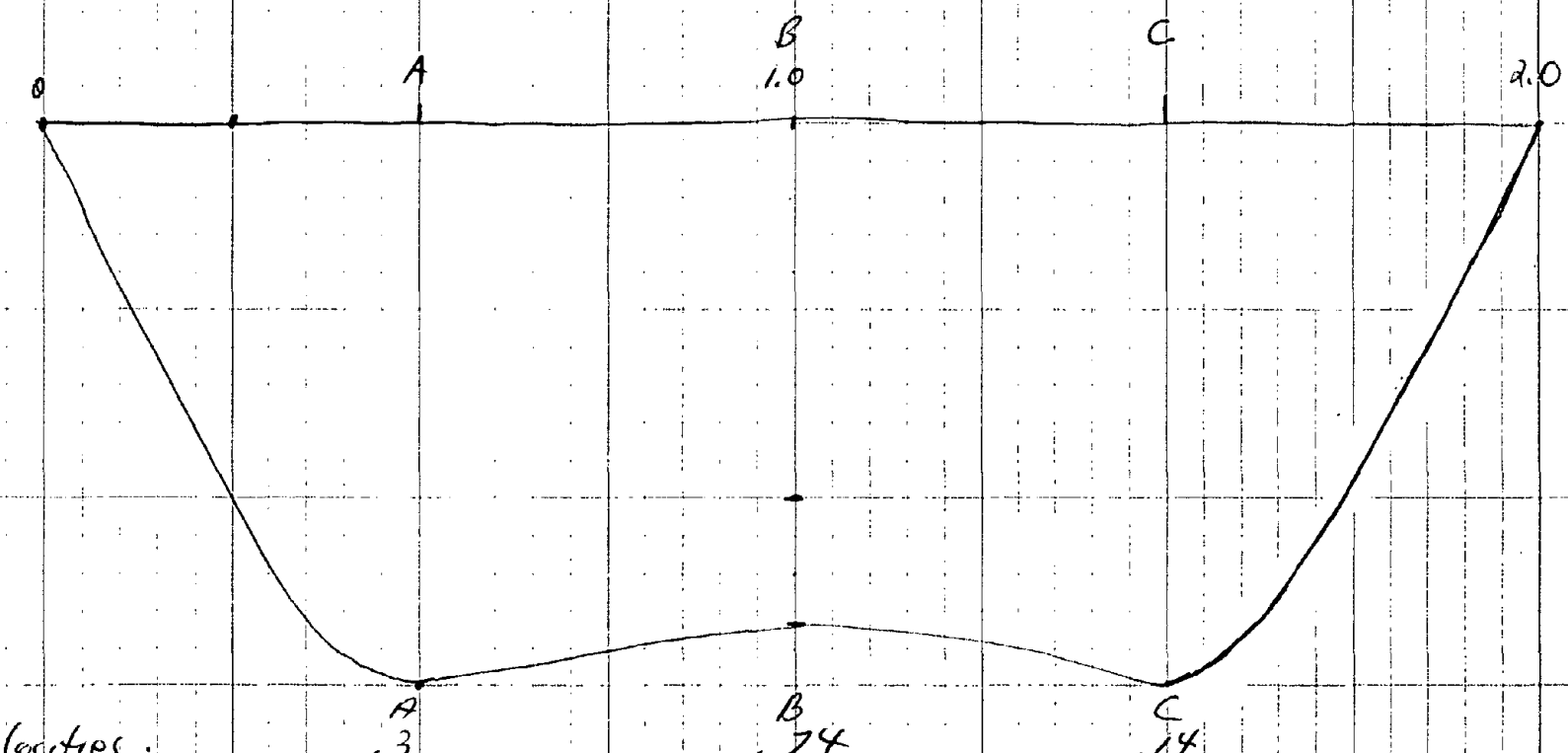
S6 - 09B

Scale 4" = 1.0 feet
1" = 0.25'

Note: Measurements were taken several 100 feet downstream



Velocities:
Mean Velocity .393 ft/sec

Areas (1) 1.164 (2) 1.110 (3) 1.162

Mean Area = 1.145 ft²

Q = VA = (.393 ft/sec)(1.145 ft²)

Q = 0.450 cfs

NONREPRODUCIBLE GRID FORM 145

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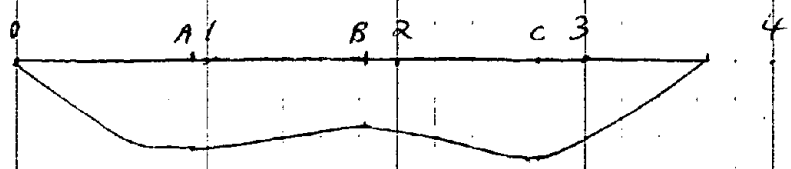
SG-10

Scale 1" = 1.0 feet

Note: Measurements made 6-feet downstream of staff-gauge



	0	A	B	C
Velocities	0	0	1.52	0.3
Mean velocity	.607 ft/sec			

Areas (1) 1.351 (2) 1.353 (3) 1.346

Mean Area : 1.350 ft²

$Q = VA = (.607\ ft/sec)(1.350\ ft^2)$

$= 0.819\ ft^3/sec$

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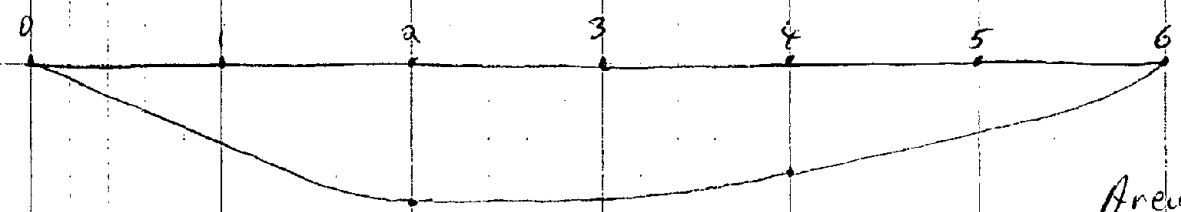
S6-11

Notes: Drogue Measurements

Scale 1.0 inch = 1.0 feet



Areas (ft^2):
(1) 2.868 (2) 2.900 (3) 2.854

(Mean Area = 2.874 ft^2)

Drogue Stations		2	4
Trials	1	28	7
3 ft/x sec.	2	21	7
Means @ each station 3 ft/x sec		24.5	7

Mean of x section = 3 ft/15.75 sec
3 ft/x sec

Mean velocity = $\boxed{.19\ ft/sec}$

$Q = VA = (.19\ ft/sec)(2.874\ ft^2) = 0.546\ cfs$

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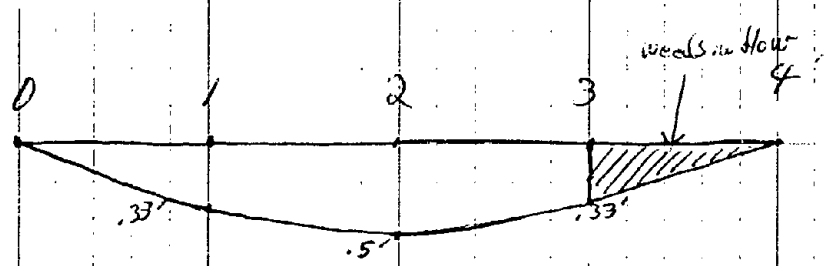
56-12

Hor Scale 1.0" = 1.0'

Vel = ft/sec



	1	2	3
Velocities	.45	.3	0

Mean Velocity .25 ft/sec

Areas ① 1.053 ② 1.058 ③ 1.044

$\boxed{\text{Mean Area} = 1.052\ ft^2}$

$\boxed{Q = VA = (.25\ ft/sec)(1.052\ ft^2) = 0.263\ cfs}$

Project S6-05 Acct. No. Page 1 of 3
Subject Saugatucket River Drainage Comptd. By Date
Detail Basin Area Ck'd. By Date

The drainage basin area was calculated using the following maps:

- National Wetlands Inventory U.S. Dept. of the Interior Fish and Wild Service
- Surficial Geology of the Narragansett Pier Quadrangle, Rhode Island by Schnitzer, J.P., 1961.
- Surficial Geology of the Slocum Quadrangle Rhode Island by Power, W.R., Jr., 1957.
- Surficial Geology of the Wickford Quadrangle, Rhode Island by Schafer, J.P., 1961

The areas of each part of the Saugatucket River Drainage Basin above S6-05 on each of the above maps was calculated with a computer digitizing program. The following scales were used and area calculated on each map.

- National Wetlands Inventory

2.65" = 1.0-miles

1.0" = .37736 miles

$(1.0")^2$ = .14240 square miles

Areas: ① .1856
② .1861
③ .1868

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Mean Area = .1862 square miles

- Surficial Geology of the Narragansett Pier Quadrangle

3.63" = 1.0 miles

1.0" = .38023 miles

$(1.0)^2$ = .14457 square miles

Areas 2 3.8795
1 3.8843
3 3.8716

Mean Area = 3.8785 square miles

- Surficial Geology of the Slocum Quadrangle

1.0" = .5 miles

$(1.0")^2$ = .25 square miles

Areas: 2 .279[illegible]
1 .280[illegible]
3 [illegible]

Mean Area = [illegible]

- Surficial Geology of the Wickford Quadrangle

1.0" = .38023 miles

$(1.0")^2$ = .14457 square miles

Areas 2 [illegible]401
1 [illegible]5675
3 [illegible]6660

Mean Area = [illegible]567 square miles

Sum of areas

.1862
3.8787
.2312
2.0567

Total = 6.4028 square miles

The number of overland flow days after a storm peak until the beginning of base flow is equal to $(A)^{.2}$ (Fetter, 1988; Linsley et. all, 1975). A = area of drainage basin in square miles

$$\boxed{(6.4028)^{.2} = 1.45 \text{ days}}$$

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Project 56-03 Acct. No. Page of
Subject Pitchbrook Drainage Comptd. By Date
Detail Basin Area Ck'd. By Date

Map Scale
.75-inches = 3000'
1.0-inches = 3157.8947'
1.0" = 3157.8947'/(5280'/mile)
1.0" = .598086 miles
$(1.0")^2$ = .357707 square miles

Drainage Basin Area using Digitizer Program = 4.3436

Measurements	Areas
1	4.3375
2	4.3486
3	4.3444

Mean Area = 4.3436 square miles

The number of overland flow days after a storm peak until the beginning of base flow is equal to $(A \text{ (square miles of drainage area)})^{.2}$ according to (Eagleson, 1988; Linsley et. all, 1975).

$$\boxed{(4.3436)^{.2} = 1.34 \text{ days}}$$

NONREPRODUCIBLE GRID FORM 145
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SURFACE WATER ELEVATIONS DETERMINED FROM STAFF GUAGES
(measurements were made by the surface water teams)

ROUND 3 Date:01/27/92

STAFF GUAGES	ELEVATIONS OF TOPS OF RULERS (FT.)	RULER MEASUREMENTS TO SURFACE WATER (FEET)	ELEVATIONS OF SURFACE WATER (FT.)
TIMES			
SG-01	48.393	0.625	47.768
SG-02	54.794	*1	*1
SG-03	42.839	2.000	40.839
SG-04	34.527	1.708	32.819
SG-05	35.017	0.932	34.085
SG-06	30.076	0.750	29.326
SG-07	30.694	0.552	30.142
SG-08	51.428	1.896	49.532
SG-09	59.554	2.031	57.523
SG-10	71.368	2.625	68.743
SG-11	32.597	1.615	30.982
SG-12	44.908	2.042	42.866

NOTES: RULER MEASUREMENTS CONVERTED TO FEET:
FROM CENTIMETERS BY MULTIPLYING TIMES .0328-FT./CM.
FROM INCHES BY DIVIDING BY 12-INCHES/FT.

*1: There was only a trickle of water; a water measurement was not possible

MINI-PIEZOMETER GROUNDWATER ELEVATIONS

ROUND 3 DATES:01/27

MINI-PIEZOMETERS	TIME	(A) ELEVATIONS OF SURFACE WATERS DETERMINED FROM STAFF GUAGES (FT.)	(X) DISTANCE FROM SURFACE WATER TO TOP OF MINI-PIEZOMETER CASING (FT.)	(Y) DEPTH TO GROUND WATER IN MINI-PIEZOMETER FROM TOP OF MINI-PIEZOMETER RISER (FT.)		(X-Y=Z) LOSS(-),GAIN(+) OR EQUAL(=) (FT.)	(A+Z=ELE.) ELEVATION OF MINI-PIEZOMETER GROUNDWATER (FT.)
MP-01	10:25	47.783	1.068	0.400	TO ICE	0.668	48.451
	16:26	47.768	1.073	0.710		0.363	48.131
MP-03	17:14	40.214	2.906	1.940		0.966	41.180
MP-07	----	------	------	------		------	------
MP-08	12:46	49.584	2.396	1.560	TO ICE	0.836	50.420
	14:43	49.543	2.432	2.234		0.198	49.741
MP-09	13:05	57.554	1.125	0.420	TO ICE	0.705	58.259
	14:58	57.523	1.208	1.080		0.128	57.651
MP-10	12:04	68.743	2.708	1.630	TO ICE	1.078	69.821
	15:44	68.681	2.760	2.510		0.250	68.931
MP-11	----	------	------	------		------	------
MP-12	----	------	------	------		------	------

SEEPAGE METERS			HEIGHT OF WATER IN SEEPAGE METER TUBE ABOVE (+) OR BELOW (-) THE SURFACE WATER (FT.)	ELEVATION OF SEEPAGE METER GROUNDWATER
SM-01	10:25	47.783	0.047	47.830
SM-05		------	------	------
SM-07		------	------	------

NOTES:MEASUREMENTS CONVERTED FEET:
FROM INCHES DIVIDED BY 12-INCHES/FT.
HEADS MEASURED IN MINI-PIEZOMETERS ARE PROBABLY NOT STATIC BECAUSE THE
THE MEASUREMENTS WERE ONLY MADE A SHORT TIME AFTER HOT WATER WAS INJECTED
DOWN INTO THE MINI-PIEZOMETERS TO MELT ICE THAT HAD FORMED IN THE MINI-PIEZOMETERS

SEEPAGE METER AND MINI-PIEZOMETER RESULTS

ROUND 3 DATES: 1/27-1/28

MINI-PIEZOMETERS	START: DATE	TIME	VOL. IN BAG (CCS.)	END: DATE	TIME	VOL. IN BAG (CCS.)	CHANGE IN VOLUME (CCMS.) LOSS(-) OR GAIN(+)	TOTAL ELAPSED TIME (MINUTES)	FLOW RATE (CCMS./MIN.) LOSS(-) OR GAIN(+)
MP-01	27-Jan	16:45	1000	28-Jan	14:13	1283	283	1288	0.220
MP-03	27-Jan	17:35	1000	28-Jan	13:32	4650	3650	1197	3.049
MP-07	28-Jan	08:40	1000	28-Jan	16:04	1774	774	444	1.743
MP-08	27-Jan	14:48	1000	28-Jan	11:32	1830	830	1244	0.667
MP-09	27-Jan	15:34	1000	28-Jan	11:08	2593	1593	1174	1.357
MP-10	27-Jan	16:00	1000	28-Jan	16:55	859	-141	1495	-0.094
MP-11	28-Jan	09:45	1000	28-Jan	15:25	2453	1453	340	4.274
MP-12	28-Jan	10:26	1500	28-Jan	10:36	1122	-378	10	-37.800
SEEPAGE METERS									
SM-01	27-Jan	10:55	1000	28-Jan	14:20	1126	126	1645	0.077
SM-05	28-Jan	07:30	600	28-Jan	13:04	3942	3342	334	10.006
SM-07	28-Jan	08:34	1000	28-Jan	15:53	1797	797	439	1.815

MINI-PIEZOMETER GROUNDWATER ELEVATIONS

ROUND 3 DATES:01/28

MINI-PIEZOMETERS	TIME	(A) ELEVATIONS OF SURFACE WATERS DETERMINED FROM STAFF GUAGES (FT.)	(X) DISTANCE FROM SURFACE WATER TO TOP OF MINI-PIEZOMETER CASING (FT.)	(Y) DEPTH TO GROUND WATER IN MINI-PIEZOMETER FROM TOP OF MINI-PIEZOMETER RISER (FT.)	(X-Y=Z) LOSS(-),GAIN(+) OR EQUAL(=) (FT.)	(A+Z=ELE.) ELEVATION OF MINI-PIEZOMETER GROUNDWATER (FT.)
MP-01	14:31	47.737	1.115	0.930	0.185	47.922
MP-03	13:54	40.822	2.932	2.830	0.102	40.924
MP-07	08:00	30.090	1.984	1.830	0.154	30.244
	16:14	30.090	1.990	1.630	0.360	30.450
MP-08	11:32	49.511	2.469	2.470	-0.001	49.510
MP-09	11:24	57.512	1.260	1.160	0.100	57.612
MP-10	16:42	68.681	2.813	2.790	0.022	68.703
MP-11	09:41	30.936	1.750	0.840	0.910	31.846
	15:37	30.941	1.813	1.760	0.052	30.993
MP-12	10:18	42.866	2.729	3.040	-0.311	42.555

SEEPAGE METERS			HEIGHT OF WATER IN SEEPAGE METER TUBE ABOVE (+) OR BELOW (-) THE SURFACE WATER (FT.)	ELEVATION OF SEEPAGE METER GROUNDWATER
SM-01	14:45	47.737	0.031	47.768
SM-05	07:09	34.059	0.146	34.205
	13:21	34.048	0.125	34.173
SM-07	08:20	30.090	0.016	30.106
	16:14	30.090	0.036	30.126

NOTES:MEASUREMENTS CONVERTED FEET:
FROM INCHES DIVIDED BY 12-INCHES/FT.
HEADS MEASURED IN MINI-PIEZOMETERS AND SEEPAGE METERS PROBABLY ARE NOT STATIC BECAUSE THE MEASUREMENTS WERE ONLY MADE A SHORT TIME AFTER VOLUMETRIC BAGS WERE DETACHED.

MINI-PIEZOMETER GROUNDWATER ELEVATIONS

ROUND 3 DATES:01/29

MINI-PIEZOMETERS	TIME	(A) ELEVATIONS OF SURFACE WATERS DETERMINED FROM STAFF GUAGES (FT.)	(X) DISTANCE FROM SURFACE WATER TO TOP OF MINI-PIEZOMETER CASING (FT.)	(Y) DEPTH TO GROUND WATER IN MINI-PIEZOMETER FROM TOP OF MINI-PIEZOMETER RISER (FT.)	(X-Y=Z) LOSS(-),GAIN(+) OR EQUAL(=) (FT.)	(A+Z=ELE.) ELEVATION OF MINI-PIEZOMETER GROUNDWATER (FT.)
MP-01	16:19	47.747	1.090	1.180	-0.090	47.657
MP-03						
MP-07						
MP-08						
MP-09						
MP-10						
MP-11						
MP-12						

SEEPAGE METERS			HEIGHT OF WATER IN SEEPAGE METER TUBE ABOVE (+) OR BELOW (-) THE SURFACE WATER (FT.)	ELEVATION OF SEEPAGE METER GROUNDWATER
SM-01	16:08	47.747	0.021	47.768
SM-05				
SM-07				

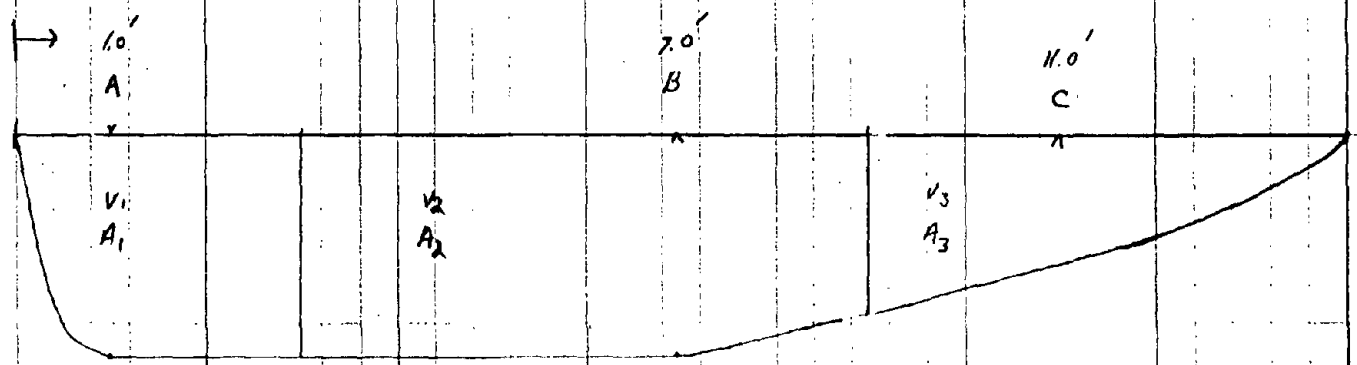
NOTES:MEASUREMENTS CONVERTED FEET:
FROM INCHES DIVIDED BY 12-INCHES/FT.
HEADS MEASURED IN MINI-PIEZOMETERS AND SEEPAGE METERS PROBABLY ARE NOT STATIC BECAUSE THE MEASUREMENTS WERE ONLY MADE A SHORT TIME AFTER VOLUMETRIC BAGS WERE DETACHED.

Round 3 1/27

Scale 1" = 2.0'

56-01

Comments: only drogue measurements were made.



Velocities
Stations

A	B	C
4'/4.57	4'/5.07	3'/3.72
4'/4.93	4'/5.19	3'/3.60
4'/4.84	4'/5.69	3'/3.00
Means: .91'/sec	.75'/sec	.88'/sec

Mean velocity of x section = $\boxed{.85\ '/sec}$

Mean of Area
Mean Total Area = $\boxed{25.81\ ft^2}$

1) 26.08 2) 25.56 3) 25.70 4) 25.89

Area 1	Area 2	Area 3
1) 6.24	13.[illegible]	5.76
2) 6.29	13.72	5.80
3) 6.35	13.61	5.84
Mean A_1 6.29	A_2 13.62	A_3 5.80

Sum = 25.71

① $Q_1 = (\overset{V}{.85'/sec})(\overset{A}{25.81}) = \boxed{21.94\ ft^3/sec}$

② $Q_2 = (\overset{V_1}{.91'/sec})(\overset{A_1}{6.29}) + (\overset{V_2}{.75'/sec})(\overset{A_2}{13.62}) + (\overset{V_3}{.88'/sec})(\overset{A_3}{5.80}) = \boxed{21.04\ ft^3/sec}$

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NONREPRODUCIBLE GRID FORM 145

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Round 3 1/27 S6-02

Comments: Trickle of flow but no velocities could be measured.

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NONREPRODUCIBLE GRID FORM 143

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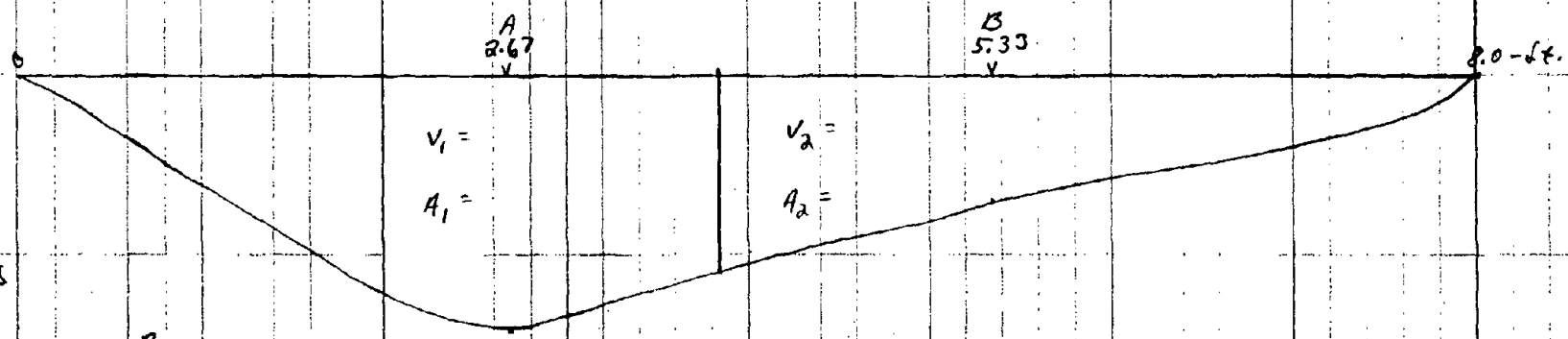
Round 3 1/27

Scale 1" = 1.0 feet

56-03
Comments: only drogue measurements were made



Stations velocities

A	B
10'/22.5	10'/40.7
10'/23.5	10'/55.1
10'/25.7	
means .42'/sec	.21'/sec

Mean velocity at X section = .31 ft/sec

Means of Areas 1) 6.08 2) 6.09 3) 6.01

Mean Total Area = 6.06 ft²

	Area 1	Area 2
1)	3.46	2.52
2)	3.54	2.51
3)	3.52	2.49
Mean A1	3.51	A2 2.51

Sum = 6.02

Ⓐ $Q_{10} = (\underset{V}{.31\ ft/sec})(\underset{A}{6.06\ ft^2}) = 1.88\ ft^3/sec$

Ⓑ $Q_{20} = (\underset{V_1}{.42\ ft/sec})(\underset{A_1}{3.51}) + (\underset{V_2}{.21\ ft/sec})(\underset{A_2}{2.51}) = 1.56\ ft^3/sec$

METCALF & EDDY, ENGINEERS
NONREPRODUCIBLE GRID FORM 145

Round 3 1/27

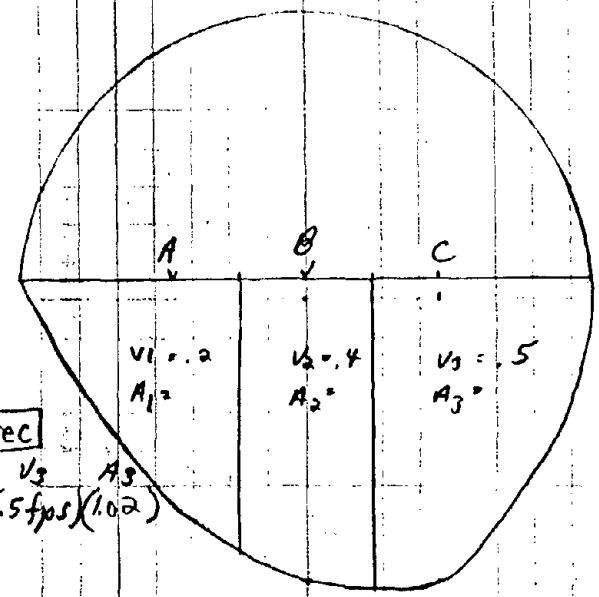
56-04

Comments: Drogue and Marsh McBirney Flow Velocity measurements were made

Scale 1" = 10"

Marsh McBirney Velocity Meas.

A .2 fps B .4 fps C .5 fps



Drogue Measurements velocities

32'/35sec
32'/38sec
32'/35sec

mean velocity = .89'/sec

mean velocity of X section = .37 fps

① $Q_{mm} = (.37\ fps)(2.46\ ft^2) = \boxed{.91\ ft^3/sec}$

② $Q_{2mm} = (.2\ fps)(.68) + (.4\ fps)(.78) + (.5\ fps)(1.02)$

$\boxed{Q_{2mm} = .96}$

① $Q_{10} = (.89'/sec)(2.46\ ft^2) = \boxed{2.19\ ft^3/sec}$

Mean of Areas ( ) 1) 352.45 2) 354.43 3) 358.18 = 354.99 in²

Mean Total Area = 354.99 in² = 2.46 ft²

		Area 1	Area 2	Area 3
inches	1)	98.[illegible]	112.63	146.70
	2)	98.61	112.20	146.81
	3)	98.13	112.92	148.85
inches	Mean A1	98.43 in²	A2 112.58 in²	A3 147.45 in²
feet	Mean A1	.68 ft²	A2 .78 ft²	A3 1.02 ft²

Sum = 2.48 feet²

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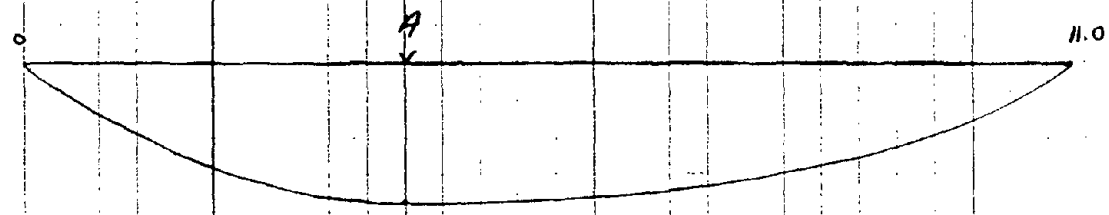
56-05 ?

Round 3 1/27 Comments: Only drogue measurements were made

Scale 1" = 2.0'



velocities
stations
A
8'/3.00 sec.
8'/2.44 sec
8'/2.34 sec
Mean = 3.12'/sec

Mean velocity of X section = 3.12'/sec

Mean of Areas 1) 11.76 2) 11.67 3) 11.88 = 11.77 ft.² X sectional area

(1) $Q = (3.12'/sec)(11.77 ft^2) = \boxed{36.72\ ft^3/sec}$

METCALF & EDDY, ENGINEERS
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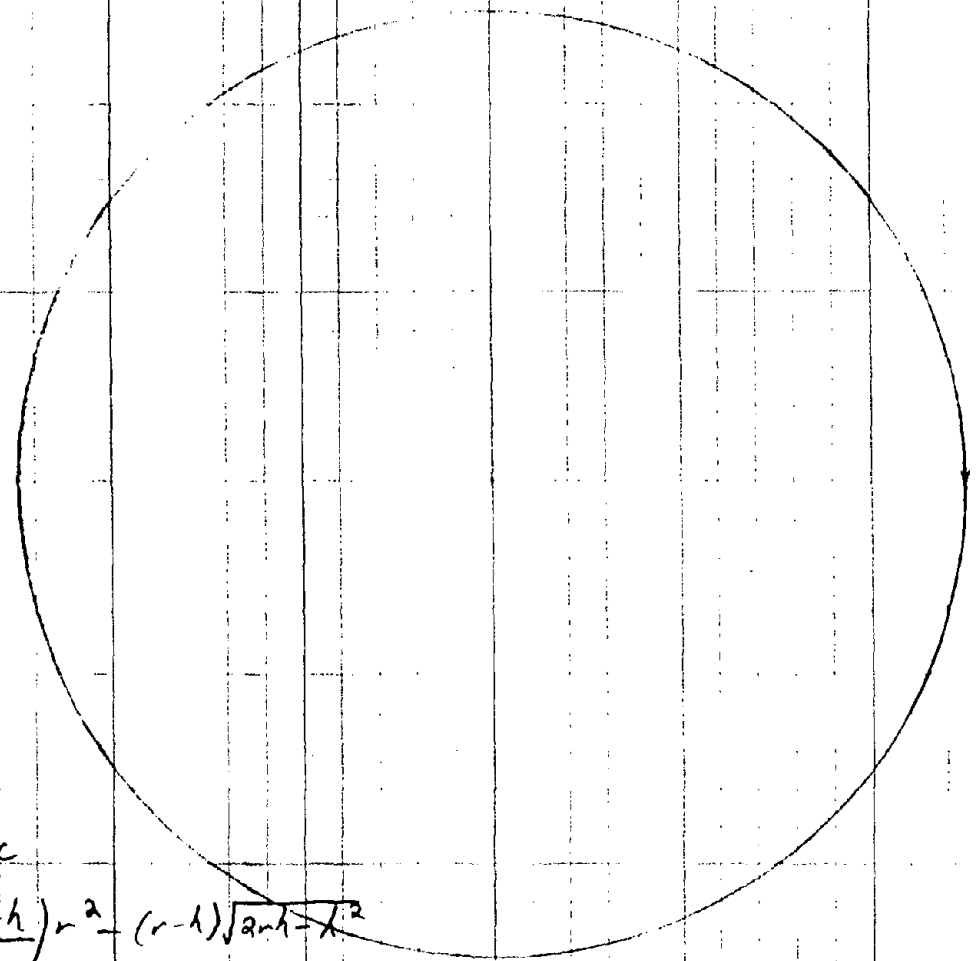
Round 3 1/27 S6-06

Comments: Drogue measurements were made but the depth of the water in the culvert was not ascertained. Only drogue measurements were made

1" = 10-feet



Velocity Measurements

① 18.2"/24.0'
② 11.25"/24.0'
③ 17.54"/24.0'

Mean Velocity = 1.33 ft/sec

Area Equation = $\text{Arccos}\left(\frac{r-h}{r}\right)r^2 - (r-h)\sqrt{2rh-h^2}$

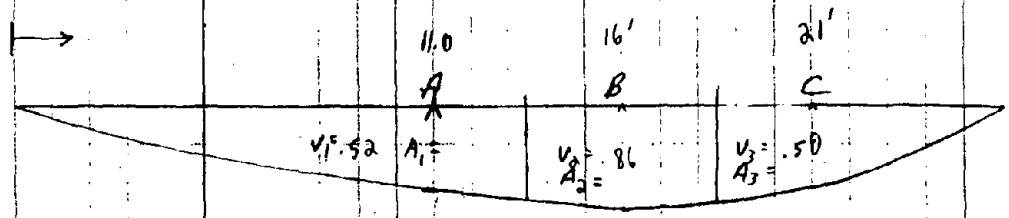
METCALF & EDDY, ENGINEERS
NONREPRODUCIBLE GRID FORM 145

Round 3 1/27

Scale 1" = 5.0 ft

56-07

Comments: Only drogue measurements were made



velocities

stations

A	B	C
4'/7.47	4'/4.88	4'/13.22
4'/7.63	4'/4.31	4'/9.07
4'/7.75	4'/4.72	4'/5.25
means .52'/sec	.86'/sec	.50'/sec

mean velocity of X section = .63'/sec = $\frac{V_1+V_2+V_3}{3}$

Cross Sectional Area = 1) 45.51 2) 45.34 3) 45.62

Mean Total Area = 45.49

① $Q_1 = (\overset{V}{.63'/sec})(\overset{A}{45.49\ ft^2}) = \boxed{28.65\ ft^3/sec}$

② $Q_2 = (\overset{V_1}{.52'/sec})(\overset{A_1}{18.59}) + (\overset{V_2}{.86'/sec})(\overset{A_2}{13.17}) + (\overset{V_3}{.50'/sec})(\overset{A_3}{12.01}) = \boxed{26.99\ ft^3/s}$

③ $Q_3 = (.63'/sec)(18.59 + 13.17 + 12.01) = \boxed{27.57}$

	Area 1	Area 2	Area 3
1)	18.92	13.08	11.97
2)	18.92	12.99	11.97
3)	19.20	13.45	12.10
Means	A1 18.59	A2 13.17	A3 12.01

Sum = $\boxed{43.77}$

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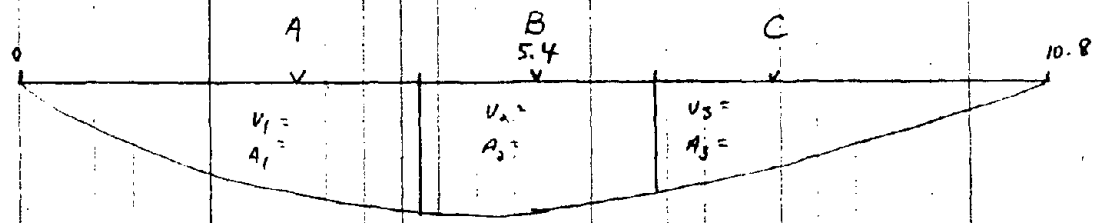
METCALF & EDDY, ENGINEERS

NONREPRODUCIBLE GRID FORM 145

Round 3 1/27 56-08

Scale 1" = 2.0 ft

Comments: only drogue measurements were made
* no depth was given for station A



Stations
Velocities

Mean Velocity of Cross Section = .60'/sec

	A	B	C
	no flow	10.0'/12.9 sec	10.0/7.6 secs
		10.0'/12.8 sec	10.0/12.5 secs
		10.0'/14.0 secs	10.0/10.0 secs
Means	0'/sec	.75'/sec	1.04'/sec

Means of Areas 1) 9.62 2) 9.60 3) 9.84

Mean Total Area = 9.69

	Area 1	Area 2	Area 3
1)	4.028	3.320	2.778
2)	3.671	3.394	2.688
3)	3.724	3.311	2.764
Mean	A1 3.81	A2 3.34	A3 2.74

Sum = 9.89

$Q_{10} = (.60\ V\ ft/sec)(9.69\ A) = 5.81\ ft^3/sec$

$Q_{20} = (0.0\ V_1\ ft/sec)(3.81\ A_1) + (.75'\ V_2\ ft/sec)(3.34\ A_2) + (1.04'\ V_3\ ft/sec)(2.74\ A_3) = 5.35\ ft^3/sec$

$Q_{30} = (.60\ ft/sec)(9.89) = 5.93$

$A_1 + A_2 + A_3$

3.81 + 3.34 + 2.74

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METCALF & EDDY, ENGINEERS
NONREPRODUCIBLE GRID FORM 148

Round 3 1/27

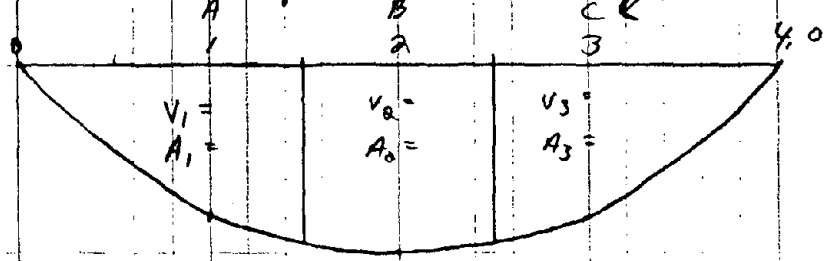
56-09 A

Comments: Location ? Drogue and Marsh McBirney Measurements were made. The Marsh McBirney Meter stopped functioning after station C was measured. Here it must be assumed that the velocity measured was an average over the section.

Scale 1" = 1.0 - foot

Marsh McBirney Velocity Measurements

A	B	C
—	—	1.3 fps



was drogue mean where here?

Drogue Measurements

10'/6
10'/7
10'/7

Mean Velocity = 1.51'/sec

① $Q_{10} = (1.51'/sec)(2.78) = 4.19 cfs/sec$

① $Q_{1mm} = (1.3 fps)(2.78 ft^2) = 3.614 ft^3/sec$

③ $Q_{3mm} = (1.3 fps)(.86 + .98 + .90) = 3.56 ft^3/sec$

Mean of Areas 1) 2.77 2) 2.78 3) 2.78

Total Mean Area = 2.78

	Area 1	Area 2	Area 3
1)	.85	.99	.92
2)	.84	.99	.89
3)	.88	.97	.90
Mean	A1 .86	A2 .98	A3 .90

Sum = 2.74

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METCALF & EDDY, ENGINEERS
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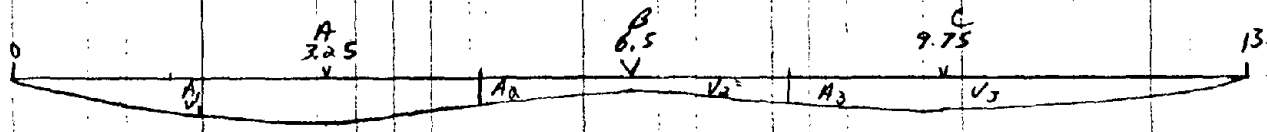
Round 3 1/27

SC-09B

Scale = 1" = 2.0'

Comments: Measurements were at the staff location only drogue measurements were made



velocities
Stations

A	B	C
0'/0"	10/28 secs	10/45 secs
	10/29 secs	10/70 secs
	10/30 secs	
Means 0'/sec	.34'/sec	.18'/sec

Mean velocity of X-section = .17 = $\frac{V_1 + V_2 + V_3}{3}$

Means of Areas 1) 3.73 2) 3.77 3) 3.52

Mean Total Area = 3.67

	Area 1	Area 2	Area 3
1)	1.59	.69	1.29
2)	1.66	.69	1.27
3)	1.69	.67	1.24
Mean A1	1.65	A2 0.68	A3 1.27

Sum = 3.6

① $Q_{10} = (.17'/sec)(3.67\ ft^2) = \boxed{.62\ ft^3/sec}$

② $Q_{20} = (0'/sec)(1.65) + (.34'/sec)(0.68) + (.18'/sec)(1.27) = \boxed{.46\ ft^3/sec}$

③ $Q_{30} = (.17'/sec)(1.65 + .68 + 1.27)$ $(A_1 + A_2 + A_3)$ $= \boxed{.61\ ft^3/sec}$

METCALF & EDDY, ENGINEERS
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Round 3 1/27 56-10

Comments: Drogue and Mark McBirney measurements made However the length of the cross section was not measured so a x-sectional area cannot be calculated.

Drogue Measurements

10' / 3.5
10' / 4.0
10' / 4.0
2.6'/sec

Mark McBirney

A	B	C	AVG
1.3 fps	2.4 fps	1.6 fps	1.8 fps

Cross Section Range = Rd 4 (4.55'), Rd 2 (3'8.0"), Rd 1 (3.75')

METCALF & EDDY, ENGINEERS

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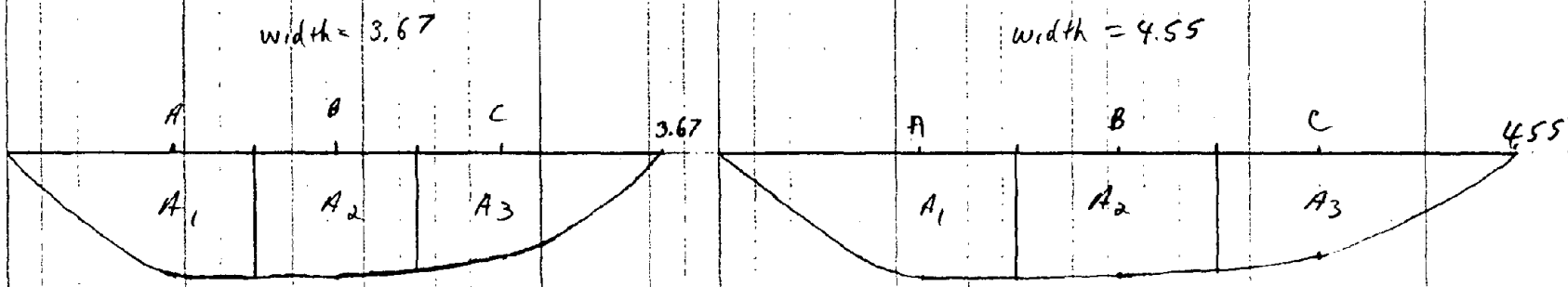
Round 3 1/27 56-10

Comments: Range of X sectional areas calculated based on max and min brook widths measured during rounds 1, 2 and 4. The brook width for Round 3 at 56-10 was not measured

1" = 1.0 ft



Means of Areas

	A_1	A_2	A_3
①	.69	.63	.64
②	.69	.64	.63
③	.71	.63	.63
Means	.7	.6	.6

Sum = 1.9

Means of Areas

	A_1	A_2	A_3
①	.88	.80	.76
②	.88	.82	.77
③	.88	.80	.74
Means	.9	.8	.8

Sum = 2.5

$Q_1 = (\overset{\bar{V}}{1.8\ ft/sec})(\overset{\Sigma\ Areas}{1.9}) = \boxed{3.4\ ft^3/sec}$

$Q_2 = (\overset{V_1}{1.3\ ft/sec})(\overset{A_1}{.7}) + (\overset{V_2}{2.4\ ft/sec})(\overset{A_2}{.6}) + (\overset{V_3}{1.6\ ft/sec})(\overset{A_3}{.6}) = \boxed{3.3\ ft^3/sec}$

$Q_{Drogue} = (\overset{\bar{V}}{2.6\ ft/sec})(\overset{\Sigma\ Area}{1.9}) = \boxed{4.9\ ft^3/sec}$

$Q_1 = (\overset{\bar{V}}{1.8\ ft/sec})(\overset{\Sigma\ Areas}{2.5}) = \boxed{4.5\ ft^3/sec}$

$Q_2 = (\overset{V_1}{1.3\ ft/sec})(\overset{A_1}{.9}) + (\overset{V_2}{2.4\ ft/sec})(\overset{A_2}{.8}) + (\overset{V_3}{1.6\ ft/sec})(\overset{A_3}{.8}) = \boxed{4.4\ ft^3/sec}$

$Q_{Drogue} = (\overset{\bar{V}}{2.6\ ft/sec})(\overset{\Sigma\ Area}{2.5}) = \boxed{6.5\ ft/sec}$

METCALF & EDDY, ENGINEERS

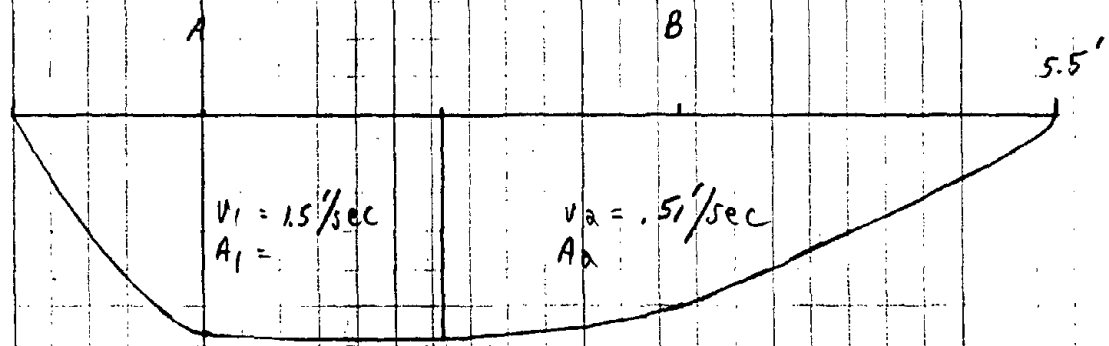
NONREPRODUCIBLE GRID FORM 145

Round 3 1/27

S6-11

Comments: Only Prague Studies were made

Scale 1" = 1.0 feet



velocities Stations	A	B
	4'/2.66	4/7.10
	4'/2.69	4/7.47
	4'/2.89	4/9.40
	4'/2.47	
Means	1.50'/sec	.51'/sec

Mean velocity of X-section = $\boxed{1.0'/sec}$

Mean of Areas 1) 4.67 2) 4.71 3) 4.64

Mean Total Area = $\boxed{4.67\ ft^2}$

	Area 1	Area 2
1)	2.17	2.49
2)	2.09	2.49
3)	2.14	2.49
Mean	A_1 2.13	A_2 2.49

Sum = 4.62

① $Q_1 = (\overset{V}{1.0'/sec})(\overset{A}{4.67\ ft^2}) = \boxed{4.67\ ft^3/sec}$

② $Q_2 = (\overset{V_1}{1.50'/sec})(\overset{A_1}{2.13}) + (\overset{V_2}{.51'/sec})(\overset{A_2}{2.49}) = \boxed{4.46\ ft^3/sec}$

③ $Q_3 = (1.0'/sec)(\underset{A_1+A_2}{4.62}) = \boxed{4.62\ ft^3/sec}$

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METCALF & EDDY, ENGINEERS

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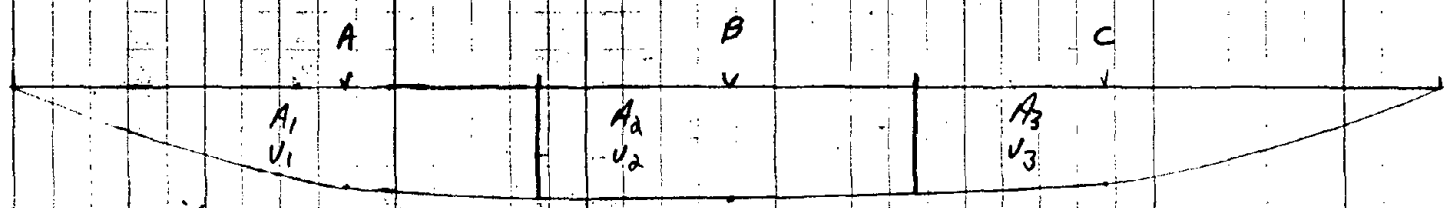
Round 3 1/27

56-12

Scale 1" = 10-feet

Comments: Drogue and Marsh-McBirney Flow Velocity Measurements were made. Measurements were made approximately 50.0 feet upstream of 56-12



Marsh McBirney velocity measurements stations/velocities

A	B	C
.2	.62	.4

Mean Velocity at X section = .41 fps

① $Q_{1mm} = (\overset{V}{.41\text{ fps}})(\overset{A}{3.26}) = 1.34\ ft^3/sec$

② $Q_{2mm} = (\overset{V_1}{.2\text{ fps}})(\overset{A_1}{1.08}) + (\overset{V_2}{.62\text{ fps}})(\overset{A_2}{1.13}) + (\overset{V_3}{.4\text{ fps}})(\overset{A_3}{1.06}) = 1.34\ ft^3/sec$

Drogue measurements stations/velocities

10 / 17.5 secs
10 / 16.7 secs
10 / 17.1 secs

Mean Velocity = .58 ft/sec

① $Q_{1D} = (\overset{V}{.58\text{ ft/sec}})(\overset{A}{3.26}) = 1.89\ ft^3/sec$

Mean of Areas
Mean Total Area = 3.26 ft² 1) 3.26 2) 3.21 3) 3.30

	Area1	Area2	Area3
1)	1.07	1.15	1.05
2)	1.07	1.09	1.05
3)	1.09	1.14	1.07
Mean	A1 1.08	A2 1.13	A3 1.06

Sum = 3.27

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NONREPRODUCIBLE GRID FORM 143

SURFACE WATER ELEVATIONS DETERMINED FROM STAFF GUAGES
(measurements were made by the surface water teams)

ROUND 4 Date:04/06/92

STAFF GUAGES	ELEVATIONS OF TOPS OF RULERS (FT.)	RULER MEASUREMENTS TO SURFACE WATER (FEET)	ELEVATIONS OF SURFACE WATER (FT.)
TIMES			
SG-01	48.393	0.896	47.497
SG-02	54.794	1.781	53.013
SG-03	42.839	2.092	40.747
SG-04	34.527	1.806	32.721
SG-05	35.017	1.350	33.667
SG-06	30.076	0.833	29.243
SG-07	30.694	0.917	29.777
SG-08	51.428	2.063	49.366
SG-09	59.554	2.198	57.356
SG-10	71.368	2.729	68.639
SG-11	32.597	1.771	30.826
SG-12	44.908	2.146	42.762

NOTES: RULER MEASUREMENTS CONVERTED TO FEET:
FROM CENTIMETERS BY MULTIPLYING TIMES .0328-FT./CM.
FROM INCHES BY DIVIDING BY 12-INCHES/FT.

SURFACE WATER ELEVATIONS DETERMINED FROM STAFF GUAGES
(Measurements were made during seepage meter studies)

ROUND 4 DATE:04/07/92

STAFF GUAGE	TIMES	ELEVATIONS OF TOPS OF RULERS (FT.)	RULER MEASUREMENTS TO SURFACE WATER (FEET)	ELEVATIONS OF SURFACE WATER (FT.)
TIMES				
SG-01	09:12	48.393	0.927	47.466
SG-02	------	54.794	------	------
SG-03	11:00	42.839	2.104	40.735
SG-04	------	34.527	------	------
SG-05	08:31	35.017	1.344	------ 33.673
SG-06	------	30.076	------	------
SG-07	07:03	30.694	0.948	29.746
SG-08	12:00	51.428	2.083	49.345
SG-09	12:41	59.554	2.219	57.335
SG-10	13:11	71.368	2.740	68.628
SG-11	06:42	32.597	1.802	30.795
SG-12	------	44.908	------	------

NOTES: RULER MEASUREMENTS CONVERTED TO FEET:
FROM CENTIMETERS BY MULTIPLYING TIMES .0328-FT./CM.
FROM INCHES BY DIVIDING BY 12-INCHES/FT.
------: MEASUREMENTS WERE NOT TAKEN

MINI-PIEZOMETER GROUNDWATER ELEVATIONS

ROUND 4 DATES:04/06

MINI-PIEZOMETERS	TIMES	(A) ELEVATIONS OF SURFACE WATERS DETERMINED FROM STAFF GUAGES BY SEEPAGE METER TEAM (FT.)	(X) DISTANCE FROM SURFACE WATER TO TOP OF MINI-PIEZOMETER CASING (FT.)	(Y) DEPTH TO GROUND WATER IN MINI-PIEZOMETER FROM TOP OF MINI-PIEZOMETER RISER (FT.)	(X-Y=Z) LOSS(-),GAIN(+) OR EQUAL(=) (FT.)	(A+Z=ELE.) ELEVATION OF MINI-PIEZOMETER GROUNDWATER (FT.)
MP-01	10:22	47.487	1.375	1.300	0.075	47.562
MP-03	11:53	40.745	3.010	2.940	0.070	40.815
MP-07	14:49	29.767	2.323	2.300	0.023	29.790
MP-08	12:35	49.366	2.625	2.610	0.015	49.381
MP-09*	13:11	57.356	1.427	0.800	0.627	57.983
MP-10*	09:31	68.618	2.875	2.930	-0.055	68.563
MP-11	16:10	30.816	1.948	1.890	0.058	30.874
MP-12	17:24	42.773	2.844	3.300	-0.456	42.317

SEEPAGE METERS			HEIGHT OF WATER IN SEEPAGE METER TUBE ABOVE (+) OR BELOW (-) THE SURFACE WATER (FT.)	ELEVATION OF SEEPAGE METER GROUNDWATER
SM-01	10:22	47.487	0.000	47.487
SM-05	-----	------	------	------
SM-07	14:49	29.767	0.01	29.777

NOTES: MEASUREMENTS CONVERTED FEET:
FROM INCHES DIVIDED BY 12-INCHES/FT.
*: Miniplezometer was lying in the water when the team arrived at the site.
------: Measurements were not taken

MINI-PIEZOMETER GROUNDWATER ELEVATIONS

ROUND 4 DATES:04/07

MINI-PIEZOMETERS	TIMES	(A) ELEVATIONS OF SURFACE WATERS DETERMINED FROM STAFF GUAGES BY SEEPAGE METER TEAM (FT.)	(X) DISTANCE FROM SURFACE WATER TO TOP OF MINI-PIEZOMETER CASING (FT.)	*1 (Y) DEPTH TO GROUND WATER IN MINI-PIEZOMETER FROM TOP OF MINI-PIEZOMETER RISER (FT.)	(X-Y=Z) LOSS(-),GAIN(+) OR EQUAL(=) (FT.)	(A+Z=ELE.) ELEVATION OF MINI-PIEZOMETER GROUNDWATER (FT.)
MP-01	09:12	47.466	------	------	------	------
MP-03	11:00	40.735	3.021	2.625	0.396	41.131
MP-07	07:03	29.746	2.333	1.830	0.503	30.249
MP-08	12:00	49.345	2.658	2.250	0.406	49.751
MP-09	12:41	57.335	1.568	1.460	0.108	57.443
MP-10	13:11	68.628	2.854	3.010	-0.156	68.472
MP-11	06:42	30.795	1.958	1.740	0.218	31.013
MP-12	-----	------	------	------	------	------

SEEPAGE METERS			HEIGHT OF WATER IN SEEPAGE METER TUBE ABOVE (+) OR BELOW (-) THE SURFACE WATER (FT.)	ELEVATION OF SEEPAGE METER GROUNDWATER
SM-01	09:12	47.466	-0.375	47.091
SM-05	08:31	33.673	0.042	33.715
SM-07	07:03	29.746	0.021	29.767

NOTES:MEASUREMENTS CONVERTED FEET:
FROM INCHES DIVIDED BY 12-INCHES/FT.

*1: The measured heads inside the miniplezometers may not be static because because the measurements were only made a short time after the miniplezometers were detached from the 8-liter bags

------: Measurements were not taken

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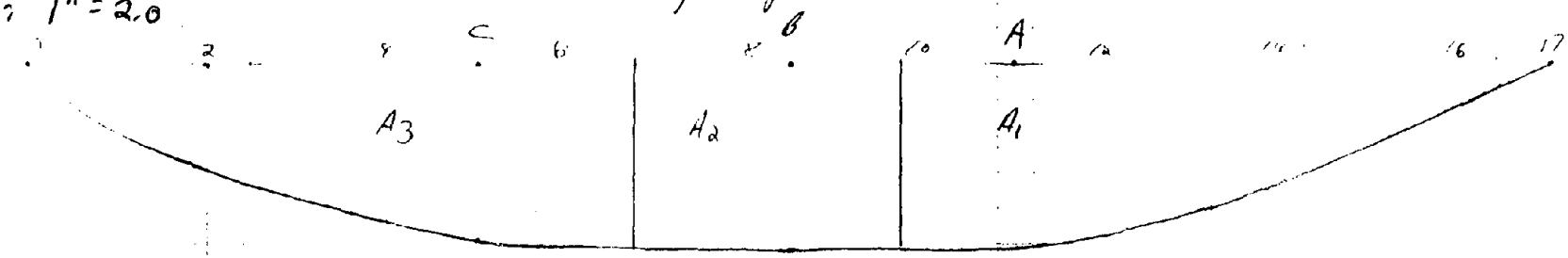
Round 4 4/6/92

Scale: 1" = 2.0'

56-01

Comments: Only drogue measurements were made



Velocities at Stations

	A	B	C
	[illegible]	10'/13"	10'/16
	[illegible]	[illegible]/12"	10'/21
	[illegible]	[illegible]/12"	10'/12
Means	.75'/sec	.81'/sec	.64'/sec

Mean velocity of Section = $\boxed{.73'/sec}$

Mean of Areas ($A_1 + A_2 + A_3$) = $\boxed{25.8 \ ft^2}$

	Area A_1	Area A_2	Area A_3
1	9.9	6.0	9.9
2	9.8	6.1	9.8
3	9.6	6.1	10.0
Means	1 9.8	2 6.1	3 9.9

Sum = 25.8

$$Q_1 = \underset{\bar{V}}{(.73'/sec)}\,\underset{\Sigma \bar{A}}{(25.8)} = \boxed{18.83 \ ft^3/sec}$$

$$Q_2 = \underset{V_1}{(.75'/sec)}\,\underset{A_1}{(9.8)} + \underset{V_2}{(.81'/sec)}\,\underset{A_2}{(6.1)} + \underset{V_3}{(.64'/sec)}\,\underset{A_3}{(9.9)} = \boxed{18.63 \ ft^3/sec}$$

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Round # 4/6/92

Scale: 1" = 1.0'

S6 - 02

Comments: Only drogue measurements were made

0.0 A 3.6 feet

velocities
5'/11.75"
5'/8.56
5'/15.16
Means .45'/sec

Mean velocity of Section = .45'/sec

Mean of Area = .29

1	.27
2	.29
3	.30
Mean	.29

$Q_1 = (.45'/sec)(.29) = .13$ ft³/sec

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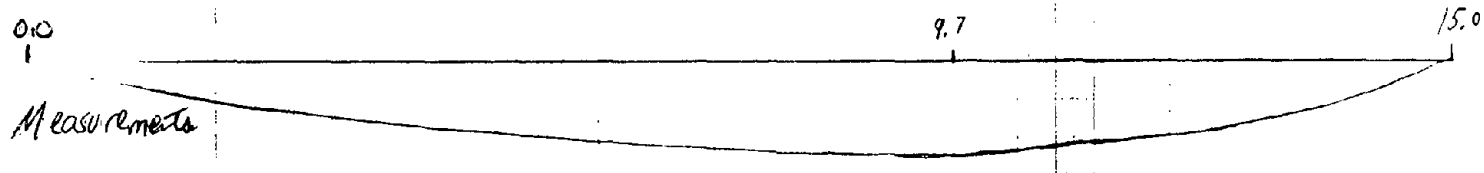
Round 4 4/6/92
Scale 1" = 2.0'

S6-03
Comments: No drogue measurements were made



Velocity Measurements

10'/29"
10'/27"
10'/25"
Mean .37'/sec

Mean Velocity of Section = .37'/sec

Mean Area = 10.23

① 10.4
② 10.1
③ 10.2
Mean Area =

$$Q_1 = (\overset{V_1}{.37'/sec})(\overset{A}{10.23}) = \boxed{3.79\ ft^3/sec}$$

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Round 4 4/6/92

Scale 1" = 1.0"

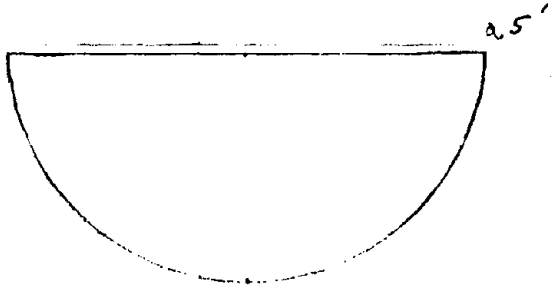
56-04

Comments: Only drogue measurement

Velocities

32' / 43.03
32' / 53.00
32' / 44.00

Mean .69'/sec



Mean of Area
① 2.32
② 2.3
③ 2.31
MeanA = 2.31

$$Q_1 = \overset{V_1}{(.69'/sec)}\,\overset{A_1}{(2.31\,ft^2)} = \boxed{1.59\ ft^3/sec}$$

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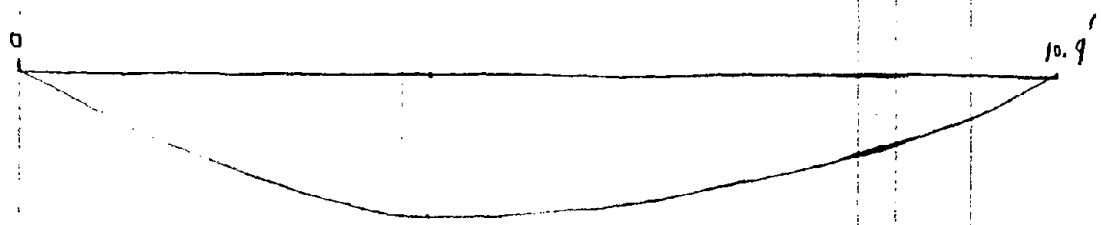
Round 4 4/6/92
Scale 1.0" = 2.0'

S6-05
Comments: only drogue measurements made



Velocities
10/4
10/3
10/3
Mean 3.05'/sec

Mean velocity of section = 3.05'/sec.

Mean Area of Cross Section = 10.6 ft²

1 10.6
2 10.5
3 10.6
Mean Area =

$Q_1 = (3.05'/sec)(10.6 ft^2) = 32.23 ft^3/sec$

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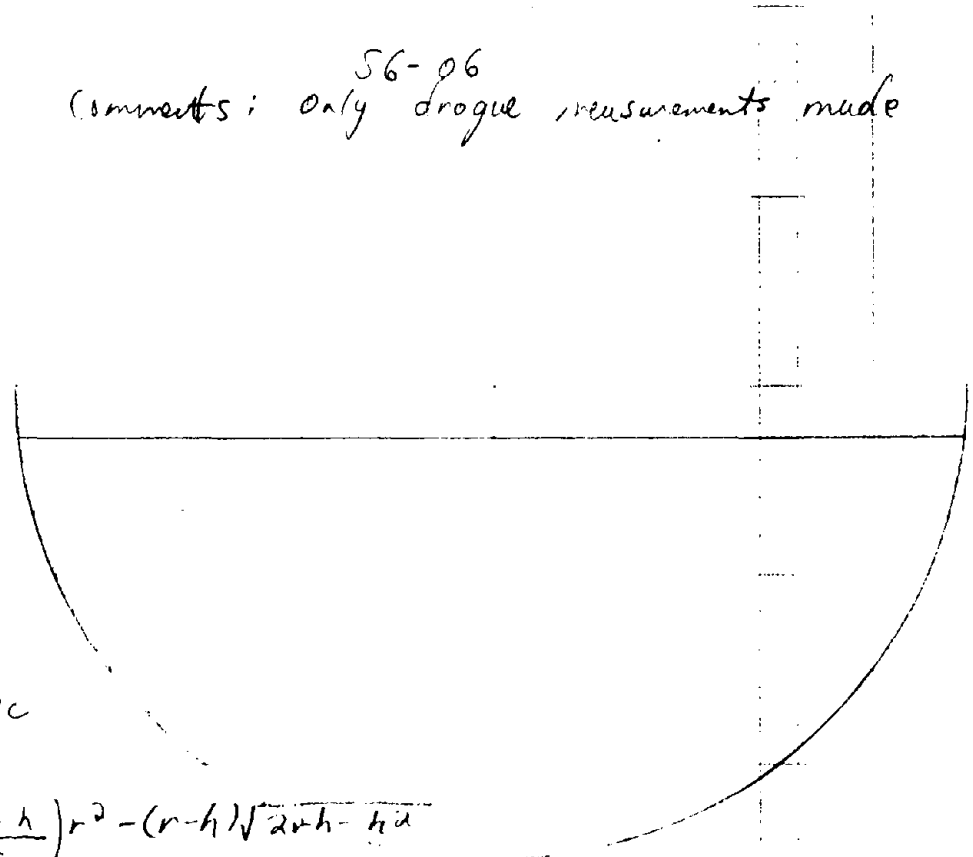
Round 4 4/6/92

Scale: 1" = 1.0"

Comments: Only 56-06 drogue measurements made



Velocity Measurements

① 24/20"
② 24/19"
③ 24/18"

Mean: 1.26'/sec

Mean velocity of X section = 1.26'/sec

Area Equation = $\text{Arc Cos}\left(\frac{r-h}{r}\right) r^2 - (r-h)\sqrt{2rh - h^2}$

Mean of Areas (A)

	Areas
①	8.4
②	8.4
③	8.4
Mean	8.4 ft²

$Q_1 = (1.26'/\text{sec})(8.4) = 10.58 \text{ ft}^3/\text{sec}$

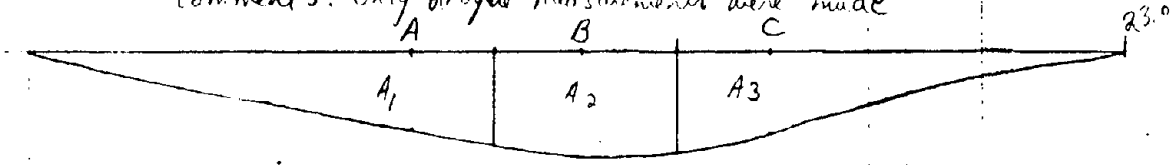
$2 \times Q_1 = \text{Flow} = 21.17 \text{ ft}^3/\text{sec}$

Round 4 4/6/92

Scale 1" = 4.0'

56-07

Comments: Only drogue measurements were made



velocities at Stations

	A	B	C
	10'/16"	10'/16"	10/11"
	10'/16"	10'/10"	10/14"
	10'/16"	10'/10"	10/11"
Means	.62'/sec	.87'/sec	.84'/sec

Mean velocity of Section = $\boxed{.78'/sec}$

Mean of Areas $(A_1 + A_2 + A_3)$ = $\boxed{28.5 \ ft^2}$

	Area A_1	Area A_2	Area A_3
1	10.1	8.3	9.8
2	11.2	8.4	9.6
3	9.9	8.5	9.7
Means	A1) 10.4	A2) 8.4	A3) 9.7

Sum = 28.5

$$Q_1 = \underbrace{(.78'/sec)}_{\bar{V}}(\underbrace{28.5}_{\Sigma \bar{A}}) = \boxed{22.23 \ ft^3/sec}$$

$$Q_2 = \underbrace{(.62'/sec)}_{V_1}(\underbrace{10.4}_{A_1}) + \underbrace{(.87'/sec)}_{V_2}(\underbrace{8.4}_{A_2}) + \underbrace{(.84'/sec)}_{V_3}(\underbrace{9.7}_{A_3}) = \boxed{21.90 \ ft^3/sec}$$

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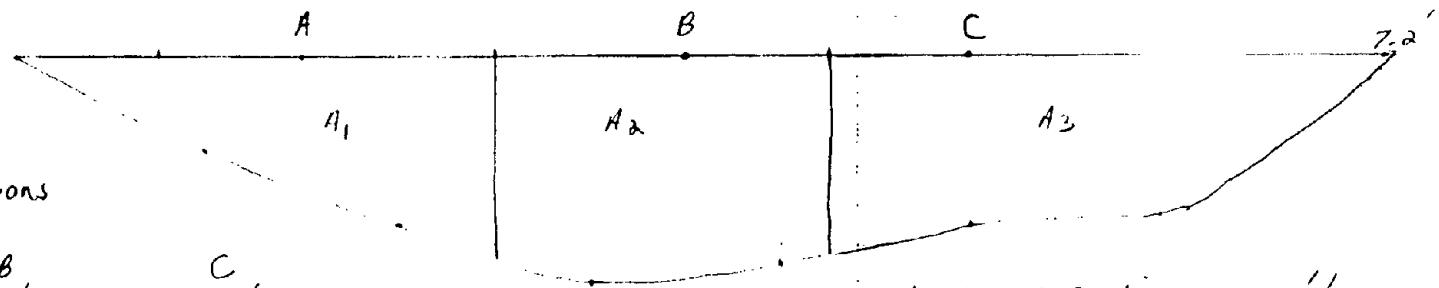
Round 4 4/6/92

Scale 1" = 1.0 feet

56-08

Comments: Only drogue measurements were made



Velocities at Stations

	A	B	C
	10'/10.96	10'/10.56	10'/7.43
	10'/7.35	10'/12.66	10'/8.10
	10'/8.57	10'/8.5	10'/6.52
Means	1.15'/sec	.98'/sec	1.37'/sec

Mean Velocity of Section = 1.17'/sec

Mean of Areas ($A_1 + A_2 + A_3$) = 5.6

	Area 1	Area 2	Area 3
1	1.5	2.0	2.1
2	1.4	2.0	2.1
3	1.5	2.0	2.1
Means 1	1.5	2 2.0	3 2.1

Sum = 5.6

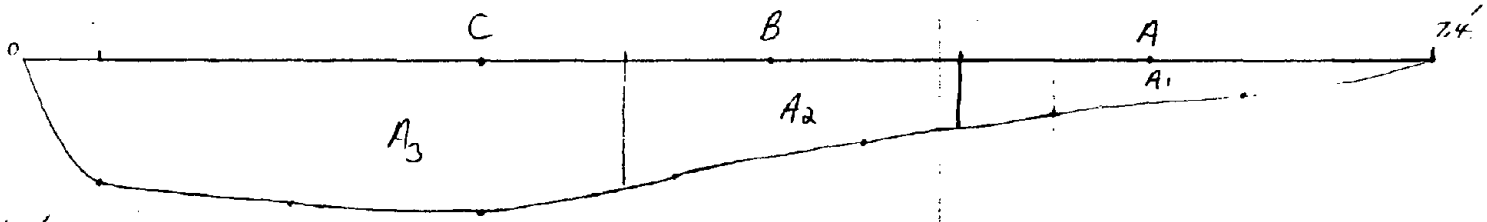
$$Q_1 = (\overset{\bar{V}}{1.17'/sec})(\overset{\Sigma A}{5.6}) = \boxed{6.5\ ft^3/sec}$$

$$Q_2 = (\overset{V_1}{1.15'/sec})(\overset{A_1}{1.5}) + (\overset{V_2}{.98'/sec})(\overset{A_2}{2.0}) + (\overset{V_3}{1.37'/sec})(\overset{A_3}{2.1}) = \boxed{6.56\ ft^3/sec}$$

Round 4 = 4/6/92

Scale: 1" = 1.0 feet

Comments: Only 56-09 drogue measurements were made



Velocities at stations

A	B	C
10'/15.65	10'/12.25	10'/14.21
10'/14.71	10'/10.78	10'/23.56
10'/15.03	10'/10.93	10'/15.63
Means: .66'/sec	.89'/sec	.59'/sec

Mean Velocity of Section = .71'/sec

Mean of Areas $(A_1 + A_2 + A_3)$ = 3.6

	Area A_1	Area A_2	Area A_3
1	2.2	.88	.50
2	2.1	.87	.52
3	2.2	.85	.51
Means 1	2.2	2 .9	3 .5

Sum = 3.6

$$Q_1 = (\underset{\bar{V}}{.71'/sec})(\underset{\Sigma \bar{A}}{3.6}) = \boxed{2.5\ ft^3/sec}$$

$$Q_2 = (\underset{V_1}{.66'/sec})(\underset{A_1}{2.2}) + (\underset{V_2}{.89'/sec})(\underset{A_2}{.9}) + (\underset{V_3}{.59'/sec})(\underset{A_3}{.5}) = \boxed{2.5\ ft^3/sec}$$

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Round 4 4/6

Scale 1 10 feet

56 - 10

Comments: Only drogue measurements were made.

Velocities @ Stations

A	B
10'/5.53sec	10'/4.97sec
10'/5.09sec	10'/4.90sec
10'/4.90sec	10'/5.87sec
Means 1.91'/sec	1.92'/sec

Mean Velocity of X-section = 1.91 ft/sec

Mean of Total Area ($A_1 + A_2 + A_3$) = 1.9 ft^2

	Area 1	Area 2
①	.86	.98
②	.86	.98
③	.88	.95
Means A_1	.9	A_2 1.0

Sum = 1.9 ft^2

① $Q_1 = (\overset{\bar{V}}{1.91\ ft/sec})(\overset{\Sigma A}{1.9\ ft^2}) = \boxed{3.6\ ft^3/sec}$

② $Q_2 = (\underset{V_1}{1.91'/sec})(\underset{A_1}{.9}) + (\underset{V_2}{1.92'/sec})(\underset{A_2}{1.0}) = \boxed{3.6\ ft^3/sec}$

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Round 4 4/6/92

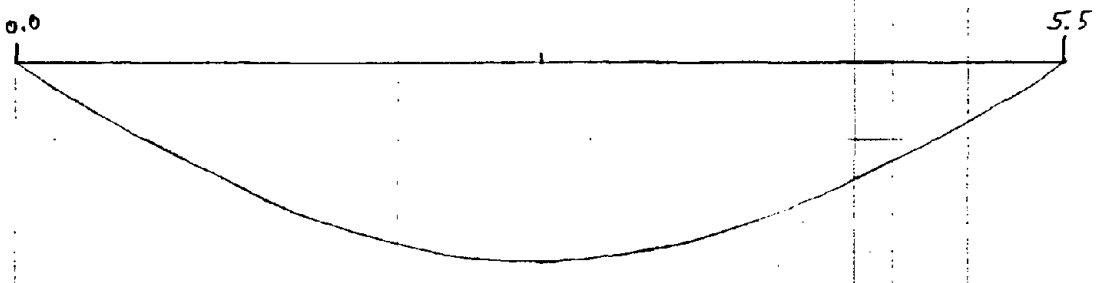
Scale 1" = 10-feet

56-11

Comments: only drogue measurements were made

Velocities

10'/19"
10'/23"
10'/21"
Mean .48'/sec



Mean velocity of section = .48'/sec

Mean of Area = 3.7 ft²

① 3.7
② 3.7
③ 3.7
Mean Area = 3.7

$Q_1 = (.48'/sec)(3.7) = 1.8$ ft³/sec

(V_1, A)

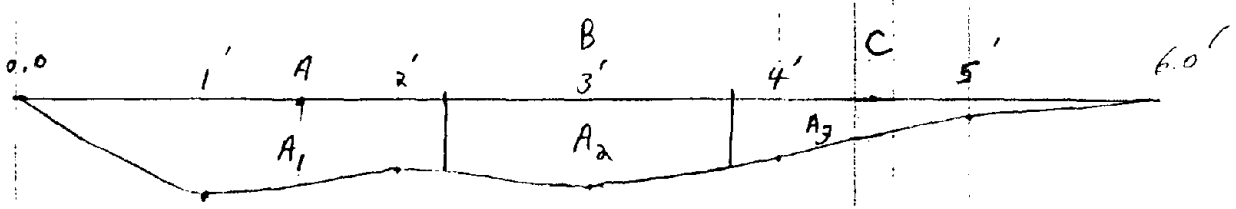
Round 4 4/6/92

METCALF & EDDY, ENGINEERS

Scale: 1" = 1.0"

S6-12

Comments: Only drogue measurements were made



Velocities at Stations

	A	B	C
	10'/18.0"	10'/17.06"	10'/15.25"
	10'/14.19"	10'/16.31"	10'/17.18"
		10'/16.68"	10'/13.94"
Means:	.63'/sec	.60'/sec	.65'/sec

Mean velocity of X-section = .63'/sec

Mean of Areas ($A_1 + A_2 + A_3$) = $\boxed{1.75\ ft^2}$

	Area 1	Area 2	Area 3
①	.81	.61	.32
②	.79	.61	.34
③	.83	.62	.32
Means	1 .81	2 .61	3 .33

= Sum = $\boxed{1.75\ ft^2}$

$Q_1 = (.63'/sec)(\overset{\Sigma A}{1.70}) = \boxed{1.1\ ft^3/sec}$

$Q_2 = (\overset{V_1}{.63'/sec})(\overset{A_1}{.81}) + (\overset{V_2}{.60'/sec})(\overset{A_2}{.61}) + (\overset{V_3}{.65'/sec})(\overset{A_3}{.33}) = \boxed{1.1\ ft^3/sec}$

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#9081

Rose Hill
3.6
#9081

B-5 SLUG TEST AND STREAMBED HYDRAULIC CONDUCTIVITY CALCULATIONS

A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells

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A procedure is presented for calculating the hydraulic conductivity of an aquifer near a well from the rate of rise of the water level in the well after a certain volume of water is suddenly removed. The calculation is based on the Thiem equation of steady state flow to a well. The effective radius R_e over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated was evaluated with a resistance network analog for a wide range of system geometries. An empirical equation relating R_e to the geometry of the well and aquifer was derived. The technique is applicable to completely or partially penetrating wells in unconfined aquifers. It can also be used for confined aquifers that receive water from the upper confining layer. The method's results are compatible with those obtained by other techniques for overlapping geometries.

With the slug test the hydraulic conductivity or transmissibility of an aquifer is determined from the rate of rise of the water level in a well after a certain volume or 'slug' of water is suddenly removed from the well. The slug test is simpler and quicker than the Theis pumping test because observation wells and pumping the well are not needed. With the slug test the portion of the aquifer 'sampled' for hydraulic conductivity is smaller than that for the pumping test even though with the latter, most of the head loss also occurs within a relatively small distance of the pumped well and the resulting transmissibility primarily reflects the aquifer conditions near the pumped well.

Essentially instantaneous lowering of the water level in a well can be achieved by quickly removing water with a bailer or by partially or completely submerging an object in the water, letting the water level reach equilibrium, and then quickly removing the object. If the aquifer is very permeable, the water level in the well may rise very rapidly. Such rapid rises can be measured with sensitive pressure transducers and fast-response strip chart recorders or x-y plotters. Also it may be possible to isolate portions of the perforated or screened section of the well with special packers for the slug test. This not only reduces the inflow and hence the rate of rise of the water level in the well, but it also makes it possible to determine the vertical distribution of the hydraulic conductivity. Special packer techniques may have to be developed to obtain a good seal, especially for rough casings or perforations. Effective sealing may be achieved with relatively long sections of inflatable stoppers or tubing. The use of long sections of these materials would also reduce leakage flow from the rest of the well to the isolated section between packers. This flow can occur through gravel envelopes or other permeable zones surrounding the casing. Sections of inflatable tubing may have to be long enough to block off the entire part of the well not used for the slug test. High inflation pressures should be used to minimize volume changes in the tubing due to changing water pressures in the isolated section when the head is lowered.

So far, solutions for the slug test have been developed only for completely penetrating wells in confined aquifers. *Cooper et al.* [1967] derived an equation for the rise or fall of the water level in a well after sudden lowering or raising, respectively. Their equation was based on nonsteady flow to a pumped, completely penetrating well, and the solution was expressed as a series of 'type curves' against which observed rates of water level rises were matched. Values for the transmissibility and storage coefficient were then evaluated from the curve parameter and horizontal-scale position of the type curve showing the best fit with the experimental data. *Skibitzke* [1958] developed an equation for calculating transmissibility from the recovery of the water level in a well that was repeatedly bailed. The technique is limited to wells in confined aquifers with sufficiently shallow water levels to permit short time intervals between bailing cycles [*Lohman*, 1972].

To use the slug test for partially penetrating or partially perforated wells in confined or unconfined aquifers, some solutions developed for the auger hole and piezometer techniques to measure soil hydraulic conductivity [*Bouwer and Jackson*, 1974] may be employed. However, the geometry of most groundwater wells is outside the range in geometry covered by the existing equations or tables for the auger hole or piezometer methods. For this reason, theory and equations are presented in this paper for slug tests on partially or completely penetrating wells in unconfined aquifers for a wide range of geometry conditions. The wells may be partially or completely perforated, screened, or otherwise open along their periphery. While the solutions are developed for unconfined aquifers, they may also be used for slug tests on wells in confined aquifers if water enters the aquifer from the upper confining layer through compression or leakage.

THEORY

Geometry and symbols of a well in an unconfined aquifer are shown in Figure 1. For the slug test the water level in the well is suddenly lowered, and the rate of rise of the water level is measured. The flow into the well at a particular value of y can be calculated by modifying the Thiem equation to

$$Q = 2\pi KL \frac{y}{\ln (R_e/r_w)} \tag{1}$$

where Q is the flow into the well (length^3/time), K is the hydraulic conductivity of the aquifer (length/time), L is the height of the portion of well through which water enters (height of screen or perforated zone or of uncased portion of well), y is the vertical distance between water level in well and equilibrium water table in aquifer, R_e is the effective radius over which y is dissipated, and r_w is the horizontal distance

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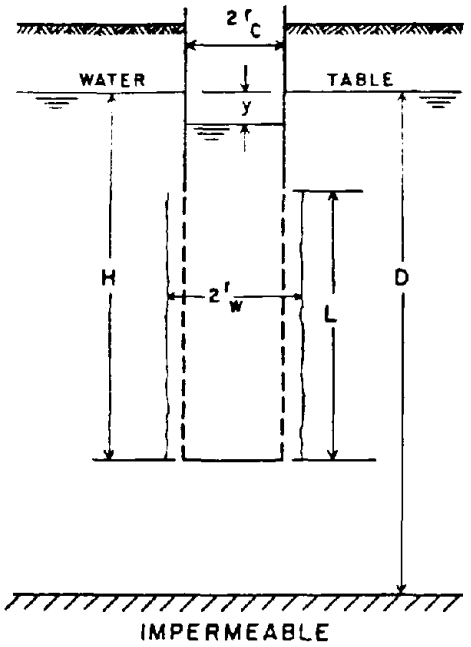

Fig. 1. Geometry and symbols of a partially penetrating, partially perforated well in unconfined aquifer with gravel pack or developed zone around perforated section.

from well center to original aquifer (well radius or radius of casing plus thickness of gravel envelope or developed zone).

The terms L, y, R_e, and r_w are all expressed in units of length. The effective radius R_e is the equivalent radial distance over which the head loss y is dissipated in the flow system. The value of R_e depends on the geometry of the flow system, and it was determined for different values of H, L, D, and r_w (Figure 1) with a resistance network analog, as will be discussed in the next section. Equation (1) is based on the assumptions that (1) drawdown of the water table around the well is negligible, (2) flow above the water table (in the capillary fringe) can be ignored, (3) head losses as water enters the well (well losses) are negligible, and (4) the aquifer is homogeneous and isotropic. These are the usual assumptions in the development of equations for pumped hole techniques [*Bouwer and Jackson*, 1974, and references therein].

The value of r_w in (1) represents the radial distance between the undisturbed aquifer and the well center. Thus r_w should include gravel envelopes or 'developed' zones if they are much more permeable than the aquifer itself (Figure 1).

The rate of rise, dy/dt, of the water level in the well after suddenly removing a slug of water can be related to the inflow Q by the equation

$$dy/dt = -Q/\pi r_c^2 \tag{2}$$

where πr_c^2 is the cross-sectional area of the well where the water level is rising. The minus sign in (2) is introduced because y decreases as t increases.

The term r_c is the inside radius of the casing if the water level is above the perforated or otherwise open portion of the well. If the water level is rising in the perforated section of the well, allowance should be made for the porosity outside the well casing if the hydraulic conductivity of the gravel envelope or developed zone is much higher than that of the aquifer. In that case the (open) porosity in the permeable zone must be included in the cross-sectional area of the well. For example, if the radius of the perforated casing is 20 cm and the casing is surrounded by a 10-cm permeable gravel envelope with a porosity of 30%, r_c should be taken as $[20^2 + 0.30(30^2 - 20^2)]^{1/2} = 23.5$ cm to obtain the cross-sectional area of the well that relates Q to dy/dt. The value of r_w for this well section is 30 cm.

Combining (1) and (2) yields

$$\frac{1}{y}\,dy = -\frac{2KL}{r_c^2 \ln (R_e/r_w)}\,dt \tag{3}$$

which can be integrated to

$$\ln y = -\frac{2KLt}{r_c^2 \ln (R_e/r_w)} + \text{constant} \tag{4}$$

Applying this equation between limits y_0 at $t = 0$ and y_t at t and solving for K yield

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\,\frac{1}{t}\,\ln \frac{y_0}{y_t} \tag{5}$$

This equation enables K to be calculated from the rise of the water level in the well after suddenly removing a slug of water from the well. Since K, r_c, r_w, R_e, and L in (5) are constants, $(1/t)\ln y_0/y_t$ must also be constant. Thus field data should yield a straight line when they are plotted as $\ln y_t$ versus t. The term $(1/t)\ln y_0/y_t$ in (5) is then obtained from the best-fitting straight line in a plot of $\ln y$ versus t (see the example). The value of $\ln R_e/r_w$ is dependent on H, D, L, and r_w and can be evaluated from the analog results presented in the next section. The transmissibility T of the aquifer is calculated by multiplying (5) by the thickness D of the aquifer or

$$T = \frac{Dr_c^2 \ln (R_e/r_w)}{2L}\,\frac{1}{t}\,\ln \frac{y_0}{y_t} \tag{6}$$

This equation is based on the assumption that the aquifer is uniform with depth.

Equations (5) and (6) are dimensionally correct. Thus K and T are expressed in the same units as the length and time parameters in the equations.

EVALUATION OF R_e

Values of R_e, expressed as $\ln R_e/r_w$, were determined with an electrical resistance network analog for different values of r_w, L, H, and D (Figure 1), using the same assumptions as those for (1). An axisymmetric sector of 1 rad was simulated by a network of electrical resistors. The vertical distance between the nodes was constant, but the radial distance between nodes increased with increasing distance from the center line (Figure 2). This yielded a network with the highest node density near the well, where the head loss was greatest, and a decreasing node density toward the outer reaches of the system. For a more detailed discussion of graded networks for representing axisymmetric flow systems, see *Liebmann* [1950] and *Bouwer* [1960].

The radial extent of the medium represented on the analog was more than 60,000 times the largest r_w value used in the analyses. Thus the radial extent of the analog system was essentially infinite, as evidenced by the fact that a reduction in radial extent by several nodes did not have a measurable effect on the observed value of R_e.

The value of R_e for an infinitely deep aquifer ($D = \infty$) was determined by simulating an impermeable and then an infinitely permeable layer at a certain value of D. If this value of D is taken to be sufficiently large, the flow in the system when the layer at D is taken as being impermeable is only slightly

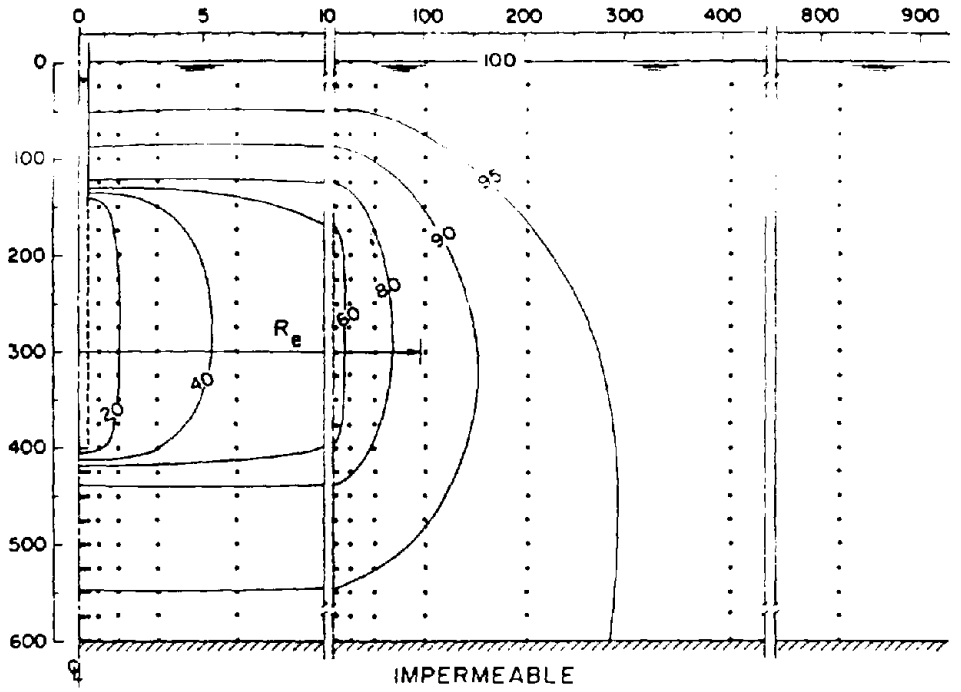

Fig. 2. Node arrangement (dots) for resistance network analog and potential distribution (indicated as percentages on equipotentials) for system with L/r_w = 625, H/r_w = 1000, and D/r_w = 1500. The numbers on the left and at the top of the figure are arbitrary length units (note breaks in horizontal scale).

less than the flow when the layer is taken as being infinitely permeable. The average of the two flows can then be taken as a good estimate of the flow that would occur if the aquifer were represented on the analog as being uniform to infinite depth [*Bouwer*, 1967]. This average flow was used to calculate R_e for $D = \infty$.

The analog analyses were performed by simulating a system with certain values of r_w, H, and D. The electrical current entering the 'well' was then measured for different values of L, ranging from near H to near 0. This was repeated for other values of r_w, H, and D. The condition where $L = H$ could not be simulated on the analog because it would mean a short between the water table as the source and the well as the sink. The electrical current flow in the analog was converted to volume per day, and $\ln R_e/r_w$ was evaluated with (1) for each combination of r_w, H, L, and D used in the analog.

For a given geometry described by r_w, H, and D, the current flow Q_i into the simulated well varied essentially linearly with L and could be described by the equation

$$Q_i = mL + n \tag{7}$$

Because of the linearity between Q_i and L the results of the analyses could be extrapolated to the condition $L = H$. The values of m in (7) appeared to vary inversely with $\ln H/r_w$. The values of n varied approximately linearly with $\ln [(D - H)/r_w]$, the slope A and intercept B in these relations being a function of L/r_w. This enabled the derivation of the following empirical equation relating $\ln R_e/r_w$ to the geometry of the system:

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln (H/r_w)} + \frac{A + B \ln [(D - H)/r_w]}{L/r_w}\right]^{-1} \tag{8}$$

In this equation, A and B are dimensionless coefficients that are functions of L/r_w, as shown in Figure 3. If $D \gg H$, an increase in D has no measurable effect on $\ln R_e/r_w$. The analog results indicated that the effective upper limit of $\ln [(D - H)/r_w]$ is 6. Thus if D is considered infinity or $(D - H)/r_w$ is so large that $\ln [(D - H)/r_w]$ is greater than 6, a value of 6 should still be used for the term $\ln [(D - H)/r_w]$ in (8).

If $D = H$, the term $\ln [(D - H)/r_w]$ in (8) cannot be used. The analog results indicated that for this condition, which is the case of a fully penetrating well, (8) should be modified to

$$\ln R_e/r_w = \left(\frac{1.1}{\ln (H/r_w)} + \frac{C}{L/r_w}\right)^{-1} \tag{9}$$

where C is a dimensionless parameter that is a function of L/r_w as shown in Figure 3.

Equations (8) and (9) yield values of $\ln R_e/r_w$ that are within 10% of the actual value as evaluated by analog if $L > 0.4H$ and within 25% if $L \ll H$ (for example, $L = 0.1H$).

The analog analyses were performed for wells that were closed at the bottom. Occasionally, however, wells with open bottoms were also simulated. The flow through the bottom appeared to be negligible for all values of r_w and L used in the analyses. If L is not much greater than r_w (for example, $L/r_w \ll 4$), the system geometry approaches that of a piezometer cavity [*Bouwer and Jackson*, 1974], in which case the bottom flow can be significant. Equations (8) and (9) can also be used to evaluate $\ln R_e/r_w$ if a portion of the perforated or otherwise open part of the well is isolated with packers for the slug test.

Equipotentials for the flow system around a partially penetrating, partially perforated well in an unconfined aquifer after lowering the water level in the well are shown in Figure 2. The numbers along the symmetry axis and the water table represent arbitrary length units. The numbers on the equipotentials indicate the potential as a percentage of the total head difference between the water table (100%) and the open portion of the well (0%) shown as a dashed line.

The value of R_e for the case in Figure 2 is 96.7 length units. As shown in the figure, this corresponds approximately to the

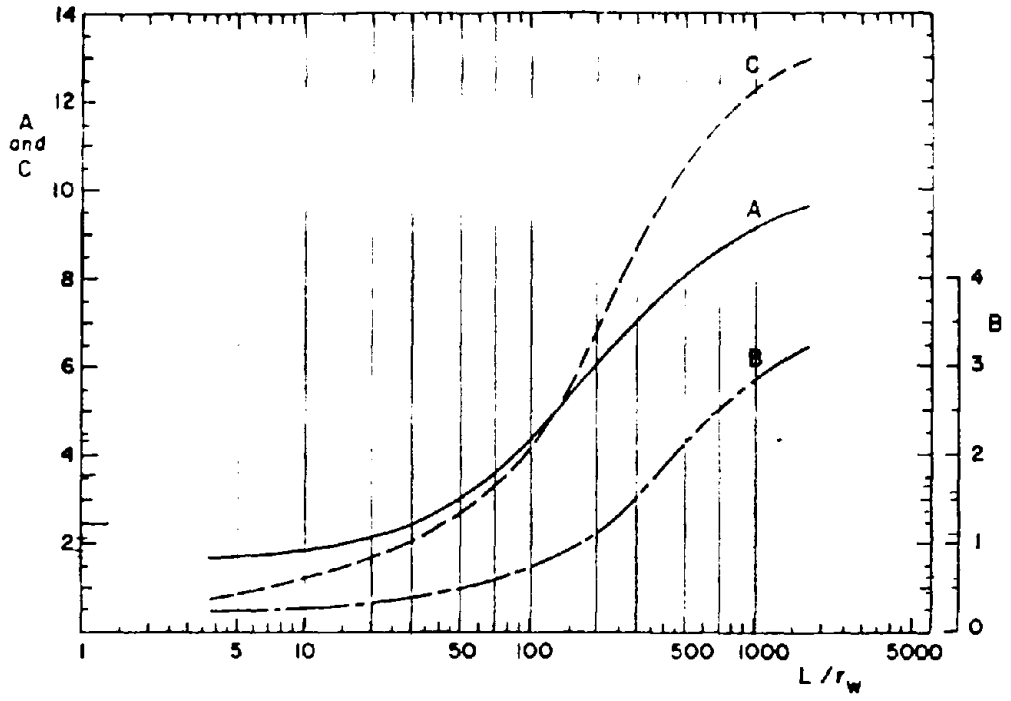

Fig. 3. Curves relating coefficients A, B, and C to L/r_w.

85% equipotential when R_e is laterally extended from the center of the open portion of the well. Thus most of the head loss in the flow system occurs in a cylinder with radius R_e, which is indicative of the horizontal extent of the portion of the aquifer sampled for K or T. The vertical extent is somewhat greater than L, as indicated by, for example, the 80% equipotential in Figure 2.

To estimate the rate of rise of the water level in a well after it is suddenly lowered, (5) can be written as

$$t = \frac{r_c^2}{2KL} \ln \frac{R_e}{r_w} \ln \frac{y_0}{y_t} \tag{10}$$

By taking $y_t = 0.9y_0$, (10) reduces to

$$t_{90\%} = 0.0527 \frac{r_c^2}{KL} \ln \frac{R_e}{r_w} \tag{11}$$

where $t_{90\%}$ is the time that it takes for the water level to rise 90% of the distance to the equilibrium level. By assuming a permeable aquifer with K = 30 m/day, a well with r_c = 0.2 m and L = 10 m, and $\ln (R_e/r_w) = 3$, (11) yields $t_{90\%}$ = 1.82 s. Thus if y_0 is taken as 30 cm, it takes 1.8 s for the water level to rise 27 cm, another 1.8 s for the next 2.7 cm (90% of the remaining 3 cm), and another 1.8 s for the next 0.27 cm, or a total of 5.4 s for a rise of 29.97 cm. Measurement of this fast rise requires a sensitive and accurate transducer and a fast-response recorder. The rate of rise can be reduced by allowing groundwater to enter through only a portion of the open section of the well, as can be accomplished with packers.

For a moderately permeable aquifer with, for example, K = 1 m/day, a well with r_c = 0.1 m and L = 20 m, and $\ln (R_e/r_w) = 5$, (11) yields t = 11.4 s. In this case, it would take the water level 22.8 s to rise from 30 cm to 0.3 cm below static level.

Example

A slug test was performed on a cased well in the alluvial deposits of the Salt River bed west of Phoenix, Arizona. The well, known as the east well, is located about 20 m east of six rapid infiltration basins for groundwater recharge with sewage effluent [*Bouwer*, 1970]. The static water table was at a depth of 3m, D = 80 m, H = 5.5 m, L = 4.56 m, r_c = 0.076 m, and r_w was taken as 0.12 m to allow for development of the aquifer around the perforated portion of the casing. A Statham PM131TC pressure transducer was suspended about 1 m below the static water level in the well (when trade names and company names are included, they are for the convenience of the reader and do not imply preferential endorsement of a particular product or company over others by the U.S. Department of Agriculture). A solid cylinder with a volume equivalent to a 0.32-m change in water level in the well was also placed below the water level. When the water level had returned to equilibrium, the cylinder was quickly removed. The transducer output, recorded on a Sargent millivolt recorder, yielded the y-t relationship shown in Figure 4 with y plotted on a logarithmic scale. The straight-line portion is the valid part of the readings. The actual y_0 value of 0.29 m indicated by the straight line is close to the theoretical value of 0.32 m calculated from the displacement of the submerged cylinder.

Extending the straight line in Figure 4 shows that for the arbitrarily selected t value of 20 s, y = 0.0025 m. Thus $(1/t) \ln y_0/y_t = 0.238\ s^{-1}$. The value of L/r_w = 38, for which Figure 3 yields A = 2.6 and B = 0.42. Substituting these values into (8) and using the maximum value of 6 for $\ln [(D - H)/r_w]$ (since $\ln [(D - H)/r_w]$ for the well exceeds 6) yield $\ln (R_e/r_w) = 2.37$. Equation (5) then gives K = 0.00036 m/s = 31 m/day. This value agrees with K values of 10 and 53 m/day obtained previously with the tube method on two nearby observation wells [*Bouwer*, 1970]. These K values were essentially point measurements on the aquifer immediately around the well bottoms, which were at depths of 9.1 and 6.1 m, respectively.

Comparisons

Piezometer method. The geometry to which (8) and (9) and the coefficients in Figure 3 apply overlaps the geometry of the

piezometer method at the lower values of L/r_w. With the piezometer method a cavity is augered out in the soil below a piezometer tube. The water level in the tube is abruptly lowered, and K of the soil around the cavity is calculated from the rate of rise of the water level in the tube [*Bouwer and Jackson*, 1974]. The equation for K is

$$K = \frac{\pi r_w^2}{A_Y} \frac{1}{t} \ln \frac{y_0}{y_t} \qquad (12)$$

where A_Y is a geometry factor with dimension of length. Values of A_Y were evaluated with an electrolytic tank analog by *Youngs* [1968], whose results were expressed in tabular form as A_Y/r_w for different values of L/r_w (ranging between 0 and 8), $(H - L)/r_w$, and $(D - H)/r_w$.

Taking a hypothetical case where $L/r_w = 8$, $H/r_w = 12$, and $D/r_w = 16$, K calculated with (5) is 18% below K calculated with (12). This is more than the 10% error normally expected with (8) and (9) for the L/H value of 0.67 in this case. The larger discrepancy may be due to the difference in methodology, or to the fact that the L/r_w value is close to the lower limit of the range covered on the resistance network analog.

An approximate equation for calculating K with the piezometer method was presented by *Hvorslev* [1951]. The equation, which is based on the assumptions of an ellipsoidal cavity or well screen and infinite vertical extent (upward and downward) of the flow system, contains a term $[1 + (L/2r_w)^2]^{1/2}$. For most well-slug-test geometries, $L/2r_w$ will be sufficiently large to permit replacement of this term by $L/2r_w$. In that case, however, Hvorslev's equation for Q yields $R_e = L$, which is not true. In reality, R_e is considerably less than L. For example, if $L = 40$ m, $r_w = 0.4$ m, $H = 80$ m, and $D = \infty$, (8) shows that $R_e = 11.9$ m, which is much less than the value of 40 m indicated by Hvorslev's equation. However, since the calculation of K is based on $\ln (R_e/r_w)$ as shown by (5), the error in K is less than the error in R_e (i.e., 36 and 236%, respectively, in this case).

If, for the above example, the top of the well screen or cavity had been taken at the same level as the water table ($H = 40$ m), R_e would have been 8.6 m and Hvorslev's equation would have yielded a K value that is 50% higher than K given by (5). The larger error is probably due to Hvorslev's assumption of infinite vertical (upward) extent of the flow system, which is not met when the cavity is immediately below the water table. Using Hvorslev's equation for cavities immediately below a confining layer would increase the error to 73%, but this, of course, is due to the fact that a water table is not a solid boundary. Hvorslev's equation for the confining layer case can be shown to yield $R_e = 2L$.

Auger hole method. The analog analyses for (8) and (9) and Figure 3 were performed for $L < H$, because short circuiting between the water table and the well prevented simulation of the case where $L = H$. If the analog results are extrapolated to $L = H$, however, the geometry of the system in Figure 1 becomes similar to that of the auger hole technique, for which a number of equations and graphs have been developed to calculate K from the rise of the water level in the well [*Bouwer and Jackson*, 1974]. *Boast and Kirkham* [1971], for example, developed the equation

$$K = C_{BK} \frac{\Delta y}{\Delta t} \qquad (13)$$

where C_{BK} was determined mathematically and expressed in tabular form for various values of L/r_w, $(D - H)/r_w$, and y_0/H. Since the rate of rise of the water level in the hole after

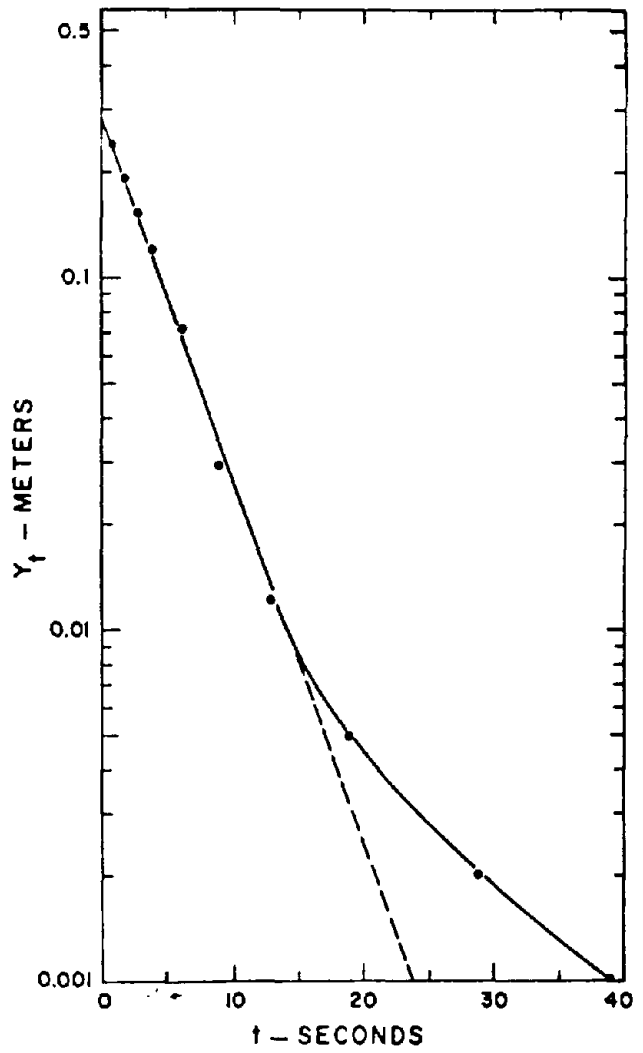

Fig. 4. Plot of y versus t for slug test on east well.

the removal of a slug of water decreases with decreasing y, $\Delta y/\Delta t$ is not a constant and the value of K obtained with this procedure depends on the magnitude of Δy used in the field measurements. The general rule is that Δy should be relatively small.

Taking a hypothetical case where $y_0 = 2.5$ m, $y_t = 2.4$ m, $\Delta t = 10$ s, $L = H = 5$ m, $D = 6$ m, and $r_w = 0.1$ m, (5) yields a K value that is 36% lower than K calculated with (13). However, if y_t is taken as 0.5 m, which should give $\Delta t = 394$ s according to the theory that $(1/t) \ln y_0/y_t$ is constant, the K value yielded by (5) is 26% higher than K obtained with (13). If y_t is taken as 0.9 m, (5) and (13) give identical results.

Slug test on wells in confined aquifers. The confined aquifer for which the slug test by *Cooper et al.* [1967] was developed is an aquifer with an internal water source, for example, recharge through aquitards or compression of confining layers or other material. This situation is similar to that of the unconfined aquifer presented in this paper because the water table is considered horizontal, like the upper boundary of a confined aquifer, and the water table is a plane source. Thus K or T calculated with (5) or (6) should be of the same order as K calculated with the procedure of *Cooper et al.* [1967], which involves plotting the rise of the water level in the well and finding the best fit on a family of type curves. *Cooper et al.* [1967] presented an example of the calculation of T for a well

with $r_c = r_w = 0.076$ m and $L = 98$ m. The resulting value of T was 45.8 m²/day. Values of D and H for this well were not given. However, since the well was 122 m deep and completely penetrating (at least theoretically), D and H must have been between 98 and 122 m. Assuming that both D and H were 100 m, (6) yields $T = 62.8$ m²/day, which is compatible with T obtained by Cooper et al.

CONCLUSIONS

The hydraulic conductivity of an aquifer near a well can be calculated from the rise of the water level in the well after a slug of water is suddenly removed. The calculation is based on the Thiem equation, using an effective radius R_e for the distance over which the head difference between the equilibrium water table in the aquifer and the water level in the well is dissipated. Values of R_e were evaluated by electrical resistance network analog. An empirical equation was then developed to relate R_e to the geometry of the system. This equation is accurate to within 10–25%, depending on how much of the well below the water table is perforated or otherwise open. The technique is applicable to partially or completely penetrating wells in unconfined aquifers. It can also be used to estimate the hydraulic conductivity of confined aquifers that receive water from the upper confining layer through recharge or compression.

The vertical distance between the rising water level in the well and the equilibrium water table in the aquifer must yield a straight line when it is plotted on a logarithmic scale against time. This can be used to check the validity of field measurements and to obtain the best-fitting line for calculating the hydraulic conductivity. Permeable aquifers produce rapidly rising water levels that can be measured with fast-response pressure transducers and strip chart recorders or x-y plotters. The portion of the aquifer sampled for hydraulic conductivity with the slug test is approximately a cylinder with radius R_e and a height somewhat larger than the perforated or otherwise open section of the well.

Hydraulic conductivity values obtained with the proposed slug test are compatible with those yielded by the auger hole and piezometer techniques where the geometries of the systems overlap, and by a slug test for completely penetrating wells in confined aquifers.

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Response of a Finite-Diameter Well to an Instantaneous Charge of Water[1]

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Abstract. A solution is presented for the change in water level in a well of finite diameter after a known volume of water is suddenly injected or withdrawn. A set of type curves computed from this solution permits a determination of the transmissibility of the aquifer. (Key words: Aquifer tests; groundwater; hydraulics; permeability)

INTRODUCTION

Ferris and Knowles [1954] introduced a method for determining the transmissibility of an aquifer from observations of the water level in a well after a known volume of water is suddenly injected into the well. (See also *Ferris et al.* [1962]). They reasoned that for practical purposes the well may be approximated by an instantaneous line source in the infinite region, in which the residual head differences due to the injection are described by

$$h = (V/4\pi Tt)e^{-r^2S/4Tt} \qquad (1)$$

where

h = change in head at distance r and time t due to the injection;
r = distance from the line source or center of well;
t = time since instantaneous injection;
V = volume of water injected;
T = transmissibility of aquifer;
S = coefficient of storage of aquifer.

They reasoned further that the head H in the pumped well would be described closely by (1) with r set equal to the effective radius r_e [*Jacob*, 1947, p. 1049] of the screen or open hole. Then, since r_e is small, the exponential approaches unity quickly, so that the equation becomes $H = V/4\pi Tt$, which can be written

$$T = V(1/t)/4\pi H \qquad (2)$$

To the extent that the equation is valid for a well of finite diameter, a determination of the transmissibility can be obtained from the slope of a plot of head H versus the reciprocal of time $(1/t)$.

Since the volume of water injected into the well is $\pi r_c^2 H_0$, where r_c is the radius of the casing in the interval over which the water level fluctuates and H_0 is the initial head increase in the well, equation 1 can be written

$$h/H_0 = (r_c^2/4Tt)e^{-r^2S/4Tt} \qquad (3)$$

and equation 2 can be written

$$H/H_0 = r_c^2/4Tt \qquad (4)$$

Recently *Bredehoeft et al.* [1966] demonstrated by means of an electrical analog model of a well-aquifer system that equation 3 gives a satisfactory approximation of the head in an injected well only after the time t is large enough for the ratio H/H_0 to be very small (see Figure 1). The observed discrepancy appears to arise from the assumption that the injected well can be approximated by a line source.

We present here an exact solution for the head in and around a well of finite diameter after the well is instantaneously charged with a known volume of water.

ANALYSIS

Consider a nonflowing well cased to the top of a homogeneous isotropic artesian aquifer of uniform thickness, and screened (or open) throughout the thickness of the aquifer (Figure 2). Suppose that the well is instantaneously charged with a volume V of water. (We will consider

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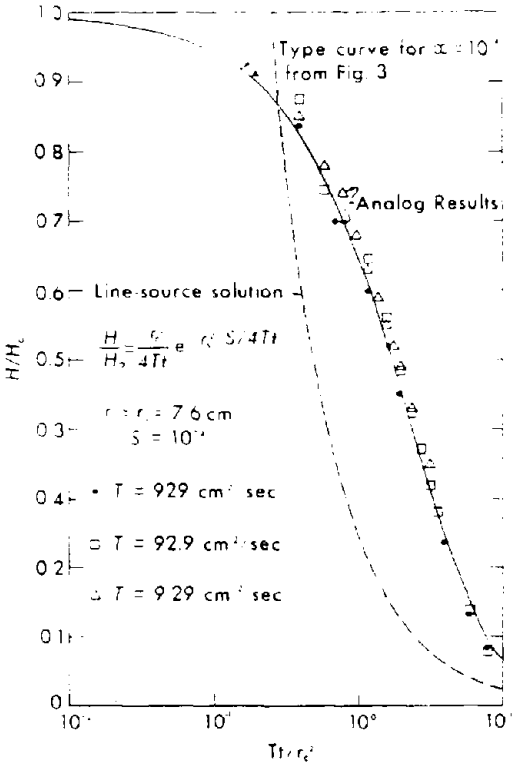

Fig. 1. Comparison of analog results with curve representing line-source solution.

an injection as a positive charge and a withdrawal as a negative one.) The water level in the well instantaneously moves to the height $H_0 = V/\pi r_c^2$ above or below its initial level and immediately begins to return to its initial level according to some function of time $H(t)$. Meanwhile the head in the surrounding aquifer varies according to $h(r, t)$. Our objective is to find a solution for $h(r, t)$ and $H(t)$. The inertia of the column of water in the well will be neglected. (See, in this connection, *Bredehoeft et al.* [1966]). Since the solution to be obtained can be superposed on any initial condition, we can simplify the problem without loss of generality by assuming that the head is initially uniform and constant.

The problem is described mathematically by

$$\partial^2 h/\partial r^2 + 1/r(\partial h/\partial r) = S/T(\partial h/\partial t) \qquad (r > r_c) \qquad (5)$$

$$h(r_c + 0, t) = H(t) \qquad (t > 0) \qquad (5a)$$

$$h(\infty, t) = 0 \qquad (t > 0) \qquad (5b)$$

$$2\pi r_c T[\partial h(r_c + 0, t)]/\partial r = \pi r_c^2(\partial H(t)/\partial t) \qquad (t > 0)$$

$$h(r, 0) = 0 \qquad (r > r_c)$$

$$H(0) = H_0 = V/\pi r_c^2$$

Equation 5 is the differential equation governing nonsteady radial flow of confined groundwater. (See, for example, *Jacob*, 1950, p. [illegible]) Boundary condition 5a states that after the first instant the head in the aquifer at the face of the well is equal to that in the well. Boundary condition 5b states that as r approaches infinity the change in head approaches zero. Equation 5c expresses the fact that the rate of flow of water into (or out of) the aquifer is equal to the rate of decrease (or increase) in volume of water within the well. The conditions 5d and 5e state that initially the change in head is zero everywhere outside the well and equal to H_0 inside the well.

By applying the Laplace transform with respect to time the problem is reduced to

$$\partial^2\bar{h}/\partial r^2 + 1/r\,(\partial\bar{h}/\partial r) = (S/T)\,(p\bar{h})$$

$$\bar{h}(\infty, p) = 0$$

$$[\partial\bar{h}(r_c + 0, p)]/\partial r = (r_c^2/2r_cT)[p\bar{h}(r_c + 0, p) - H_0]$$

for which the solution is

$$\bar{h}(r, p) = \frac{r_c S H_0 K_0(rq)}{Tq[r_c q K_0(r_c q) + 2\alpha K_0(r_c q)]}$$

where $q = (pS/T)^{\frac{1}{2}}$, and $\alpha = r_c^2 S/r_0^2$. The solution $h(r, t)$ is the inverse transform which is available from the analogous problem in heat flow [*Carslaw and Jaeger*, 1959, p. [illegible]]

$$h = \frac{2H_0}{\pi}\int_0^\infty e^{-\beta u^2/\alpha}\{J_0(ur/r_c) \cdot [uY_0(u) - 2\alpha Y_1(u)] - Y_0(ur/r_c) \cdot [uJ_0(u) - 2\alpha J_1(u)]\}\frac{du}{\Delta(u)}$$

where $\beta = Tt/r_c^2$ and

$$\Delta(u) = [uJ_0(u) - 2\alpha J_1(u)]^2 + [uY_0(u) - 2\alpha Y_1(u)]^2$$

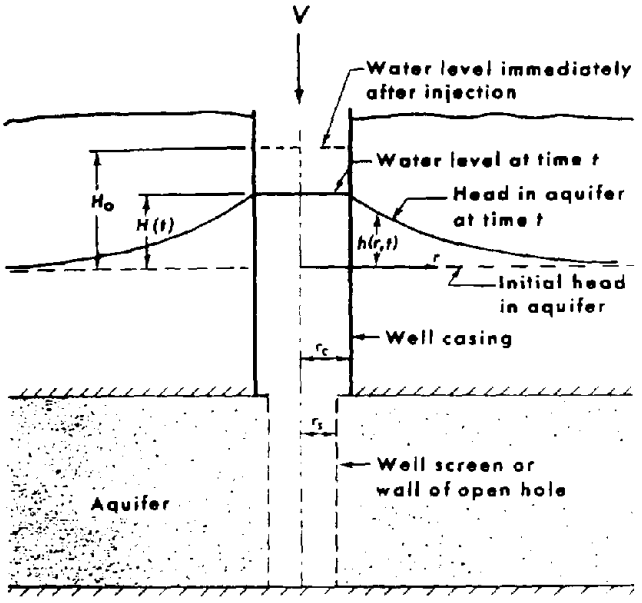

Fig. 2. Idealized representation of a well into which a volume V of water is suddenly injected.

The head $H(t)$ inside the well, obtained by substituting $r = r_s$ in equation 8, is

$$H = (8H_0\alpha/\pi^2) \int_0^\infty e^{-\beta u^2/\alpha}\, du/(u\,\Delta(u)) \qquad (9)$$

Values of H/H_0 computed by numerically integrating equation 9 are given in Table 1. Values computed from the line-source solutions, equations 3 and 4, are given in Table 2. In Figure 3 the values from Table 1 are represented as a family of five curves of H/H_0 versus the dimensionless time parameter $\beta = Tt/r_c^2$, one curve for each of five values of the parameter $\alpha = r_s^2S/r_c^2$. Also represented, by a dashed curve, are the values computed from equation 4.

It is apparent from Tables 1 and 2 and from Figure 2 that the line-source solutions 3 and 4 proposed by *Ferris and Knowles* [1954] give a good approximation of the finite-source solution only for large values of the time parameter Tt/r_c^2. The approximation seems to be acceptable for Tt/r_c^2 greater than 100 (or, equivalently, for H/H_0 less than about 0.0025). (In the test at Greenwood City, Indiana, used by Ferris and Knowles to exemplify their method, H/H_0 ranged from 0.01 to 0.001, and the value of transmissibility determined from these data agreed fairly well with one obtained by another method.)

A family of type curves plotted on semilogarithmic paper, as in Figure 3, permits a determination of the transmissibility. The method is similar to the Theis graphical method [*Wenzel*, 1942]. A test on a well near Dawsonville, Georgia, will be used to demonstrate the method. This well is cased to 24 m with 15.2-cm (6-inch) casing and drilled as a 15.2-cm open hole to a depth of 122 m. Figure 4 is a reproduction of a chart showing the hydrograph of the well after the sudden withdrawal of a long weighted float from the well. The weight of the float was 10.16 kilograms, and hence by the principle of Archimedes it had displaced a volume of 0.01016 m³ of water when floating in the well. Its withdrawal was therefore equivalent to a negative charge of $V = 0.01016$ m³. From the relation $H_0 = V/\pi r_c^2$ the initial head change is found to be $H_0 = 0.560$ m.

The hydrograph in Figure 4 was recorded electrically from a pressure transducer, which was suspended below the water surface in the well. Table 3 lists data from this chart. To determine the aquifer constants the data are

TABLE 1. Values of H/H_0 for a Well of Finite Diameter (computed from equation 9)

Tt/r_c^2	H/H_0				
	$\alpha = 10^{-1}$	$\alpha = 10^{-2}$	$\alpha = 10^{-3}$	$\alpha = 10^{-4}$	$\alpha = 10^{-5}$
1.00×10^{-3}	0.9771	0.9920	0.9969	0.9985	0.9992
2.15×10^{-3}	0.9658	0.9876	0.9949	0.9974	0.9985
4.64×10^{-3}	0.9490	0.9807	0.9914	0.9954	0.9970
1.00×10^{-2}	0.9238	0.9693	0.9853	0.9915	0.9942
2.15×10^{-2}	0.8860	0.9505	0.9744	0.9841	0.9888
4.64×10^{-2}	0.8293	0.9187	0.9545	0.9701	0.9781
1.00×10^{-1}	0.7460	0.8655	0.9183	0.9434	0.9572
2.15×10^{-1}	0.6289	0.7782	0.8538	0.8935	0.9167
4.64×10^{-1}	0.4782	0.6436	0.7436	0.8031	0.8410
1.00×10^{0}	0.3117	0.4598	0.5729	0.6520	0.7080
2.15×10^{0}	0.1665	0.2597	0.3543	0.4364	0.5038
4.64×10^{0}	0.07415	0.1086	0.1554	0.2082	0.2620
7.00×10^{0}	0.04625	0.06204	0.08519	0.1161	0.1521
1.00×10^{1}	0.03065	0.03780	0.04821	0.06355	0.08378
1.40×10^{1}	0.02092	0.02414	0.02844	0.03492	0.04426
2.15×10^{1}	0.01297	0.01414	0.01545	0.01723	0.01999
3.00×10^{1}	0.009070	0.009615	0.01016	0.01083	0.01169
4.64×10^{1}	0.005711	0.005919	0.006111	0.006319	0.006554
7.00×10^{1}	0.003722	0.003809	0.003884	0.003962	0.004046
1.00×10^{2}	0.002577	0.002618	0.002653	0.002688	0.002725
2.15×10^{2}	0.001179	0.001187	0.001194	0.001201	0.001208

plotted on semilogarithmic paper of the same scale as that of the type curves in Figure 3, and this plot is superposed on the type curves. With the arithmetic axes coincident, the da plot is translated horizontally to a positi where the data best fit the type curves, a

TABLE 2. Values of H/H_0 for Line-source Approximation of a Well

Tt/r_c^2	H/H_0 from equation 3					H/H_0 fro eq. 4
	$\alpha = 10^{-1}$	$\alpha = 10^{-2}$	$\alpha = 10^{-3}$	$\alpha = 10^{-4}$	$\alpha = 10^{-5}$	
1.00×10^{-3}	0.000000	20.52	194.7	243.8	249.4	250.0
2.15×10^{-3}	0.001035	36.35	103.5	115.0	116.2	116.3
4.64×10^{-3}	0.2463	31.44	51.05	53.59	53.85	53.88
1.00×10^{-2}	2.052	19.47	24.38	24.94	24.99	25.00
2.15×10^{-2}	3.635	10.35	11.50	11.62	11.63	11.63
4.64×10^{-2}	3.144	5.105	5.359	5.385	5.388	5.388
1.00×10^{-1}	1.947	2.438	2.494	2.499	2.500	2.500
2.15×10^{-1}	1.035	1.150	1.162	1.163		1.163
4.64×10^{-1}	0.5105	0.5359	0.5385	0.5388		[illegible]
1.00×10^{0}	0.2438	0.2494	0.2499	0.2500		[illegible]
2.15×10^{0}	0.1150	0.1162	0.1163			[illegible]
4.64×10^{0}	0.05359	0.05385	0.05388			[illegible]
7.00×10^{0}	0.03558	0.03570	0.03571			[illegible]
1.00×10^{1}	0.02494	0.02499	0.02500			[illegible]
1.40×10^{1}	0.01783	0.01786				[illegible]
2.15×10^{1}	0.01162	0.01163				[illegible]
3.00×10^{1}	0.008326	0.008333				[illegible]
4.64×10^{1}	0.005385	0.005388				[illegible]
7.00×10^{1}	0.003570	0.003571				[illegible]
1.00×10^{2}	0.002499	0.002500				[illegible]
2.15×10^{2}	0.001163					[illegible]

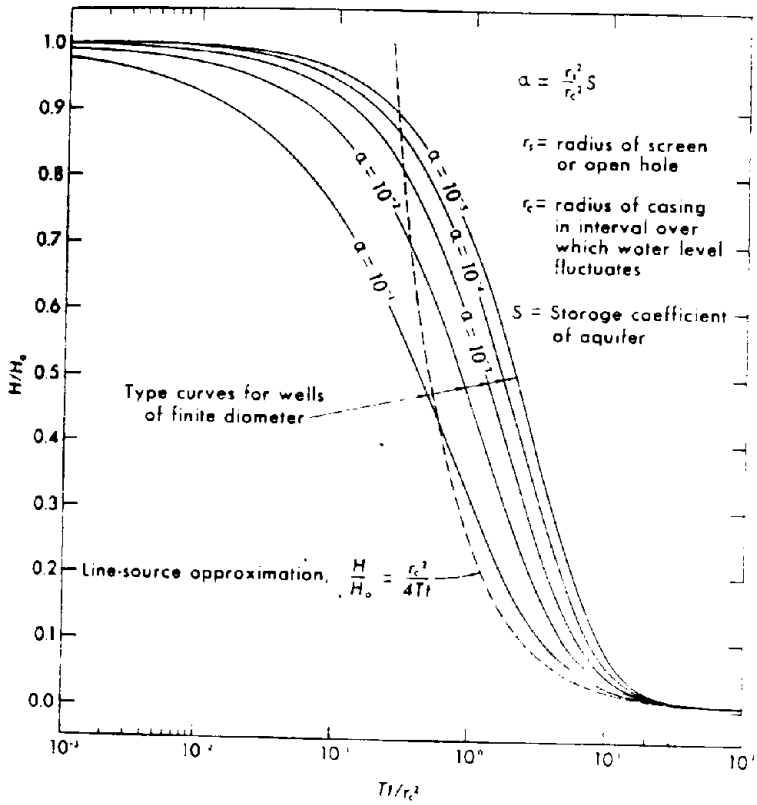

Fig. 3. Type curves for instantaneous charge in well of finite diameter.

shown in Figure 5. In this position the time $t = 11$ sec on the data coordinates is found to match the value $Tt/r_c^2 = 1.0$ on the type-curve coordinates. Hence the transmissibility is computed to be

$$T = \frac{1.0r_c^2}{t} = \frac{(1.0)(7.6)^2}{(11)} = 5.3 \text{ cm}^2/\text{sec}$$

In principle the coefficient of storage can be determined by interpolating from its values for the curves that lie on either side of the data that is the matched position. Thus, in the example just described, the coefficient of storage should be $S = 10^{-6}$, since for this well $r_s = r_c$, so that $\alpha = S$, and the points fall on the curve for $\alpha = 10^{-6}$. However, because the matching of data plot to the type curves depends upon the shapes of the type curves, which differ only slightly when α differs by an order of magnitude, a determination of S by this method has questionable reliability.

The determination of T is not so sensitive to the choice of the curves to be matched. Whereas the determined value of S will change by an

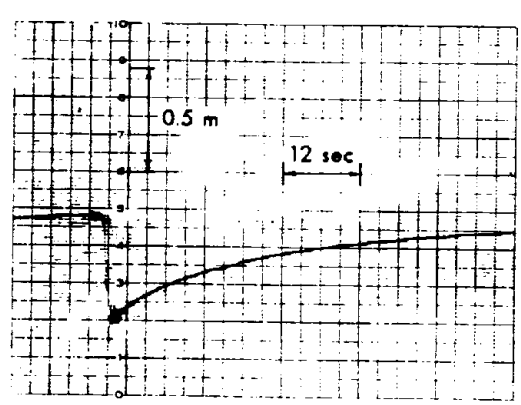

Fig. 4. Hydrograph of well at Dawsonville, Georgia, showing response of water level to the sudden withdrawal of a weighted float.

TABLE 3. Rise of Water Level in Dawsonville Well after Instantaneous Withdrawal of Weighted Float

t (sec)	$1/t$	Head (m)	H (m)	H/H_0
−1		0.896		
0		0.336	0.560	1.000
3	0.333	0.439	0.457	0.816
6	0.167	0.504	0.392	0.700
9	0.111	0.551	0.345	0.616
12	0.0833	0.588	0.308	0.550
15	0.0667	0.616	0.280	0.500
18	0.0556	0.644	0.252	0.450
21	0.0476	0.672	0.224	0.400
24	0.0417	0.691	0.205	0.366
27	0.0370	0.709	0.187	0.334
30	0.0333	0.728	0.168	0.300
33	0.0303	0.747	0.149	0.266
36	0.0278	0.756	0.140	0.250
39	0.0256	0.765	0.131	0.234
42	0.0238	0.784	0.112	0.200
45	0.0222	0.788	0.108	0.193
48	0.0208	0.803	0.093	0.166
51	0.0196	0.807	0.089	0.159
54	0.0185	0.814	0.082	0.146
57	0.0175	0.821	0.075	0.134
60	0.0167	0.825	0.071	0.127
63	0.0159	0.831	0.065	0.116

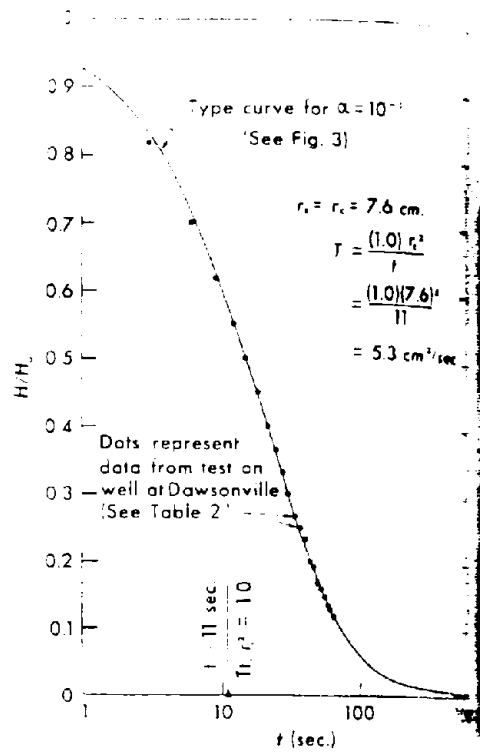

Fig. 5. Plot of data from test at Dawson Georgia, superposed on type curve.

order of magnitude when the data plot is moved from one type curve to another, that of T will change much less. From a knowledge of the geologic conditions and other considerations one can ordinarily estimate S within an order of magnitude and thereby eliminate some of the doubt as to what value of α is to be used for matching the data plot.

Figure 6 shows the data from the test on the Dawsonville well plotted according to the Ferris-Knowles method. The points do not fall along a straight line as postulated in this method but, instead, fall along the trace of the type curve for $\alpha = 10^{-4}$, which has been transferred from Figure 5. Also shown is a straight line through the origin whose slope, when used according to the Ferris-Knowles method, will yield the transmissibility of 5.3 cm²/sec obtained by matching the data to the type curves.

CONCLUSION

The judgment of an experienced hydrologist is needed to decide the significance, if any, of a determination of T by the method of instantaneous charge. As *Ferris et al.* [1962] propo warned

> the duration of a 'slug' test is very short hence the estimated transmissibility determined from the test will be representative only of the water-bearing material close to the well. Serious errors will be introduced unless the . . . well is fully developed and completely penetrates the aquifer.

Few wells completely penetrate an aquifer, but it is nevertheless possible under some circumstances for a hydrologist to derive useful information from a test on a partially penetrating well. Since the vertical permeabilities of most stratified aquifers are only small fractions of the horizontal permeabilities, the induced flow within the small radius of the cone that develops during the short period of observation is likely to be essentially 2-dimensional. Therefore, the determined value of T would represent approximately the transmissibility of that part

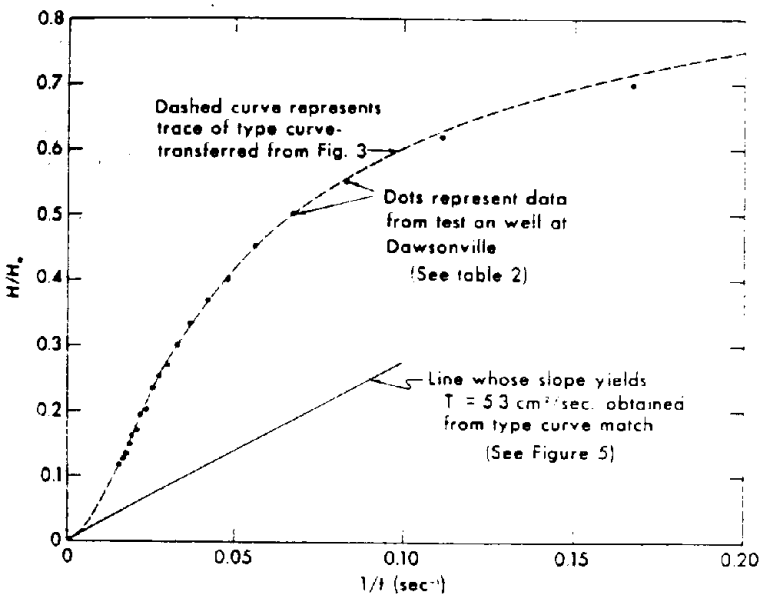

Fig. 6. Data from test on well of Dawsonville, Georgia, plotted according to the Ferris-Knowles method.

of the aquifer in which the well is screened or open, provided that the aquifer is reasonably homogeneous and isotropic in planes parallel to the bedding and provided that the effective radius r_e can be estimated closely.

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On the Analysis of 'Slug Test' Data

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Methods of analyzing 'slug test' data are reviewed, and additional type curves for the analysis of test data from formations with very low storage coefficients are presented.

The 'slug test' as a method of estimating the transmissivity of an aquifer was introduced by *Ferris and Knowles* [1954] (see also *Ferris et al.* [1962]). As is well known, the test consists of causing an instantaneous change in the water level of a well either by suddenly introducing or removing a known volume of water or by any other possible means and observing the recovery of the water level in the well with time. The method proposed by *Ferris and Knowles* [1954] for analyzing the test data is based on a solution that assumes a well of infinitesimal diameter (mathematical line source) and that can be expressed as

$$H/H_0 = r_c^2/4Tt \qquad (1)$$

where

- H_0, instantaneous head change in the well;
- H, head in the well at time $t > 0$;
- r_c, radius of the well casing in the interval over which the head change takes place;
- T, transmissivity of the aquifer;
- t, time since the instantaneous head change.

The transmissivity is determined from the slope of an arithmetic plot of H or of H/H_0 against $1/t$. Later we [*Cooper et al.*, 1967] presented a solution for a well of finite diameter and showed that the line source approximation of Ferris and Knowles is valid only for the relatively large times $t > 100\, r_c^2/T$, or, equivalently, when $H/H_0 < 0.0025$ (see the dashed line in Figure 1).

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Our solution, which is applicable for all times t, has the form

$$H/H_0 = F(\beta, \alpha) \qquad (2)$$

where

- $\beta = Tt/r_c^2$;
- $\alpha = r_w^2 S/r_c^2$;
- r_w, effective radius of the well;
- S, storage coefficient of the aquifer;
- $F(\beta, \alpha)$, a function whose tables and graphs were presented for five orders of α, 10^{-1}–10^{-5}, and for $10^{-3} < \beta < 2.15 \times 10^{3}$ (for larger values of β the function is closely approximated by equation 1).

On the basis of this solution a type curve method for analyzing test data was proposed.

As both *Ferris et al.* [1962] and *Cooper et al.* [1967] recognize, transmissivities determined from the analysis of slug test data are 'representative only of the water-bearing material close to the well.' The test provides, however, an economical means of determining 'point' transmissivities. In some types of groundwater investigations a large number of such point transmissivities are often of greater use than a single value of the transmissivity obtained from a long-term pumping test at the same cost. The test has also been used as an indicator of the effectiveness of well development (W. A. Meneley, oral communication, 1972). In a properly developed well the slug test transmissivity should be higher than the long-term pumping test transmissivity. In the oil industry the type curve method has been adapted to

TABLE 1. Values of H/H_0 for a Well of Finite Diameter

Tt/r_c^2	$\alpha = 10^{-6}$	$\alpha = 10^{-7}$	$\alpha = 10^{-8}$	$\alpha = 10^{-9}$	$\alpha = 10^{-10}$
0.001	0.9994	0.9996	0.9996	0.9997	0.9997
0.002	0.9989	0.9992	0.9993	0.9994	0.9995
0.004	0.9980	0.9985	0.9987	0.9989	0.9991
0.006	0.9972	0.9978	0.9982	0.9984	0.9986
0.008	0.9964	0.9971	0.9976	0.9980	0.9982
0.01	0.9956	0.9965	0.9971	0.9975	0.9978
0.02	0.9919	0.9934	0.9944	0.9952	0.9958
0.04	0.9848	0.9875	0.9894	0.9908	0.9919
0.06	0.9782	0.9819	0.9846	0.9866	0.9881
0.08	0.9718	0.9765	0.9799	0.9824	0.9844
0.1	0.9655	0.9712	0.9753	0.9784	0.9807
0.2	0.9361	0.9459	0.9532	0.9587	0.9631
0.4	0.8828	0.8995	0.9122	0.9220	0.9298
0.6	0.8345	0.8569	0.8741	0.8875	0.8984
0.8	0.7901	0.8173	0.8383	0.8550	0.8686
1.0	0.7489	0.7801	0.8045	0.8240	0.8401
2.0	0.5800	0.6235	0.6591	0.6889	0.7139
3.0	0.4554	0.5033	0.5442	0.5792	0.6096
4.0	0.3613	0.4093	0.4517	0.4891	0.5222
5.0	0.2893	0.3351	0.3768	0.4146	0.4487
6.0	0.2337	0.2759	0.3157	0.3525	0.3865
7.0	0.1903	0.2285	0.2655	0.3007	0.3337
8.0	0.1562	0.1903	0.2243	0.2573	0.2888
9.0	0.1292	0.1594	0.1902	0.2208	0.2505
10.0	0.1078	0.1343	0.1620	0.1900	0.2178
20.0	0.02720	0.03343	0.04129	0.05071	0.06149
30.0	0.01286	0.01448	0.01667	0.01956	0.02320
40.0	0.008337	0.008898	0.009637	0.01062	0.01190
50.0	0.006209	0.006470	0.006789	0.007192	0.007709
60.0	0.004961	0.005111	0.005283	0.005487	0.005735
80.0	0.003547	0.003617	0.003691	0.003773	0.003863
100.0	0.002763	0.002803	0.002845	0.002890	0.002938
200.0	0.001313	0.001322	0.001330	0.001339	0.001348

analyze drill-stem tests [*Kohlhaas*, 1972], most of which 'do not have production to the surface, either because of low formation productivity or because of the limited duration of the flow period.'

In recent years the increased interest in determining the hydrologic properties of low transmissivity formations, mostly in relation with deep-well waste disposal studies, has also increased the popularity of the slug test. The yield of test wells in tight formations is often too low to permit a pumping test of even relatively short duration, and the slug test becomes one of the few available field test methods. Some of these tight formations because of their low compressibility and low porosity, sometimes as low as 0.1%, have also a very small storage coefficient. Under these conditions the value of the parameter α appearing in (2) is smaller than 10^{-5}, and the test data cannot be matched to the available type curves. These conditions were observed in data from tests conducted on oil shales at the Piceance Basin, Colorado, by J. D. Bredehoeft and R. G. Wolff of the U.S. Geological Survey and were also reported to us by several investigators conducting tests on similar formations elsewhere.

Therefore we are presenting here an extension to the previously available values of $F(\beta, \alpha)$, i.e., of H/H_0, for another five orders of α, 10^{-6}–10^{-10} (Table 1). These values are plotted together with the previously available type curves in Figure 1. As can be noted in the figure, for these small values of α the curves have a very similar shape, run close to each other, and are almost parallel for most of their length. This fact indicates that, when the storage coefficient is so small, the recovery of the water level in the test well becomes very insensitive, even to order of magnitude changes in the storage coefficient. In *Cooper et al.* [1967] we stated that 'a deter-

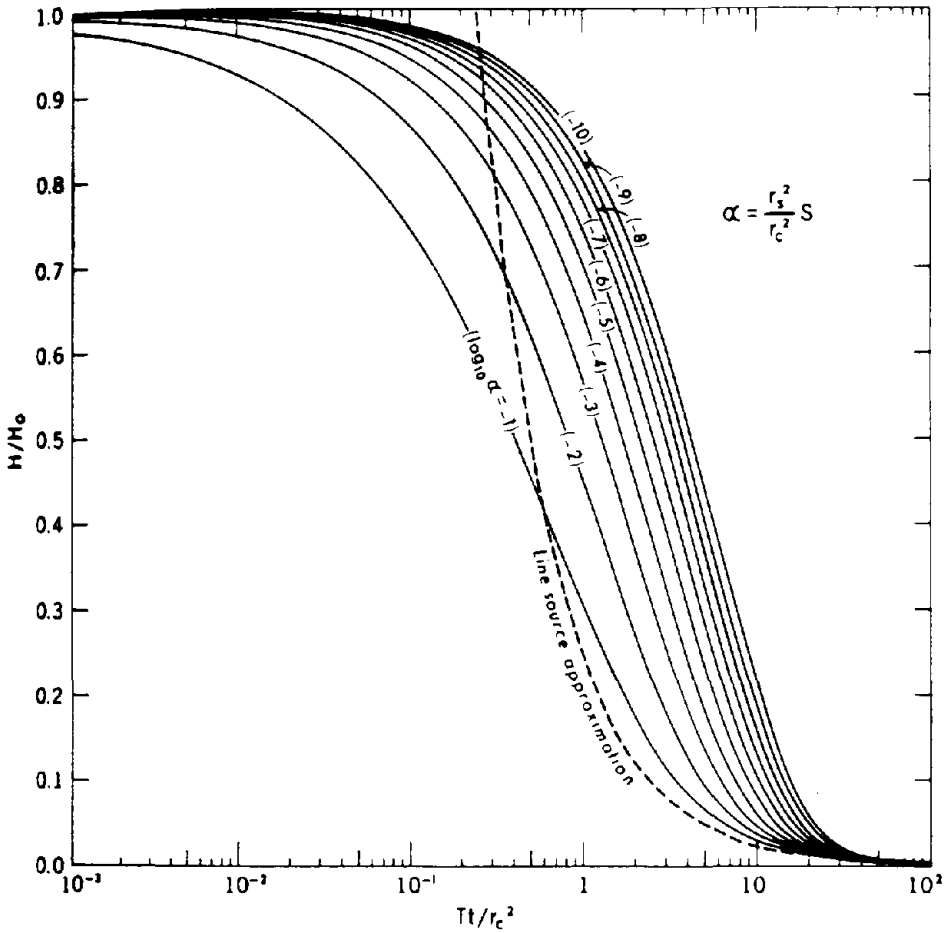

Fig. 1. Type curves for instantaneous change in a well of finite diameter.

mination of S by this method has questionable reliability[7]; reliability becomes even more questionable when α is smaller than 10^{-5}. Of course, the similarity of the type curves in this range of α also affects the determinations of transmissivity. Even the most carefully and accurately collected test data could easily be matched with more than one of the type curves. The best one could expect is to be within one or two orders of magnitude of the actual α. An analysis in the range $\alpha < 10^{-5}$ indicates that, if the value of α for the chosen type curve is within two orders of magnitude of its actual value, the error in the determined T would be less than about 30%. This possible error should be kept in mind when one is making use of transmissivities determined by this method.

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(Received February 23, 1973.)

(Rising head test 1)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-01-01
Test by:	K. Arena	Date:	10/28/91
Analysis:	K. Arena	Date:	11/25/91

USER INPUT DATA		WORKSHEET		A=	2.7	ERR
Aquifer Thickness=	20.24	FIGURES		B =	0.42	ERR
Exposed Len.(Le) =	15			C =	2.4	ERR
Well Length (Lw) =	13.22	R(eq) =	0.1873		0.0675	ERR
Casing Radius(Rc)=	0.083	Est. Rw				ERR
Well Radius (Rw) =	0.333	Est. n			-0.023	
Sandpack Porosity=	0.270	log(Le/Rw)			1.5984	ERR
Slug Volume =	0.025	ln(Re/Rw)			2.5053	ERR
Static Level =	6.50	Max. Y(t)			1.77	
Offset time =	0	Regr. Y(0)			1.74	
Shape Factor =	24.8	Casing Y(0)			1.15	DRAINED
(F from est. Rw)	ERR					

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	2.7E-02	5.3E-02	39.11
Bouwer & Rice - estimated porosity	3.5E-03	7.0E-03	5.09
Bouwer & Rice - estimated Rw	ERR	ERR	ERR
Hvorslev - user porosity and Rw	3.6E-02	7.2E-02	52.37
Hvorslev - estimated porosity	4.7E-03	9.3E-03	6.81
Hvorslev - estimated Rw	ERR	ERR	ERR

Regression Output:

Constant	0.556636
Std Err of Y Est	0.018701
R Squared	0.936918
No. of Observations	8
Degrees of Freedom	6

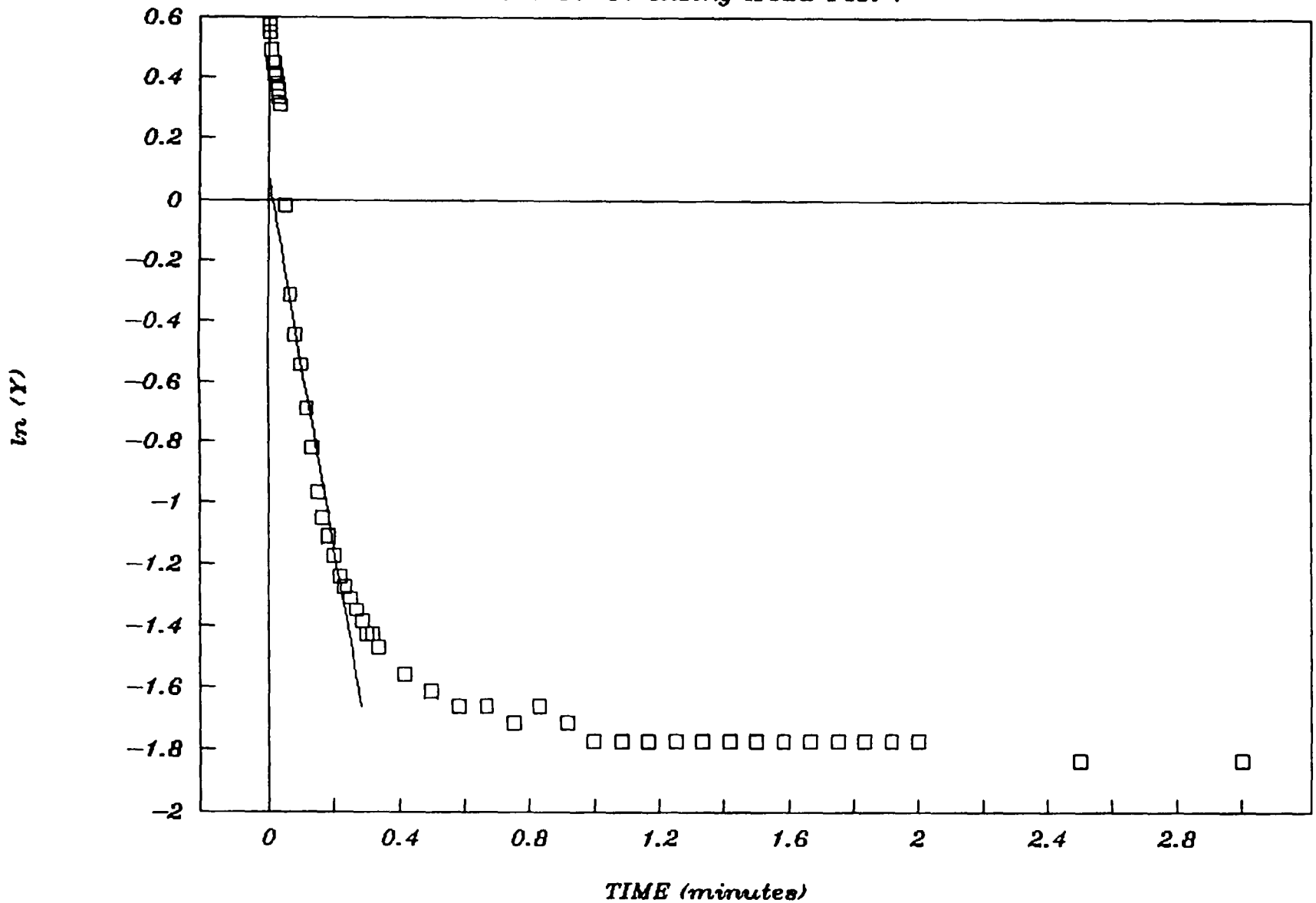
X Coefficient(s)	-8.17235
Std Err of Coef.	0.865707

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.77	1.77	0.5710	B	0.5566
0.0033	-1.73	1.73	0.5481		0.5297
0.0066	-1.63	1.63	0.4886		0.5027
0.0099	-1.56	1.56	0.4447		0.4757
0.0133	-1.56	1.56	0.4447		0.4479
0.0166	-1.51	1.51	0.4121		0.4210
0.02	-1.5	1.50	0.4055		0.3932
0.0233	-1.46	1.46	0.3784	E	0.3662
0.0266	-1.43	1.43	0.3577		0.3393
0.03	-1.4	1.40	0.3365		0.3115
0.0333	-1.36	1.36	0.3075		0.2845
0.05	-0.98	0.98	-0.0202	b2	0.1480
0.0666	-0.73	0.73	-0.3147		0.0124
0.0833	-0.64	0.64	-0.4463		-0.1241
0.1	-0.58	0.58	-0.5447		-0.2606
0.1166	-0.5	0.50	-0.6931		-0.3963
0.1333	-0.44	0.44	-0.8210		-0.5327
0.15	-0.38	0.38	-0.9676		-0.6692
0.1666	-0.35	0.35	-1.0498		-0.8049
0.1833	-0.33	0.33	-1.1087		-0.9414

0.2	-0.31	0.31	-1.1712		-1.0778
0.2166	-0.29	0.29	-1.2379		-1.2135
0.2333	-0.28	0.28	-1.2730		-1.3500
0.25	-0.27	0.27	-1.3093	e2	-1.4865
0.2666	-0.26	0.26	-1.3471		-1.6221
0.2833	-0.25	0.25	-1.3863		-1.7586
0.3	-0.24	0.24	-1.4271		-1.8951
0.3166	-0.24	0.24	-1.4271		-2.0307
0.3333	-0.23	0.23	-1.4697		-2.1672
0.4167	-0.21	0.21	-1.5606		-2.8488
0.5	-0.2	0.20	-1.6094		-3.5295
0.5833	-0.19	0.19	-1.6607		-4.2103
0.6667	-0.19	0.19	-1.6607		-4.8919
0.75	-0.18	0.18	-1.7148		-5.5726
0.8333	-0.19	0.19	-1.6607		-6.2534
0.9167	-0.18	0.18	-1.7148		-6.9350
1	-0.17	0.17	-1.7720		-7.6157
1.0833	-0.17	0.17	-1.7720		-8.2965
1.1667	-0.17	0.17	-1.7720		-8.9781
1.25	-0.17	0.17	-1.7720		-9.6588
1.3333	-0.17	0.17	-1.7720		-10.3396
1.4166	-0.17	0.17	-1.7720		-11.0203
1.5	-0.17	0.17	-1.7720		-11.7019
1.5833	-0.17	0.17	-1.7720		-12.3827
1.6667	-0.17	0.17	-1.7720		-13.0642
1.75	-0.17	0.17	-1.7720		-13.7450
1.8333	-0.17	0.17	-1.7720		-14.4257
1.9167	-0.17	0.17	-1.7720		-15.1073
2	-0.17	0.17	-1.7720		-15.7881
2.5	-0.16	0.16	-1.8326		-19.8743
3	-0.16	0.16	-1.8326		-23.9604
3.5	-0.16	0.16	-1.8326		-28.0466
4	-0.16	0.16	-1.8326		-32.1328
4.5	-0.17	0.17	-1.7720		-36.2190
5	-0.17	0.17	-1.7720		-40.3052
5.5	-0.16	0.16	-1.8326		-44.3913
6	-0.16	0.16	-1.8326		-48.4775
6.5	-0.16	0.16	-1.8326		-52.5637
7	-0.16	0.16	-1.8326		-56.6499
7.5	-0.17	0.17	-1.7720		-60.7361
8	-0.17	0.17	-1.7720		-64.8222
8.5	-0.16	0.16	-1.8326		-68.9084
9	-0.16	0.16	-1.8326		-72.9946
9.5	-0.16	0.16	-1.8326		-77.0808
10	-0.17	0.17	-1.7720		-81.1670
12	-0.16	0.16	-1.8326		-97.5117

ROSEHILL SLUG TEST

MW-01-01 Rising Head Test 1



(First rising head test)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA — Revised 11/05/91
Site: Rosehill — Well ID: MW-01-02
Test by: K.Arena — Date: 10/28/91
Analysis: K.Arena — Date: 12/03/91

USER INPUT DATA		WORKSHEET	A=	5.7	5.7
Aquifer Thickness=	300	FIGURES	B =	1.08	1.08
Exposed Len.(Le) =	46.69		C =	6.4	6.4
Well Length (Lw) =	77.7	R(eq) =	0.2500	0.2500	0.2500
Casing Radius(Rc)=	0.250	Est. Rw			0.250
Well Radius (Rw) =	0.250	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		2.2713	2.2713
Slug Volume =	0.153	ln(Re/Rw)		3.8928	3.8928
Static Level =	6.31	Max. Y(t)		0.75	
Offset time =	0	Regr. Y(0)		0.73	
Shape Factor =	56.1	Casing Y(0)		0.78	UNDRAINED
(F from est. Rw)	56.1				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	4.4E-05	8.7E-05	0.06
Bouwer & Rice - estimated porosity	4.4E-05	8.7E-05	0.06
Bouwer & Rice - estimated Rw	4.4E-05	8.7E-05	0.06
Hvorslev - user porosity and Rw	6.0E-05	1.2E-04	0.09
Hvorslev - estimated porosity	6.0E-05	1.2E-04	0.09
Hvorslev - estimated Rw	6.0E-05	1.2E-04	0.09

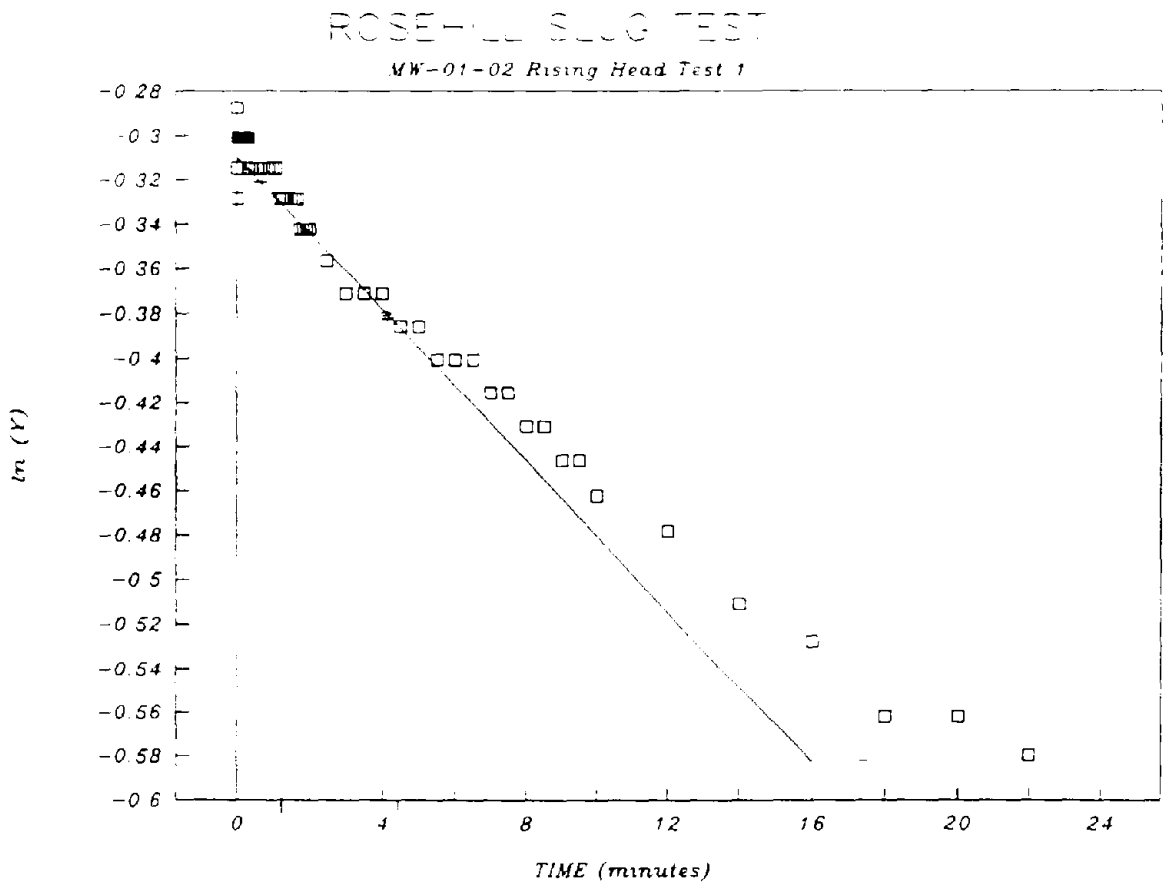
Regression Output:

Constant	-0.30993
Std Err of Y Est	0.005895
R Squared	0.908633
No. of Observations	10
Degrees of Freedom	8

X Coefficient(s) -0.01704
Std Err of Coef. 0.001911

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.75	0.73	-0.3147		-0.3099
0.0033	-0.73	0.75	-0.2877		-0.3100
0.0066	-0.75	0.73	-0.3147		-0.3100
0.0099	-0.73	0.75	-0.2877		-0.3101
0.0133	-0.75	0.72	-0.3285		-0.3102
0.0166	-0.72	0.74	-0.3011		-0.3102
0.02	-0.74	0.73	-0.3147		-0.3103
0.0233	-0.73	0.73	-0.3147		-0.3103
0.0266	-0.73	0.74	-0.3011		-0.3104
0.03	-0.74	0.74	-0.3011		-0.3104
0.0333	-0.74	0.74	-0.3011		-0.3105
0.05	-0.74	0.74	-0.3011		-0.3108
0.0666	-0.74	0.74	-0.3011		-0.3111
0.0833	-0.74	0.74	-0.3011		-0.3114
0.1	-0.74	0.74	-0.3011		-0.3116
0.1166	-0.74	0.74	-0.3011		-0.3119
0.1333	-0.74	0.74	-0.3011		-0.3122
0.15	-0.74	0.74	-0.3011		-0.3125
0.1666	-0.74	0.74	-0.3011		-0.3128
0.1833	-0.74	0.74	-0.3011		-0.3131

0.2	-0.74	0.74	-0.3011		-0.3133
0.2166	-0.74	0.74	-0.3011		-0.3136
0.2333	-0.74	0.74	-0.3011		-0.3139
0.25	-0.74	0.74	-0.3011		-0.3142
0.2666	-0.74	0.74	-0.3011		-0.3145
0.2833	-0.74	0.74	-0.3011		-0.3148
0.3	-0.74	0.74	-0.3011		-0.3150
0.3166	-0.74	0.74	-0.3011		-0.3153
0.3333	-0.74	0.73	-0.3147		-0.3156
0.4167	-0.73	0.73	-0.3147		-0.3170
0.5	-0.73	0.73	-0.3147		-0.3185
0.5833	-0.73	0.73	-0.3147		-0.3199
0.6667	-0.73	0.73	-0.3147		-0.3213
0.75	-0.73	0.73	-0.3147		-0.3227
0.8333	-0.73	0.73	-0.3147		-0.3241
0.9167	-0.73	0.73	-0.3147		-0.3256
1	-0.73	0.73	-0.3147		-0.3270
1.0833	-0.73	0.73	-0.3147		-0.3284
1.1667	-0.73	0.72	-0.3285		-0.3298
1.25	-0.72	0.72	-0.3285		-0.3312
1.3333	-0.72	0.72	-0.3285		-0.3327
1.4166	-0.72	0.72	-0.3285		-0.3341
1.5	-0.72	0.72	-0.3285		-0.3355
1.5833	-0.72	0.72	-0.3285		-0.3369
1.6667	-0.72	0.72	-0.3285	B	-0.3384
1.75	-0.72	0.71	-0.3425		-0.3398
1.8333	-0.71	0.71	-0.3425		-0.3412
1.9167	-0.71	0.71	-0.3425		-0.3426
2	-0.71	0.71	-0.3425		-0.3440
2.5	-0.71	0.70	-0.3567		-0.3526
3	-0.7	0.69	-0.3711		-0.3611
3.5	-0.69	0.69	-0.3711		-0.3696
4	-0.69	0.69	-0.3711		-0.3781
4.5	-0.69	0.68	-0.3857	E	-0.3867
5	-0.68	0.68	-0.3857		-0.3952
5.5	-0.68	0.67	-0.4005		-0.4037
6	-0.67	0.67	-0.4005		-0.4122
6.5	-0.67	0.67	-0.4005		-0.4208
7	-0.67	0.66	-0.4155		-0.4293
7.5	-0.66	0.66	-0.4155		-0.4378
8	-0.66	0.65	-0.4308		-0.4463
8.5	-0.65	0.65	-0.4308		-0.4549
9	-0.65	0.64	-0.4463		-0.4634
9.5	-0.64	0.64	-0.4463		-0.4719
10	-0.64	0.63	-0.4620		-0.4804
12	-0.63	0.62	-0.4780		-0.5145
14	-0.62	0.60	-0.5108		-0.5486
16	-0.6	0.59	-0.5276		-0.5827
18	-0.59	0.57	-0.5621		-0.6168
20	-0.57	0.57	-0.5621		-0.6509
22	-0.57	0.56	-0.5798		-0.6850
24	-0.56	0.00	ERR		-0.7191


ROSE-'LL SLUG TEST
MW-01-02 Rising Head Test 1
-0.28
-0.3
-0.32
-0.34
-0.36
-0.38
-0.4
-0.42
-0.44
-0.46
-0.48
-0.5
-0.52
-0.54
-0.56
-0.58
-0.6
ln (Y)
0
4
8
12
16
20
24
TIME (minutes)

(Rising Head test 1 MW-02-01)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-02-01
Test by: K.Arena Date: 10/30/91
Analysis:K.Arena Date: 11/26/91

USER INPUT DATA		WORKSHEET	A=	5.6	5.6
Aquifer Thickness=	46.26	FIGURES	B =	1.05	1.05
Exposed Len.(Le) =	15		C =	6.3	6.3
Well Length (Lw) =	23.89	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.083
Well Radius (Rw) =	0.083	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		2.2553	2.2553
Slug Volume =	0.025	ln(Re/Rw)		3.8715	3.8715
Static Level =	24.05	Max. Y(t)		0.41	
Offset time =	0.0066	Regr. Y(0)		0.40	
Shape Factor =	18.1	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	18.1				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	2.6E-02	5.0E-02	36.77
Bouwer & Rice - estimated porosity	2.6E-02	5.0E-02	36.77
Bouwer & Rice - estimated Rw	2.6E-02	5.0E-02	36.77
Hvorslev - user porosity and Rw	3.4E-02	6.7E-02	49.32
Hvorslev - estimated porosity	3.4E-02	6.7E-02	49.32
Hvorslev - estimated Rw	3.4E-02	6.7E-02	49.32

Regression Output:

Constant	-0.73587
Std Err of Y Est	0.135850
R Squared	0.983609
No. of Observations	10
Degrees of Freedom	8

X Coefficient(s) -28.4950
Std Err of Coef. 1.300478

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.54	0.54	-0.6162		-0.7359
0.0033	-0.71	0.71	-0.3425		-0.8299
0.0066	-0.8	0.80	-0.2231		-0.9239
0.0099	-0.68	0.68	-0.3857		-1.0180
0.0133	-0.53	0.53	-0.6349		-1.1149
0.0166	-0.41	0.41	-0.8916		-1.2089
0.02	-0.33	0.33	-1.1087	B3	-1.3058
0.0233	-0.27	0.27	-1.3093		-1.3998
0.0266	-0.23	0.23	-1.4697		-1.4938
0.03	-0.2	0.20	-1.6094		-1.5907
0.0333	-0.17	0.17	-1.7720		-1.6848
0.05	-0.1	0.10	-2.3026		-2.1606
0.0666	-0.06	0.06	-2.8134		-2.6336
0.0833	-0.04	0.04	-3.2189		-3.1095
0.1	-0.03	0.03	-3.5066		-3.5854
0.1166	-0.02	0.02	-3.9120	E3	-4.0584
0.1333	-0.02	0.02	-3.9120		-4.5343
0.15	-0.01	0.01	-4.6052		-5.0101
0.1666	-0.01	0.01	-4.6052		-5.4832
0.1833	-0.01	0.01	-4.6052		-5.9590

0.2	-0.01	0.01	-4.6052	-6.4349
0.2166	-0.01	0.01	-4.6052	-6.9079
0.2333	0	0.00	ERR	-7.3838
0.25	0	0.00	ERR	-7.8596
0.2666	0	0.00	ERR	-8.3327
0.2833	0	0.00	ERR	-8.8085
0.3	0	0.00	ERR	-9.2844
0.3166	0	0.00	ERR	-9.7574
0.3333	0	0.00	ERR	-10.2333
0.4167	0	0.00	ERR	-12.6098
0.5	0	0.00	ERR	-14.9834
0.5833	0	0.00	ERR	-17.3571
0.6667	0	0.00	ERR	-19.7335
0.75	0	0.00	ERR	-22.1072
0.8333	0	0.00	ERR	-24.4808
0.9167	0	0.00	ERR	-26.8573
1	0	0.00	ERR	-29.2310
1.0833	0	0.00	ERR	-31.6046
1.1667	0	0.00	ERR	-33.9811
1.25	0	0.00	ERR	-36.3547
1.3333	0	0.00	ERR	-38.7284
1.4166	0	0.00	ERR	-41.1020
1.5	0	0.00	ERR	-43.4785
1.5833	0	0.00	ERR	-45.8521
1.6667	0	0.00	ERR	-48.2286
1.75	0	0.00	ERR	-50.6023
1.8333	0	0.00	ERR	-52.9759
1.9167	0	0.00	ERR	-55.3524
2	0	0.00	ERR	-57.7260
2.5	0	0.00	ERR	-71.9736
3	0	0.00	ERR	-86.2211
3.5	0	0.00	ERR	*********
4	0	0.00	ERR	*********
4.5	0	0.00	ERR	*********
5	0	0.00	ERR	*********
5.5	0	0.00	ERR	*********
6	0	0.00	ERR	*********
6.5	0	0.00	ERR	*********
7	0	0.00	ERR	*********
7.5	0	0.00	ERR	*********

(Rising Head test 1 MW-02-01)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-02-01
Test by: K.Arena Date: 10/30/91
Analysis:K.Arena Date: 11/26/91

USER INPUT DATA		WORKSHEET		A=	2.5	4.1
Aquifer Thickness=	46.26	FIGURES		B =	0.39	0.65
Exposed Len.(Le) =	15			C =	2.2	4.1
Well Length (Lw) =	11.75	R(eq) =	0.1973		0.0985	0.0985
Casing Radius(Rc)=	0.083	Est. Rw				0.131
Well Radius (Rw) =	0.354	Est. n			0.023	
Sandpack Porosity=	0.270	log(Le/Rw)			1.5208	1.9526
Slug Volume =	0.025	ln(Re/Rw)			2.2563	2.5936
Static Level =	24.05	Max. Y(t)			0.8	
Offset time =	0.0066	Regr. Y(0)			0.82	
Shape Factor =	25.2	Casing Y(0)			1.15	DRAINED
(F from est. Rw)	19.9					

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	2.5E-01	4.9E-01	361.22
Bouwer & Rice - estimated porosity	6.3E-02	1.2E-01	90.04
Bouwer & Rice - estimated Rw	7.2E-02	1.4E-01	103.51
Hvorslev - user porosity and Rw	3.3E-01	6.4E-01	469.78
Hvorslev - estimated porosity	8.1E-02	1.6E-01	117.10
Hvorslev - estimated Rw	1.0E-01	2.0E-01	148.18

Regression Output:

Constant	0.244255
Std Err of Y Est	0.025788
R Squared	0.996992
No. of Observations	6
Degrees of Freedom	4

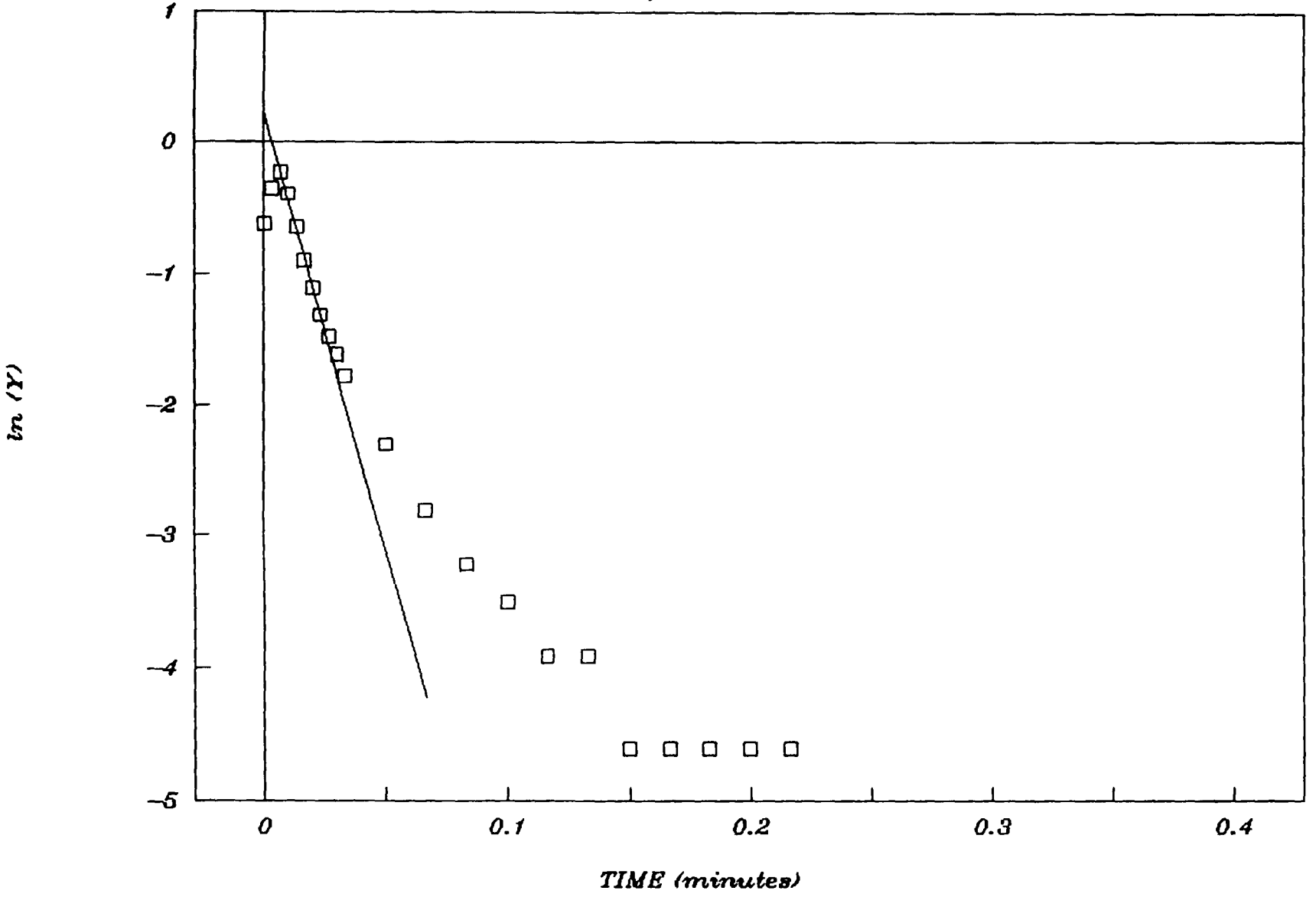
X Coefficient(s)	-67.0993
Std Err of Coef.	1.842521

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.54	0.54	-0.6162		0.2443
0.0033	-0.71	0.71	-0.3425		0.0228
0.0066	-0.8	0.80	-0.2231	b	-0.1986
0.0099	-0.68	0.68	-0.3857		-0.4200
0.0133	-0.53	0.53	-0.6349		-0.6482
0.0166	-0.41	0.41	-0.8916		-0.8696
0.02	-0.33	0.33	-1.1087		-1.0977
0.0233	-0.27	0.27	-1.3093	e	-1.3192
0.0266	-0.23	0.23	-1.4697		-1.5406
0.03	-0.2	0.20	-1.6094		-1.7687
0.0333	-0.17	0.17	-1.7720		-1.9902
0.05	-0.1	0.10	-2.3026		-3.1107
0.0666	-0.06	0.06	-2.8134		-4.2246
0.0833	-0.04	0.04	-3.2189		-5.3451
0.1	-0.03	0.03	-3.5066		-6.4657
0.1166	-0.02	0.02	-3.9120		-7.5795
0.1333	-0.02	0.02	-3.9120		-8.7001
0.15	-0.01	0.01	-4.6052		-9.8206
0.1666	-0.01	0.01	-4.6052		-10.9345
0.1833	-0.01	0.01	-4.6052		-12.0551

0.2	-0.01	0.01	-4.6052	-13.1756
0.2166	-0.01	0.01	-4.6052	-14.2895
0.2333	0	0.00	ERR	-15.4100
0.25	0	0.00	ERR	-16.5306
0.2666	0	0.00	ERR	-17.6444
0.2833	0	0.00	ERR	-18.7650
0.3	0	0.00	ERR	-19.8855
0.3166	0	0.00	ERR	-20.9994
0.3333	0	0.00	ERR	-22.1200
0.4167	0	0.00	ERR	-27.7160
0.5	0	0.00	ERR	-33.3054
0.5833	0	0.00	ERR	-38.8948
0.6667	0	0.00	ERR	-44.4909
0.75	0	0.00	ERR	-50.0802
0.8333	0	0.00	ERR	-55.6696
0.9167	0	0.00	ERR	-61.2657
1	0	0.00	ERR	-66.8551
1.0833	0	0.00	ERR	-72.4444
1.1667	0	0.00	ERR	-78.0405
1.25	0	0.00	ERR	-83.6299
1.3333	0	0.00	ERR	-89.2193
1.4166	0	0.00	ERR	-94.8087
1.5	0	0.00	ERR	-100.4047
1.5833	0	0.00	ERR	-105.9941
1.6667	0	0.00	ERR	-111.5902
1.75	0	0.00	ERR	-117.1796
1.8333	0	0.00	ERR	-122.7689
1.9167	0	0.00	ERR	-128.3650
2	0	0.00	ERR	-133.9544
2.5	0	0.00	ERR	-167.5041
3	0	0.00	ERR	-201.0537
3.5	0	0.00	ERR	-234.6034
4	0	0.00	ERR	-268.1531
4.5	0	0.00	ERR	-301.7027
5	0	0.00	ERR	-335.2524
5.5	0	0.00	ERR	-368.8021
6	0	0.00	ERR	-402.3517
6.5	0	0.00	ERR	-435.9014
7	0	0.00	ERR	-469.4510
7.5	0	0.00	ERR	-503.0007

ROSEHILL SLUG TEST

MW-02-01 Rising Head Test 1



(Rising head test 1 in MW-02-02)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-02-02
Test by:	K.Arena	Date:	10/30/91
Analysis:	K.Arena	Date:	11/26/91

USER INPUT DATA		WORKSHEET	A=	3.0	3.0
Aquifer Thickness=	46.87	FIGURES	B =	0.46	0.46
Exposed Len.(Le) =	10		C =	2.7	2.7
Well Length (Lw) =	46.87	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.208
Well Radius (Rw) =	0.208	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6812	1.6812
Slug Volume =	0.025	ln(Re/Rw)		3.8573	3.8573
Static Level =	23.70	Max. Y(t)		0.76	
Offset time =	0.0233	Regr. Y(0)		0.76	
Shape Factor =	16.2	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	16.2				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.1E-02	2.1E-02	15.23
Bouwer & Rice - estimated porosity	1.1E-02	2.1E-02	15.23
Bouwer & Rice - estimated Rw	1.1E-02	2.1E-02	15.23
Hvorslev - user porosity and Rw	1.1E-02	2.1E-02	15.28
Hvorslev - estimated porosity	1.1E-02	2.1E-02	15.28
Hvorslev - estimated Rw	1.1E-02	2.1E-02	15.28

Regression Output:

Constant	-0.08512
Std Err of Y Est	0.022942
R Squared	0.998492
No. of Observations	16
Degrees of Freedom	14

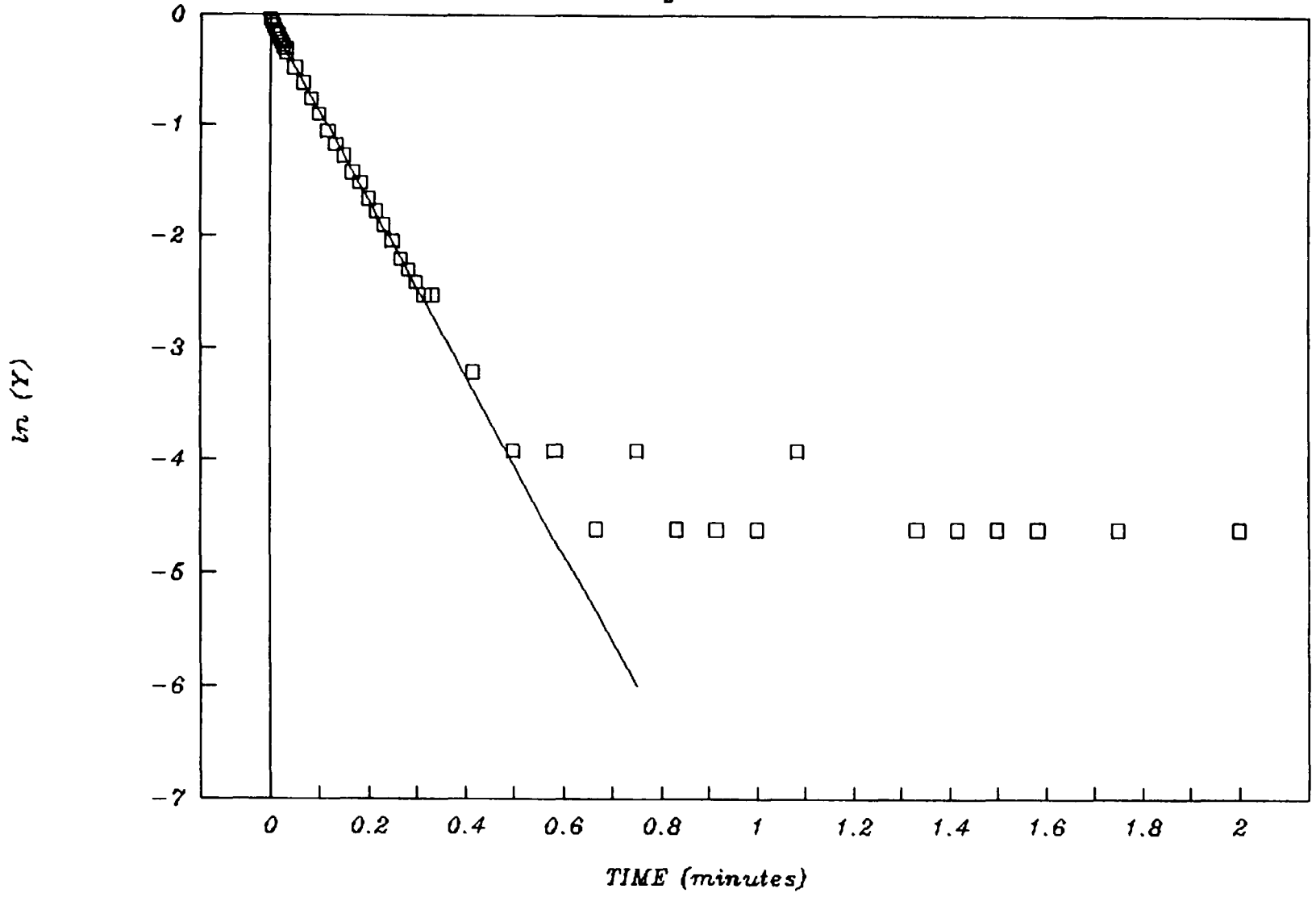
X Coefficient(s)	-7.89409
Std Err of Coef.	0.081986

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.96	0.96	-0.0408		-0.0851
0.0033	-0.93	0.93	-0.0726		-0.1112
0.0066	-0.9	0.90	-0.1054		-0.1372
0.0099	-0.87	0.87	-0.1393		-0.1633
0.0133	-0.85	0.85	-0.1625		-0.1901
0.0166	-0.83	0.83	-0.1863		-0.2162
0.02	-0.8	0.80	-0.2231		-0.2430
0.0233	-0.78	0.78	-0.2485	B	-0.2691
0.0266	-0.76	0.76	-0.2744		-0.2951
0.03	-0.74	0.74	-0.3011		-0.3219
0.0333	-0.71	0.71	-0.3425		-0.3480
0.05	-0.62	0.62	-0.4780		-0.4798
0.0666	-0.54	0.54	-0.6162		-0.6109
0.0833	-0.47	0.47	-0.7550		-0.7427
0.1	-0.41	0.41	-0.8916		-0.8745
0.1166	-0.35	0.35	-1.0498		-1.0056
0.1333	-0.31	0.31	-1.1712		-1.1374
0.15	-0.28	0.28	-1.2730		-1.2692
0.1666	-0.24	0.24	-1.4271		-1.4003
0.1833	-0.22	0.22	-1.5141		-1.5321

0.2	-0.19	0.19	-1.6607		-1.6639
0.2166	-0.17	0.17	-1.7720		-1.7950
0.2333	-0.15	0.15	-1.8971	E	-1.9268
0.25	-0.13	0.13	-2.0402		-2.0586
0.2666	-0.11	0.11	-2.2073		-2.1897
0.2833	-0.1	0.10	-2.3026		-2.3215
0.3	-0.09	0.09	-2.4079		-2.4534
0.3166	-0.08	0.08	-2.5257		-2.5844
0.3333	-0.08	0.08	-2.5257		-2.7162
0.4167	-0.04	0.04	-3.2189		-3.3746
0.5	-0.02	0.02	-3.9120		-4.0322
0.5833	-0.02	0.02	-3.9120		-4.6897
0.6667	-0.01	0.01	-4.6052		-5.3481
0.75	-0.02	0.02	-3.9120		-6.0057
0.8333	-0.01	0.01	-4.6052		-6.6633
0.9167	-0.01	0.01	-4.6052		-7.3216
1	-0.01	0.01	-4.6052		-7.9792
1.0833	-0.02	0.02	-3.9120		-8.6368
1.1667	0	0.00	ERR		-9.2952
1.25	0	0.00	ERR		-9.9527
1.3333	-0.01	0.01	-4.6052		-10.6103
1.4166	-0.01	0.01	-4.6052		-11.2679
1.5	-0.01	0.01	-4.6052		-11.9263
1.5833	-0.01	0.01	-4.6052		-12.5838
1.6667	0	0.00	ERR		-13.2422
1.75	-0.01	0.01	-4.6052		-13.8998
1.8333	0	0.00	ERR		-14.5574
1.9167	0	0.00	ERR		-15.2157
2	-0.01	0.01	-4.6052		-15.8733
2.5	-0.01	0.01	-4.6052		-19.8204
3	-0.01	0.01	-4.6052		-23.7674
3.5	0	0.00	ERR		-27.7145
4	-0.01	0.01	-4.6052		-31.6615
4.5	0	0.00	ERR		-35.6085
5	-0.01	0.01	-4.6052		-39.5556
5.5	0	0.00	ERR		-43.5026

ROSEHILL SLUG TEST

MW-02-02 Rising head test 1



(Rising Head Test 1)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-03-01
Test by:	D.Berler	Date:	11/01/91
Analysis:	K.Arena	Date:	12/03/91

USER INPUT DATA		WORKSHEET	A=	2.4	2.4
Aquifer Thickness=	44.42	FIGURES	B =	0.38	0.38
Exposed Len.(Le) =	10		C =	2.1	2.1
Well Length (Lw) =	11.46	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.333
Well Radius (Rw) =	0.333	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.4771	1.4771
Slug Volume =	0.025	ln(Re/Rw)		2.2308	2.2308
Static Level =	0.00	Max. Y(t)		1.26	
Offset time =	0.0033	Regr. Y(0)		1.26	
Shape Factor =	18.5	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	18.5				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	3.5E-03	7.0E-03	5.10
Bouwer & Rice - estimated porosity	3.5E-03	7.0E-03	5.10
Bouwer & Rice - estimated Rw	3.5E-03	7.0E-03	5.10
Hvorslev - user porosity and Rw	5.4E-03	1.1E-02	7.77
Hvorslev - estimated porosity	5.4E-03	1.1E-02	7.77
Hvorslev - estimated Rw	5.4E-03	1.1E-02	7.77

Regression Output:

Constant	0.249496
Std Err of Y Est	0.009088
R Squared	0.999755
No. of Observations	6
Degrees of Freedom	4

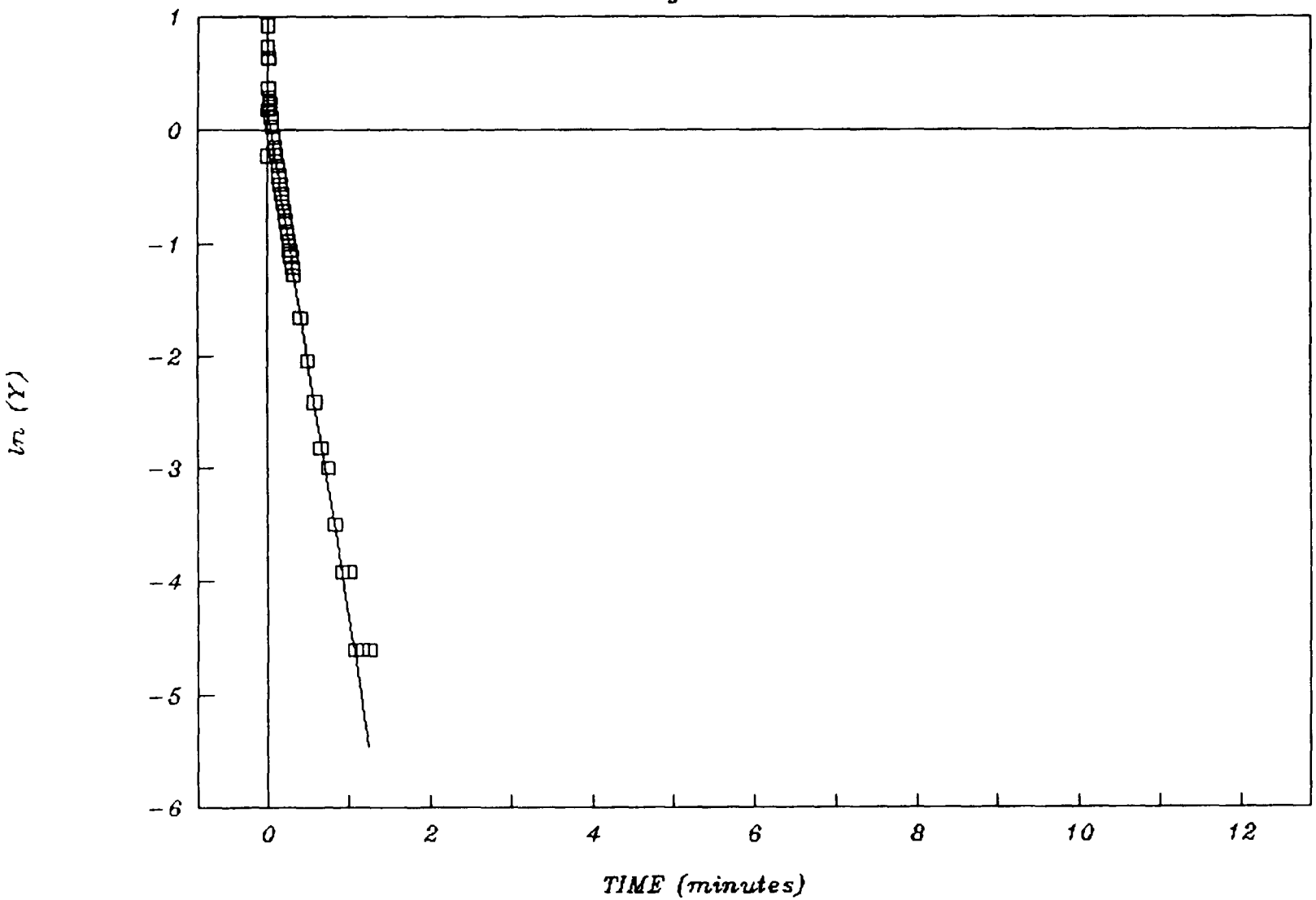
X Coefficient(s)	-4.56813
Std Err of Coef.	0.035684

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-2.07	2.07	0.7275		0.2495
0.0033	-2.51	2.51	0.9203		0.2344
0.0066	-0.8	0.80	-0.2231		0.2193
0.0099	-1.9	1.90	0.6419		0.2043
0.0133	-1.2	1.20	0.1823		0.1887
0.0166	-1.46	1.46	0.3784		0.1737
0.02	-1.3	1.30	0.2624		0.1581
0.0233	-1.33	1.33	0.2852		0.1431
0.0266	-1.28	1.28	0.2469		0.1280
0.03	-1.26	1.26	0.2311		0.1125
0.0333	-1.23	1.23	0.2070		0.0974
0.05	-1.12	1.12	0.1133		0.0211
0.0666	-1.03	1.03	0.0296		-0.0547
0.0833	-0.94	0.94	-0.0619		-0.1310
0.1	-0.86	0.86	-0.1508		-0.2073
0.1166	-0.8	0.80	-0.2231		-0.2831
0.1333	-0.73	0.73	-0.3147		-0.3594
0.15	-0.67	0.67	-0.4005		-0.4357
0.1666	-0.62	0.62	-0.4780		-0.5116
0.1833	-0.57	0.57	-0.5621		-0.5878

0.2	-0.53	0.53	-0.6349		-0.6641
0.2166	-0.49	0.49	-0.7133		-0.7400
0.2333	-0.45	0.45	-0.7985		-0.8162
0.25	-0.41	0.41	-0.8916		-0.8925
0.2666	-0.38	0.38	-0.9676		-0.9684
0.2833	-0.35	0.35	-1.0498		-1.0447
0.3	-0.33	0.33	-1.1087	B	-1.1209
0.3166	-0.3	0.30	-1.2040		-1.1968
0.3333	-0.28	0.28	-1.2730		-1.2731
0.4167	-0.19	0.19	-1.6607		-1.6540
0.5	-0.13	0.13	-2.0402		-2.0346
0.5833	-0.09	0.09	-2.4079	E	-2.4151
0.6667	-0.06	0.06	-2.8134		-2.7961
0.75	-0.05	0.05	-2.9957		-3.1766
0.8333	-0.03	0.03	-3.5066		-3.5571
0.9167	-0.02	0.02	-3.9120		-3.9381
1	-0.02	0.02	-3.9120		-4.3186
1.0833	-0.01	0.01	-4.6052		-4.6992
1.1667	-0.01	0.01	-4.6052		-5.0801
1.25	-0.01	0.01	-4.6052		-5.4607
1.3333	0	0.00	ERR		-5.8412
1.4166	0	0.00	ERR		-6.2217
1.5	0	0.00	ERR		-6.6027
1.5833	0	0.00	ERR		-6.9832
1.6667	0	0.00	ERR		-7.3642
1.75	0	0.00	ERR		-7.7447
1.8333	0	0.00	ERR		-8.1253
1.9167	0	0.00	ERR		-8.5063
2	0	0.00	ERR		-8.8868
2.5	0	0.00	ERR		-11.1708
3	0	0.00	ERR		-13.4549
3.5	0	0.00	ERR		-15.7390
4	0	0.00	ERR		-18.0231
4.5	0	0.00	ERR		-20.3071
5	0	0.00	ERR		-22.5912
5.5	0	0.00	ERR		-24.8753
6	0	0.00	ERR		-27.1593
6.5	0	0.00	ERR		-29.4434
7	0	0.00	ERR		-31.7275
7.5	0	0.00	ERR		-34.0115
8	0	0.00	ERR		-36.2956
8.5	0	0.00	ERR		-38.5797
9	0	0.00	ERR		-40.8637
9.5	0	0.00	ERR		-43.1478
10	0	0.00	ERR		-45.4319
12	0	0.00	ERR		-54.5682

ROSEHILL SLUG TEST

MW-03-01 Rising Head Test 1



(First rising head test)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-03-02
Test by:	D.Berler	Date:	11/01/91
Analysis:	K.Arena	Date:	12/03/91

USER INPUT DATA		WORKSHEET			
	1.3		A=	3.0	3.0
Aquifer Thickness=	44.68	FIGURES	B =	0.46	0.46
Exposed Len.(Le) =	10		C =	2.7	2.7
Well Length (Lw) =	43.03	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.208
Well Radius (Rw) =	0.208	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6812	1.6812
Slug Volume =	0.025	ln(Re/Rw)		3.4758	3.4758
Static Level =	1.72	Max. Y(t)		2.95	
Offset time =	0.0033	Regr. Y(0)		1.52	
Shape Factor =	16.2	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	16.2				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	3.7E-03	7.3E-03	5.35
Bouwer & Rice - estimated porosity	3.7E-03	7.3E-03	5.35
Bouwer & Rice - estimated Rw	3.7E-03	7.3E-03	5.35
Hvorslev - user porosity and Rw	4.1E-03	8.2E-03	5.96
Hvorslev - estimated porosity	4.1E-03	8.2E-03	5.96
Hvorslev - estimated Rw	4.1E-03	8.2E-03	5.96

Regression Output:

Constant	0.427261
Std Err of Y Est	0.017968
R Squared	0.998881
No. of Observations	6
Degrees of Freedom	4

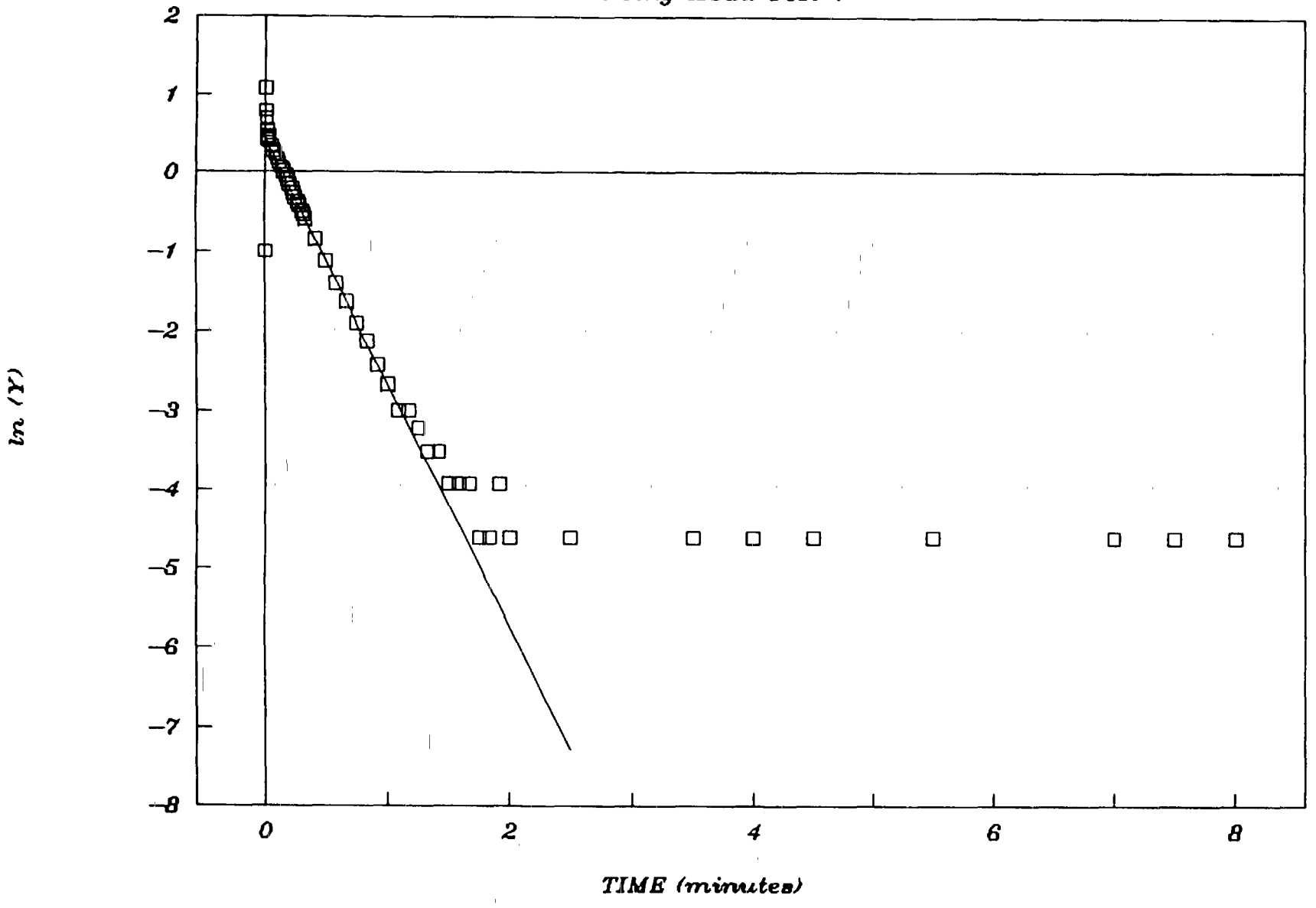
X Coefficient(s)	-3.08077
Std Err of Coef.	0.051540

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.37	0.37	-0.9943		0.4273
0.0033	-2.95	2.95	1.0818		0.4171
0.0066	-2.2	2.20	0.7885		0.4069
0.0099	-1.97	1.97	0.6780		0.3968
0.0133	-1.7	1.70	0.5306		0.3863
0.0166	-1.52	1.52	0.4187		0.3761
0.02	-1.57	1.57	0.4511		0.3656
0.0233	-1.59	1.59	0.4637		0.3555
0.0266	-1.55	1.55	0.4383		0.3453
0.03	-1.51	1.51	0.4121		0.3348
0.0333	-1.5	1.50	0.4055		0.3247
0.05	-1.41	1.41	0.3436		0.2732
0.0666	-1.33	1.33	0.2852		0.2221
0.0833	-1.26	1.26	0.2311		0.1706
0.1	-1.19	1.19	0.1740		0.1192
0.1166	-1.13	1.13	0.1222		0.0680
0.1333	-1.07	1.07	0.0677		0.0166
0.15	-1.02	1.02	0.0198		-0.0349
0.1666	-0.96	0.96	-0.0408		-0.0860
0.1833	-0.91	0.91	-0.0943		-0.1374

0.2	-0.86	0.86	-0.1508		-0.1889
0.2166	-0.81	0.81	-0.2107		-0.2400
0.2333	-0.77	0.77	-0.2614		-0.2915
0.25	-0.73	0.73	-0.3147		-0.3429
0.2666	-0.69	0.69	-0.3711		-0.3941
0.2833	-0.66	0.66	-0.4155		-0.4455
0.3	-0.62	0.62	-0.4780		-0.4970
0.3166	-0.59	0.59	-0.5276		-0.5481
0.3333	-0.56	0.56	-0.5798		-0.5996
0.4167	-0.43	0.43	-0.8440		-0.8565
0.5	-0.33	0.33	-1.1087	B	-1.1131
0.5833	-0.25	0.25	-1.3863		-1.3698
0.6667	-0.2	0.20	-1.6094		-1.6267
0.75	-0.15	0.15	-1.8971		-1.8833
0.8333	-0.12	0.12	-2.1203		-2.1399
0.9167	-0.09	0.09	-2.4079	E	-2.3969
1	-0.07	0.07	-2.6593		-2.6535
1.0833	-0.05	0.05	-2.9957		-2.9101
1.1667	-0.05	0.05	-2.9957		-3.1671
1.25	-0.04	0.04	-3.2189		-3.4237
1.3333	-0.03	0.03	-3.5066		-3.6803
1.4166	-0.03	0.03	-3.5066		-3.9370
1.5	-0.02	0.02	-3.9120		-4.1939
1.5833	-0.02	0.02	-3.9120		-4.4505
1.6667	-0.02	0.02	-3.9120		-4.7075
1.75	-0.01	0.01	-4.6052		-4.9641
1.8333	-0.01	0.01	-4.6052		-5.2207
1.9167	-0.02	0.02	-3.9120		-5.4777
2	-0.01	0.01	-4.6052		-5.7343
2.5	-0.01	0.01	-4.6052		-7.2747
3	0	0.00	ERR		-8.8151
3.5	-0.01	0.01	-4.6052		-10.3554
4	-0.01	0.01	-4.6052		-11.8958
4.5	-0.01	0.01	-4.6052		-13.4362
5	0	0.00	ERR		-14.9766
5.5	-0.01	0.01	-4.6052		-16.5170
6	0	0.00	ERR		-18.0574
6.5	0	0.00	ERR		-19.5978
7	-0.01	0.01	-4.6052		-21.1382
7.5	-0.01	0.01	-4.6052		-22.6785
8	-0.01	0.01	-4.6052		-24.2189

ROSEHILL SLUG TEST

MW-03-02 Rising Head Test 1



(First Rising Head Test)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA — Revised 11/05/91
Site: Rosehill — Well ID: MW-03-03
Test by: D.Berler — Date: 11/01/91
Analysis: K.Arena — Date: 12/03/91

USER INPUT DATA		WORKSHEET FIGURES			
Aquifer Thickness=	142.57		A=	7.3	7.3
Exposed Len.(Le) =	90.5		B =	1.68	1.68
Well Length (Lw) =	142.57		C =	8.9	8.9
Casing Radius(Rc)=	0.250	R(eq) =	0.2500	0.2500	0.2500
Well Radius (Rw) =	0.250	Est. Rw			0.250
Sandpack Porosity=	0.270	Est. n		NA	
Slug Volume =	0.153	log(Le/Rw)		2.5587	2.5587
Static Level =	1.94	ln(Re/Rw)		5.0518	5.0518
Offset time =	0.0066	Max. Y(t)		1.2	
Shape Factor =	96.5	Regr. Y(0)		0.73	
(F from est. Rw)	96.5	Casing Y(0)		0.78	UNDRAINED

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.4E-03	2.7E-03	2.00
Bouwer & Rice - estimated porosity	1.4E-03	2.7E-03	2.00
Bouwer & Rice - estimated Rw	1.4E-03	2.7E-03	2.00
Hvorslev - user porosity and Rw	1.6E-03	3.2E-03	2.33
Hvorslev - estimated porosity	1.6E-03	3.2E-03	2.33
Hvorslev - estimated Rw	1.6E-03	3.2E-03	2.33

Regression Output:

Constant	-0.31428
Std Err of Y Est	0.005783
R Squared	0.998642
No. of Observations	7
Degrees of Freedom	5

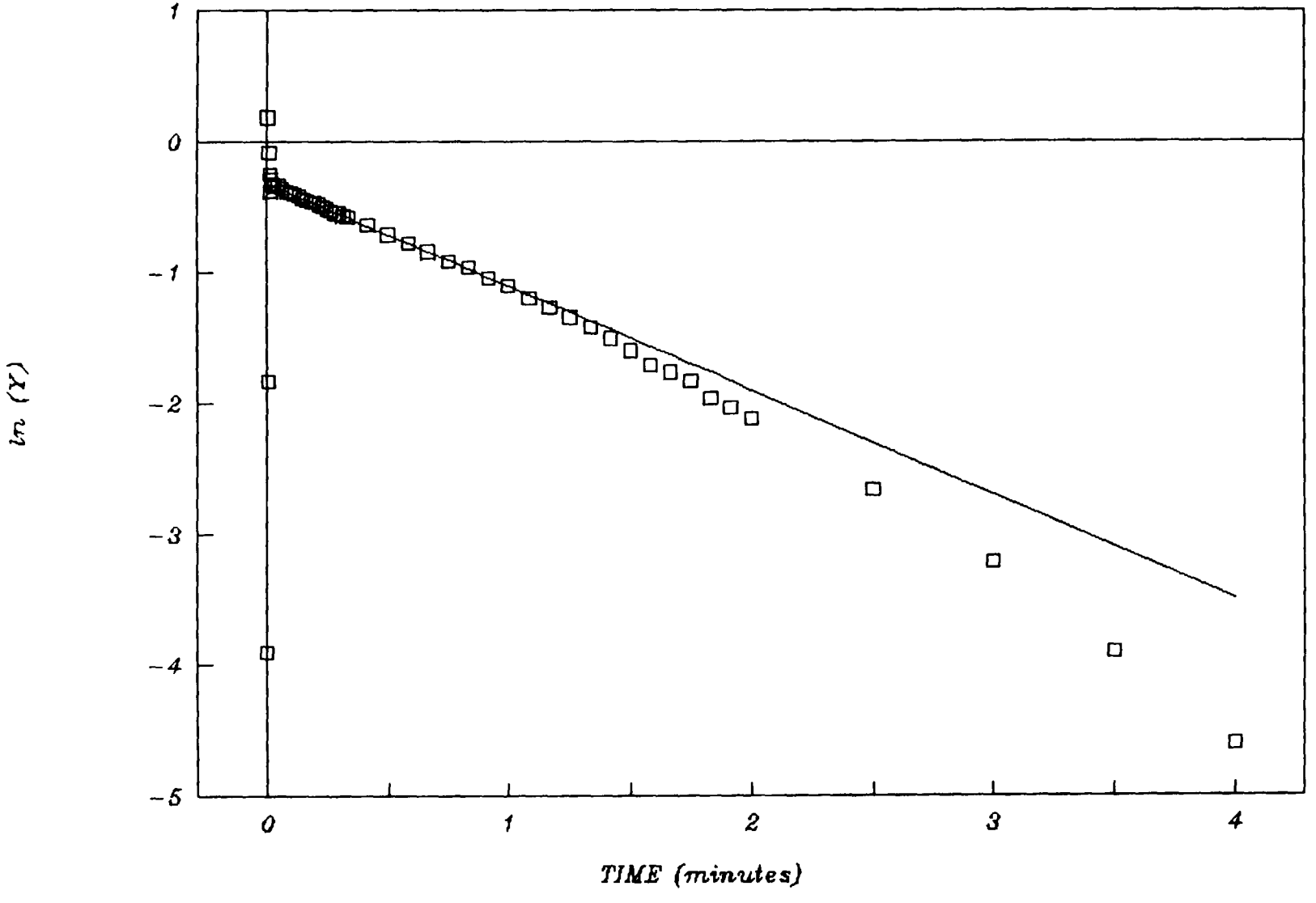
X Coefficient(s)	-0.79546
Std Err of Coef.	0.013115

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.02	0.02	-3.9120		-0.3143
0.0033	-1.2	1.20	0.1823		-0.3169
0.0066	0.16	0.16	-1.8326		-0.3195
0.0099	-0.92	0.92	-0.0834		-0.3222
0.0133	-0.78	0.78	-0.2485		-0.3249
0.0166	-0.69	0.69	-0.3711		-0.3275
0.02	-0.75	0.75	-0.2877		-0.3302
0.0233	-0.73	0.73	-0.3147		-0.3328
0.0266	-0.72	0.72	-0.3285		-0.3354
0.03	-0.71	0.71	-0.3425		-0.3381
0.0333	-0.72	0.72	-0.3285		-0.3408
0.05	-0.72	0.72	-0.3285		-0.3541
0.0666	-0.7	0.70	-0.3567		-0.3673
0.0833	-0.69	0.69	-0.3711		-0.3805
0.1	-0.68	0.68	-0.3857		-0.3938
0.1166	-0.67	0.67	-0.4005		-0.4070
0.1333	-0.66	0.66	-0.4155		-0.4203
0.15	-0.65	0.65	-0.4308		-0.4336
0.1666	-0.64	0.64	-0.4463		-0.4468
0.1833	-0.63	0.63	-0.4620		-0.4601

0.2	-0.63	0.63	-0.4620		-0.4734
0.2166	-0.62	0.62	-0.4780		-0.4866
0.2333	-0.61	0.61	-0.4943		-0.4999
0.25	-0.6	0.60	-0.5108		-0.5132
0.2666	-0.59	0.59	-0.5276		-0.5264
0.2833	-0.58	0.58	-0.5447		-0.5396
0.3	-0.58	0.58	-0.5447		-0.5529
0.3166	-0.57	0.57	-0.5621		-0.5661
0.3333	-0.56	0.56	-0.5798		-0.5794
0.4167	-0.53	0.53	-0.6349		-0.6458
0.5	-0.49	0.49	-0.7133	B	-0.7120
0.5833	-0.46	0.46	-0.7765		-0.7783
0.6667	-0.43	0.43	-0.8440		-0.8446
0.75	-0.4	0.40	-0.9163		-0.9109
0.8333	-0.38	0.38	-0.9676		-0.9771
0.9167	-0.35	0.35	-1.0498		-1.0435
1	-0.33	0.33	-1.1087	E	-1.1098
1.0833	-0.3	0.30	-1.2040		-1.1760
1.1667	-0.28	0.28	-1.2730		-1.2424
1.25	-0.26	0.26	-1.3471		-1.3086
1.3333	-0.24	0.24	-1.4271		-1.3749
1.4166	-0.22	0.22	-1.5141		-1.4411
1.5	-0.2	0.20	-1.6094		-1.5075
1.5833	-0.18	0.18	-1.7148		-1.5738
1.6667	-0.17	0.17	-1.7720		-1.6401
1.75	-0.16	0.16	-1.8326		-1.7064
1.8333	-0.14	0.14	-1.9661		-1.7726
1.9167	-0.13	0.13	-2.0402		-1.8390
2	-0.12	0.12	-2.1203		-1.9052
2.5	-0.07	0.07	-2.6593		-2.3030
3	-0.04	0.04	-3.2189		-2.7007
3.5	-0.02	0.02	-3.9120		-3.0984
4	-0.01	0.01	-4.6052		-3.4962
4.5	-0.01	0.01	-4.6052		-3.8939
5	0	0.00	ERR		-4.2916
5.5	0	0.00	ERR		-4.6894
6	0	0.00	ERR		-5.0871
6.5	0	0.00	ERR		-5.4848
7	0	0.00	ERR		-5.8826
7.5	0	0.00	ERR		-6.2803
8	0	0.00	ERR		-6.6780
8.5	0	0.00	ERR		-7.0758
9	0	0.00	ERR		-7.4735
9.5	0	0.00	ERR		-7.8712
10	0	0.00	ERR		-8.2690
12	0	0.00	ERR		-9.8599

ROSEHILL SLUG TEST

MW-03-03 Rising Head Test



(Rising Head test 1 for MW-04-01)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-04-01
Test by: K.Arena Date: 10/30/91
Analysis:K.Arena Date: 11/26/91

USER INPUT DATA		WORKSHEET	A=	2.4	2.4
Aquifer Thickness=	13.37	FIGURES	B =	0.38	0.38
Exposed Len.(Le) =	10		C =	2.1	2.1
Well Length (Lw) =	10.05	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.333
Well Radius (Rw) =	0.333	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.4771	1.4771
Slug Volume =	0.025	ln(Re/Rw)		2.3194	2.3194
Static Level =	4.80	Max. Y(t)		1.21	
Offset time =	0.0833	Regr. Y(0)		1.19	
Shape Factor =	18.5	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	18.5				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.2E-03	2.4E-03	1.76
Bouwer & Rice - estimated porosity	1.2E-03	2.4E-03	1.76
Bouwer & Rice - estimated Rw	1.2E-03	2.4E-03	1.76
Hvorslev - user porosity and Rw	1.8E-03	3.5E-03	2.57
Hvorslev - estimated porosity	1.8E-03	3.5E-03	2.57
Hvorslev - estimated Rw	1.8E-03	3.5E-03	2.57

Regression Output:

Constant	0.296275
Std Err of Y Est	0.004530
R Squared	0.997178
No. of Observations	11
Degrees of Freedom	9

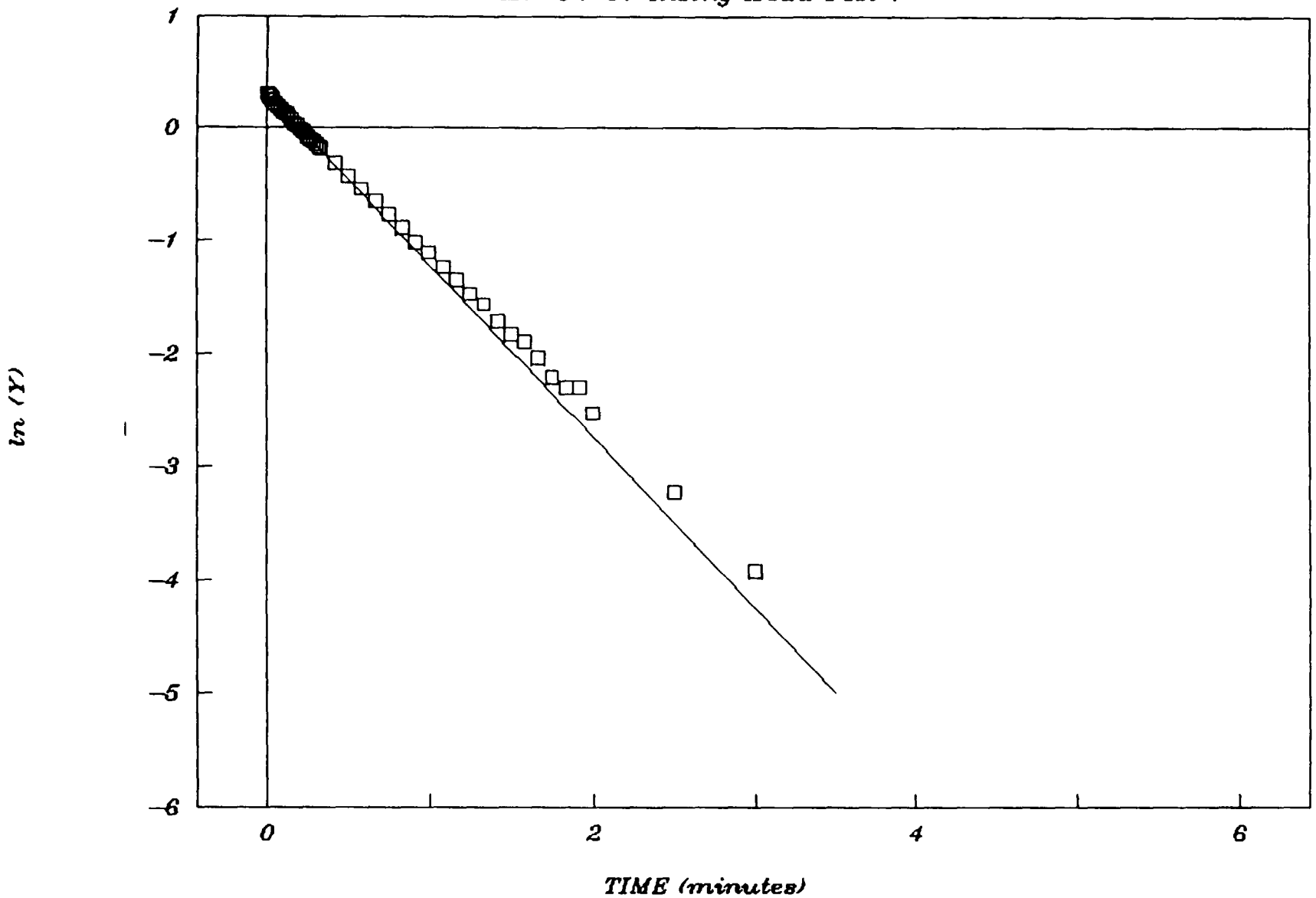
X Coefficient(s) -1.51390
Std Err of Coef. 0.026842

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.36	1.36	0.3075		0.2963
0.0033	-1.36	1.36	0.3075		0.2913
0.0066	-1.35	1.35	0.3001		0.2863
0.0099	-1.34	1.34	0.2927		0.2813
0.0133	-1.33	1.33	0.2852		0.2761
0.0166	-1.32	1.32	0.2776		0.2711
0.02	-1.32	1.32	0.2776		0.2660
0.0233	-1.3	1.30	0.2624		0.2610
0.0266	-1.3	1.30	0.2624		0.2560
0.03	-1.29	1.29	0.2546	B	0.2509
0.0333	-1.28	1.28	0.2469		0.2459
0.05	-1.25	1.25	0.2231		0.2206
0.0666	-1.21	1.21	0.1906		0.1954
0.0833	-1.18	1.18	0.1655		0.1702
0.1	-1.15	1.15	0.1398		0.1449
0.1166	-1.13	1.13	0.1222		0.1198
0.1333	-1.1	1.10	0.0953		0.0945
0.15	-1.08	1.08	0.0770		0.0692
0.1666	-1.04	1.04	0.0392		0.0441
0.1833	-1.02	1.02	0.0198	E	0.0188

0.2	-0.99	0.99	-0.0101	-0.0065
0.2166	-0.97	0.97	-0.0305	-0.0316
0.2333	-0.95	0.95	-0.0513	-0.0569
0.25	-0.92	0.92	-0.0834	-0.0822
0.2666	-0.9	0.90	-0.1054	-0.1073
0.2833	-0.88	0.88	-0.1278	-0.1326
0.3	-0.86	0.86	-0.1508	-0.1579
0.3166	-0.84	0.84	-0.1744	-0.1830
0.3333	-0.83	0.83	-0.1863	-0.2083
0.4167	-0.73	0.73	-0.3147	-0.3346
0.5	-0.65	0.65	-0.4308	-0.4607
0.5833	-0.58	0.58	-0.5447	-0.5868
0.6667	-0.52	0.52	-0.6539	-0.7130
0.75	-0.46	0.46	-0.7765	-0.8392
0.8333	-0.41	0.41	-0.8916	-0.9653
0.9167	-0.36	0.36	-1.0217	-1.0915
1	-0.33	0.33	-1.1087	-1.2176
1.0833	-0.29	0.29	-1.2379	-1.3437
1.1667	-0.26	0.26	-1.3471	-1.4700
1.25	-0.23	0.23	-1.4697	-1.5961
1.3333	-0.21	0.21	-1.5606	-1.7222
1.4166	-0.18	0.18	-1.7148	-1.8483
1.5	-0.16	0.16	-1.8326	-1.9746
1.5833	-0.15	0.15	-1.8971	-2.1007
1.6667	-0.13	0.13	-2.0402	-2.2269
1.75	-0.11	0.11	-2.2073	-2.3531
1.8333	-0.1	0.10	-2.3026	-2.4792
1.9167	-0.1	0.10	-2.3026	-2.6054
2	-0.08	0.08	-2.5257	-2.7315
2.5	-0.04	0.04	-3.2189	-3.4885
3	-0.02	0.02	-3.9120	-4.2454
3.5	0	0.00	ERR	-5.0024
4	0	0.00	ERR	-5.7593
4.5	0	0.00	ERR	-6.5163
5	0	0.00	ERR	-7.2732
5.5	0	0.00	ERR	-8.0302

ROSEHILL SLUG TEST

MW-04-01 Rising Head Test 1



(Rising head test 2 on MW-04-02)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-04-02
Test by: K.Arena Date: 10/30/91
Analysis:K.Arena Date: 11/26/91

USER INPUT DATA		WORKSHEET	A=	2.4	2.4
Aquifer Thickness=	33.37	FIGURES	B =	0.38	0.38
Exposed Len.(Le) =	10		C =	2.1	2.1
Well Length (Lw) =	29.68	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.333
Well Radius (Rw) =	0.333	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.4771	1.4771
Slug Volume =	0.025	ln(Re/Rw)		2.8202	2.8202
Static Level =	4.69	Max. Y(t)		0.81	
Offset time =	0	Regr. Y(0)		0.81	
Shape Factor =	18.5	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	18.5				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	2.6E-02	5.1E-02	37.48
Bouwer & Rice - estimated porosity	2.6E-02	5.1E-02	37.48
Bouwer & Rice - estimated Rw	2.6E-02	5.1E-02	37.48
Hvorslev - user porosity and Rw	3.1E-02	6.2E-02	45.20
Hvorslev - estimated porosity	3.1E-02	6.2E-02	45.20
Hvorslev - estimated Rw	3.1E-02	6.2E-02	45.20

Regression Output:

Constant	-0.21175
Std Err of Y Est	0.002584
R Squared	0.999804
No. of Observations	6
Degrees of Freedom	4

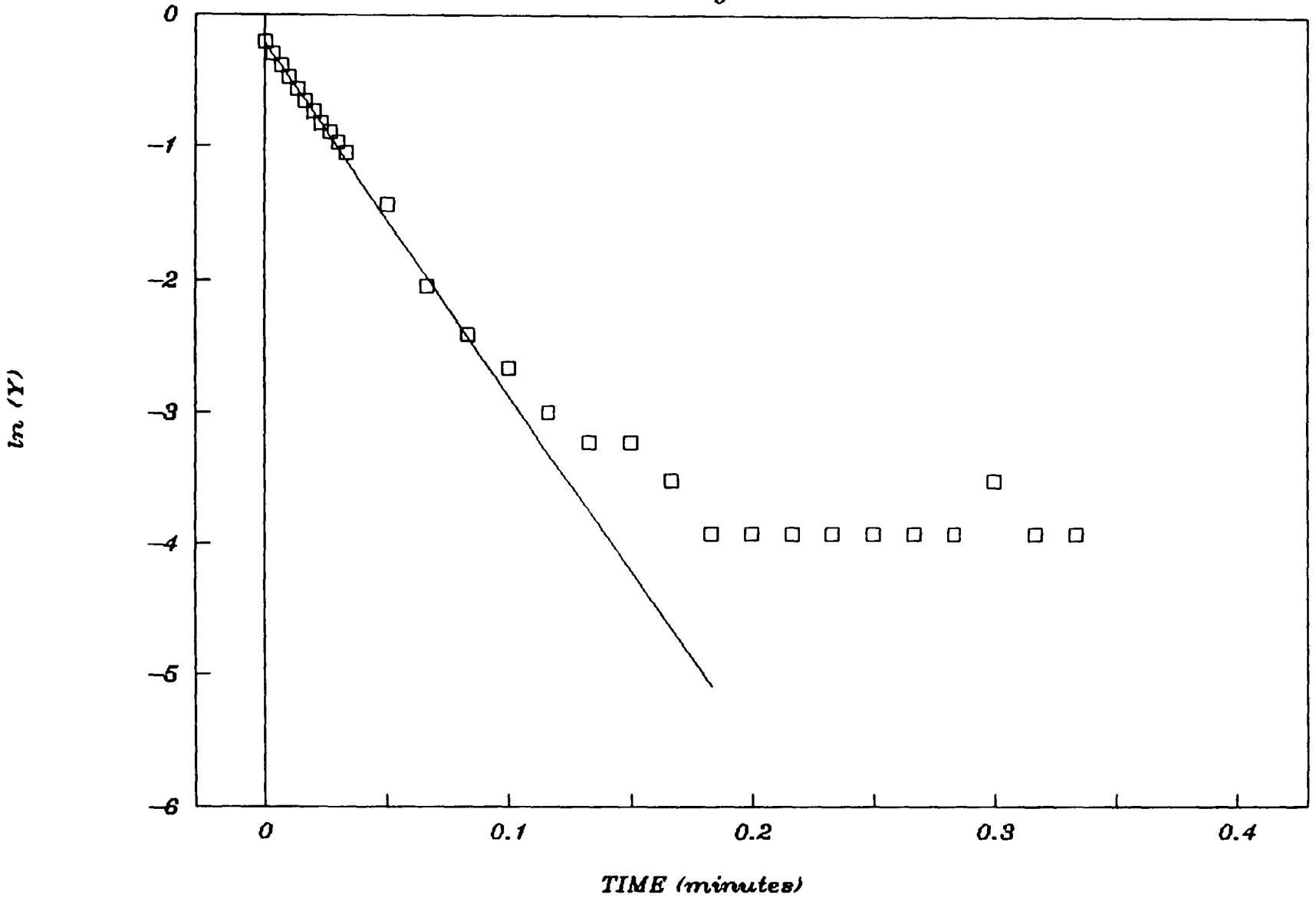
X Coefficient(s)	-26.5804
Std Err of Coef.	0.185941

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.81	0.81	-0.2107	b	-0.2118
0.0033	-0.74	0.74	-0.3011		-0.2995
0.0066	-0.68	0.68	-0.3857		-0.3872
0.0099	-0.62	0.62	-0.4780		-0.4749
0.0133	-0.57	0.57	-0.5621		-0.5653
0.0166	-0.52	0.52	-0.6539	e	-0.6530
0.02	-0.48	0.48	-0.7340		-0.7434
0.0233	-0.44	0.44	-0.8210		-0.8311
0.0266	-0.41	0.41	-0.8916		-0.9188
0.03	-0.38	0.38	-0.9676		-1.0092
0.0333	-0.35	0.35	-1.0498		-1.0969
0.05	-0.24	0.24	-1.4271		-1.5408
0.0666	-0.13	0.13	-2.0402		-1.9820
0.0833	-0.09	0.09	-2.4079		-2.4259
0.1	-0.07	0.07	-2.6593		-2.8698
0.1166	-0.05	0.05	-2.9957		-3.3110
0.1333	-0.04	0.04	-3.2189		-3.7549
0.15	-0.04	0.04	-3.2189		-4.1988
0.1666	-0.03	0.03	-3.5066		-4.6401
0.1833	-0.02	0.02	-3.9120		-5.0840

0.2	-0.02	0.02	-3.9120	-5.5278
0.2166	-0.02	0.02	-3.9120	-5.9691
0.2333	-0.02	0.02	-3.9120	-6.4130
0.25	-0.02	0.02	-3.9120	-6.8569
0.2666	-0.02	0.02	-3.9120	-7.2981
0.2833	-0.02	0.02	-3.9120	-7.7420
0.3	-0.03	0.03	-3.5066	-8.1859
0.3166	-0.02	0.02	-3.9120	-8.6271
0.3333	-0.02	0.02	-3.9120	-9.0710
0.4167	-0.02	0.02	-3.9120	-11.2878
0.5	-0.02	0.02	-3.9120	-13.5020
0.5833	-0.02	0.02	-3.9120	-15.7161
0.6667	-0.01	0.01	-4.6052	-17.9329
0.75	-0.01	0.01	-4.6052	-20.1471
0.8333	-0.02	0.02	-3.9120	-22.3613
0.9167	-0.02	0.02	-3.9120	-24.5781
1	-0.02	0.02	-3.9120	-26.7922
1.0833	-0.02	0.02	-3.9120	-29.0064
1.1667	-0.02	0.02	-3.9120	-31.2232
1.25	-0.02	0.02	-3.9120	-33.4373
1.3333	-0.02	0.02	-3.9120	-35.6515
1.4166	-0.02	0.02	-3.9120	-37.8656
1.5	-0.02	0.02	-3.9120	-40.0824
1.5833	-0.02	0.02	-3.9120	-42.2966
1.6667	-0.02	0.02	-3.9120	-44.5134
1.75	-0.02	0.02	-3.9120	-46.7276
1.8333	-0.02	0.02	-3.9120	-48.9417
1.9167	-0.02	0.02	-3.9120	-51.1585
2	-0.02	0.02	-3.9120	-53.3727
2.5	-0.02	0.02	-3.9120	-66.6629
3	-0.02	0.02	-3.9120	-79.9531
3.5	-0.02	0.02	-3.9120	-93.2434
4	-0.03	0.03	-3.5066	-106.5336
4.5	-0.01	0.01	-4.6052	-119.8238
5	-0.01	0.01	-4.6052	-133.1141

ROSEHILL SLUG TEST

MW-04-02 Rising Head Test 2



Rising Head Test 1
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-04-03
Test by:	K.Arena	Date:	11/01/91
Analysis:	K.Arena	Date:	12/19/91

USER INPUT DATA		WORKSHEET	A=	7.4	7.4
Aquifer Thickness=	300	FIGURES	B =	1.73	1.73
Exposed Len.(Le) =	94.7		C =	9.1	9.1
Well Length (Lw) =	129.67	R(eq) =	0.2500	0.2500	0.2500
Casing Radius(Rc)=	0.250	Est. Rw			0.250
Well Radius (Rw) =	0.250	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		2.5784	2.5784
Slug Volume =	0.153	ln(Re/Rw)		4.4901	4.4901
Static Level =	10.33	Max. Y(t)		0.75	
Offset time =	3	Regr. Y(0)		0.75	
Shape Factor =	100.2	Casing Y(0)		0.78	UNDRAINED
(F from est. Rw)	100.2				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	4.0E-05	7.9E-05	0.06
Bouwer & Rice - estimated porosity	4.0E-05	7.9E-05	0.06
Bouwer & Rice - estimated Rw	4.0E-05	7.9E-05	0.06
Hvorslev - user porosity and Rw	5.3E-05	1.0E-04	0.08
Hvorslev - estimated porosity	5.3E-05	1.0E-04	0.08
Hvorslev - estimated Rw	5.3E-05	1.0E-04	0.08

Regression Output:

Constant	-0.21110
Std Err of Y Est	0.011034
R Squared	0.75
No. of Observations	3
Degrees of Freedom	1

X Coefficient(s)	-0.02702
Std Err of Coef.	0.015605

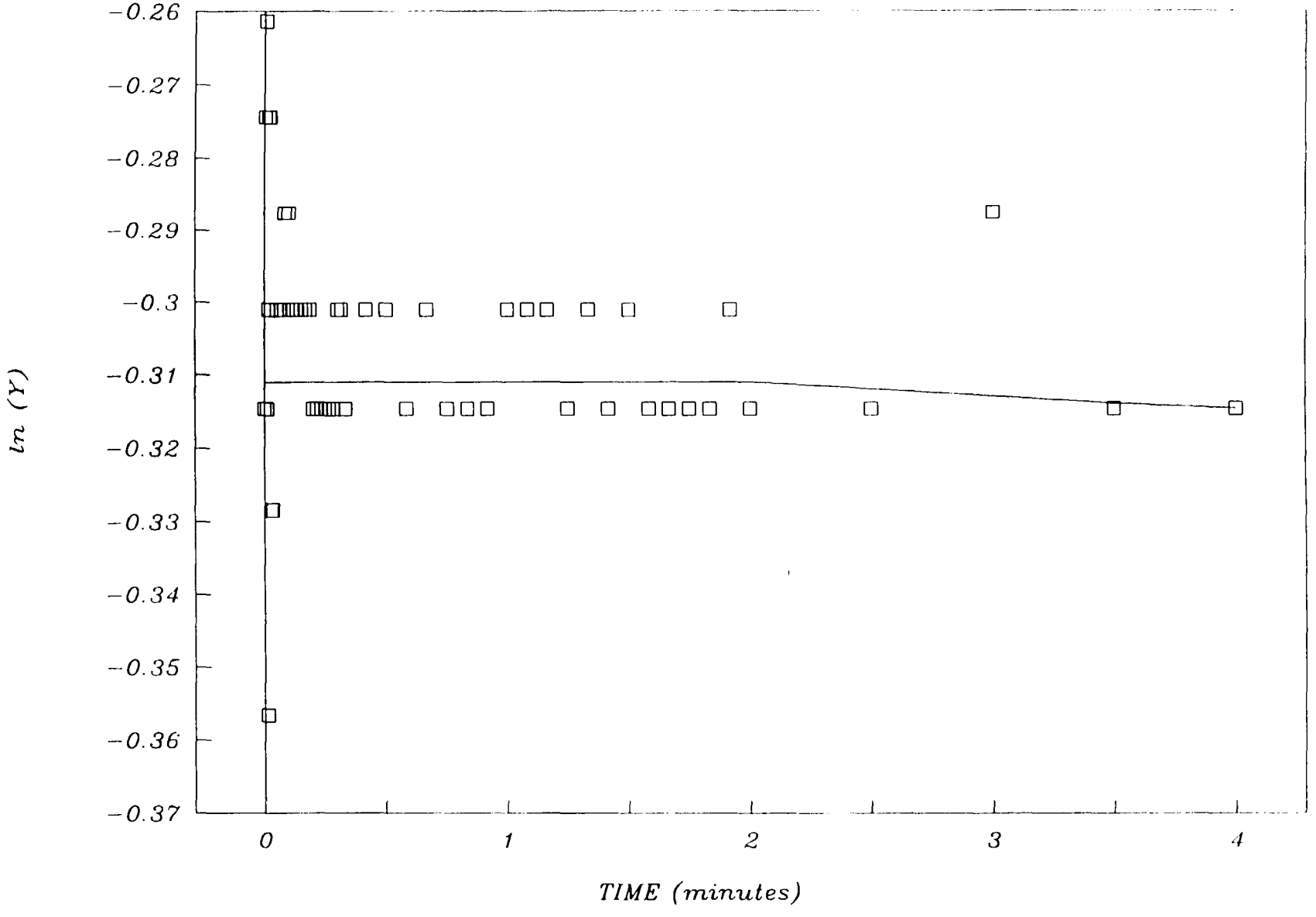
Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY	
0	-0.73	0.73	-0.3147		-0.2111	-0.311
0.0033	-0.76	0.76	-0.2744		-0.2112	-0.311
0.0066	-0.77	0.77	-0.2614		-0.2113	-0.311
0.0099	-0.73	0.73	-0.3147		-0.2114	-0.311
0.0133	-0.7	0.70	-0.3567		-0.2115	-0.311
0.0166	-0.74	0.74	-0.3011		-0.2115	-0.311
0.02	-0.76	0.76	-0.2744		-0.2116	-0.311
0.0233	-0.76	0.76	-0.2744		-0.2117	-0.311
0.0266	-0.74	0.74	-0.3011		-0.2118	-0.311
0.03	-0.72	0.72	-0.3285		-0.2119	-0.311
0.0333	-0.72	0.72	-0.3285		-0.2120	-0.311
0.05	-0.74	0.74	-0.3011		-0.2125	-0.311
0.0666	-0.74	0.74	-0.3011		-0.2129	-0.311
0.0833	-0.75	0.75	-0.2877		-0.2134	-0.311
0.1	-0.75	0.75	-0.2877		-0.2138	-0.311
0.1166	-0.74	0.74	-0.3011		-0.2143	-0.311
0.1333	-0.74	0.74	-0.3011		-0.2147	-0.311
0.15	-0.74	0.74	-0.3011		-0.2152	-0.311
0.1666	-0.74	0.74	-0.3011		-0.2156	-0.311
0.1833	-0.74	0.74	-0.3011		-0.2161	-0.311

0.2	-0.73	0.73	-0.3147		-0.2165	-0.311
0.2166	-0.73	0.73	-0.3147		-0.2170	-0.311
0.2333	-0.73	0.73	-0.3147		-0.2174	-0.311
0.25	-0.73	0.73	-0.3147		-0.2179	-0.311
0.2666	-0.73	0.73	-0.3147		-0.2183	-0.311
0.2833	-0.73	0.73	-0.3147		-0.2188	-0.311
0.3	-0.74	0.74	-0.3011		-0.2192	-0.311
0.3166	-0.74	0.74	-0.3011		-0.2197	-0.311
0.3333	-0.73	0.73	-0.3147		-0.2201	-0.311
0.4167	-0.74	0.74	-0.3011		-0.2224	-0.311
0.5	-0.74	0.74	-0.3011		-0.2246	-0.311
0.5833	-0.73	0.73	-0.3147		-0.2269	-0.311
0.6667	-0.74	0.74	-0.3011		-0.2291	-0.311
0.75	-0.73	0.73	-0.3147		-0.2314	-0.311
0.8333	-0.73	0.73	-0.3147		-0.2336	-0.311
0.9167	-0.73	0.73	-0.3147		-0.2359	-0.311
1	-0.74	0.74	-0.3011		-0.2381	-0.311
1.0833	-0.74	0.74	-0.3011		-0.2404	-0.311
1.1667	-0.74	0.74	-0.3011		-0.2426	-0.311
1.25	-0.73	0.73	-0.3147		-0.2449	-0.311
1.3333	-0.74	0.74	-0.3011		-0.2471	-0.311
1.4166	-0.73	0.73	-0.3147		-0.2494	-0.311
1.5	-0.74	0.74	-0.3011		-0.2516	-0.311
1.5833	-0.73	0.73	-0.3147		-0.2539	-0.311
1.6667	-0.73	0.73	-0.3147		-0.2561	-0.311
1.75	-0.73	0.73	-0.3147		-0.2584	-0.311
1.8333	-0.73	0.73	-0.3147		-0.2607	-0.311
1.9167	-0.74	0.74	-0.3011		-0.2629	-0.311
2	-0.73	0.73	-0.3147		-0.2652	-0.311
2.5	-0.73	0.73	-0.3147		-0.2787	-0.312
3	-0.75	0.75	-0.2877	B2	-0.2922	-0.313
3.5	-0.73	0.73	-0.3147		-0.3057	-0.314
4	-0.73	0.73	-0.3147	E2	-0.3192	-0.3147
4.5	-0.73	0.73	-0.3147		-0.3327	
5	-0.73	0.73	-0.3147		-0.3462	
5.5	-0.73	0.73	-0.3147		-0.3598	
6	-0.73	0.73	-0.3147		-0.3733	
6.5	-0.73	0.73	-0.3147		-0.3868	
7	-0.73	0.73	-0.3147		-0.4003	
7.5	-0.73	0.73	-0.3147		-0.4138	
8	-0.73	0.73	-0.3147		-0.4273	
8.5	-0.73	0.73	-0.3147		-0.4408	
9	-0.73	0.73	-0.3147		-0.4544	
9.5	-0.73	0.73	-0.3147		-0.4679	
10	-0.73	0.73	-0.3147		-0.4814	
12	-0.73	0.73	-0.3147		-0.5354	
14	-0.72	0.72	-0.3285		-0.5895	
16	-0.72	0.72	-0.3285		-0.6436	
18	-0.72	0.72	-0.3285		-0.6976	
20	-0.73	0.73	-0.3147		-0.7517	
22	-0.73	0.73	-0.3147		-0.8057	
24	-0.72	0.72	-0.3285		-0.8598	
26	-0.73	0.73	-0.3147		-0.9138	
28	-0.72	0.72	-0.3285		-0.9679	
30	-0.72	0.72	-0.3285		-1.0220	
32	-0.72	0.72	-0.3285		-1.0760	
34	-0.73	0.73	-0.3147		-1.1301	
36	-0.72	0.72	-0.3285		-1.1841	
38	0.75	0.75	-0.2877		-1.2382	
40	0.74	0.74	-0.3011		-1.2922	

42	0.75	0.75	-0.2877	-1.3463
44	0.75	0.75	-0.2877	-1.4004
46	0.75	0.75	-0.2877	-1.4544
48	0.75	0.75	-0.2877	-1.5085
50	0.75	0.75	-0.2877	-1.5625
52	0.75	0.75	-0.2877	-1.6166
54	0.76	0.76	-0.2744	-1.6706

ROSEHILL SLUG TEST

MW-04-03 RISING HEAD TEST 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 1 (B1-E1)
Client: EPA Revised 11/05/91
Site: ROSE HILL Well ID: MW-05-01
Test by: DANIEL H. BERLER Date: 10/30/91
Analysis:DANIEL H. BERLER Date: 11/19/91

USER INPUT DATA		WORKSHEET	A=	2.4	2.4
Aquifer Thickness=	23.33	FIGURES	B =		0.38
Exposed Len.(Le) =	10		C =	2.1	2.1
Well Length (Lw) =	11.53	R(eq) =	0.0830	0.0830	0.0830
Casing Radius(Rc)=	0.083	Est. Rw			0.333
Well Radius (Rw) =	0.333	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.4776	1.4776
Slug Volume =	0.025	ln(Re/Rw)		2.5684	2.5684
Static Level =	6.42	Max. Y(t)		1.01	
Offset time =	0.0666	Regr. Y(0)		1.01	
Shape Factor =	18.5	Casing Y(0)		1.16	UNDRAINED
(F from est. Rw)	18.5				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	3.5E-03	6.9E-03	5.03
Bouwer & Rice - estimated porosity	3.5E-03	6.9E-03	5.03
Bouwer & Rice - estimated Rw	3.5E-03	6.9E-03	5.03
Hvorslev - user porosity and Rw	4.6E-03	9.1E-03	6.67
Hvorslev - estimated porosity	4.6E-03	9.1E-03	6.67
Hvorslev - estimated Rw	4.6E-03	9.1E-03	6.67

Regression Output:

Constant	0.269926
Std Err of Y Est	0.006637
R Squared	0.998550
No. of Observations	8
Degrees of Freedom	6

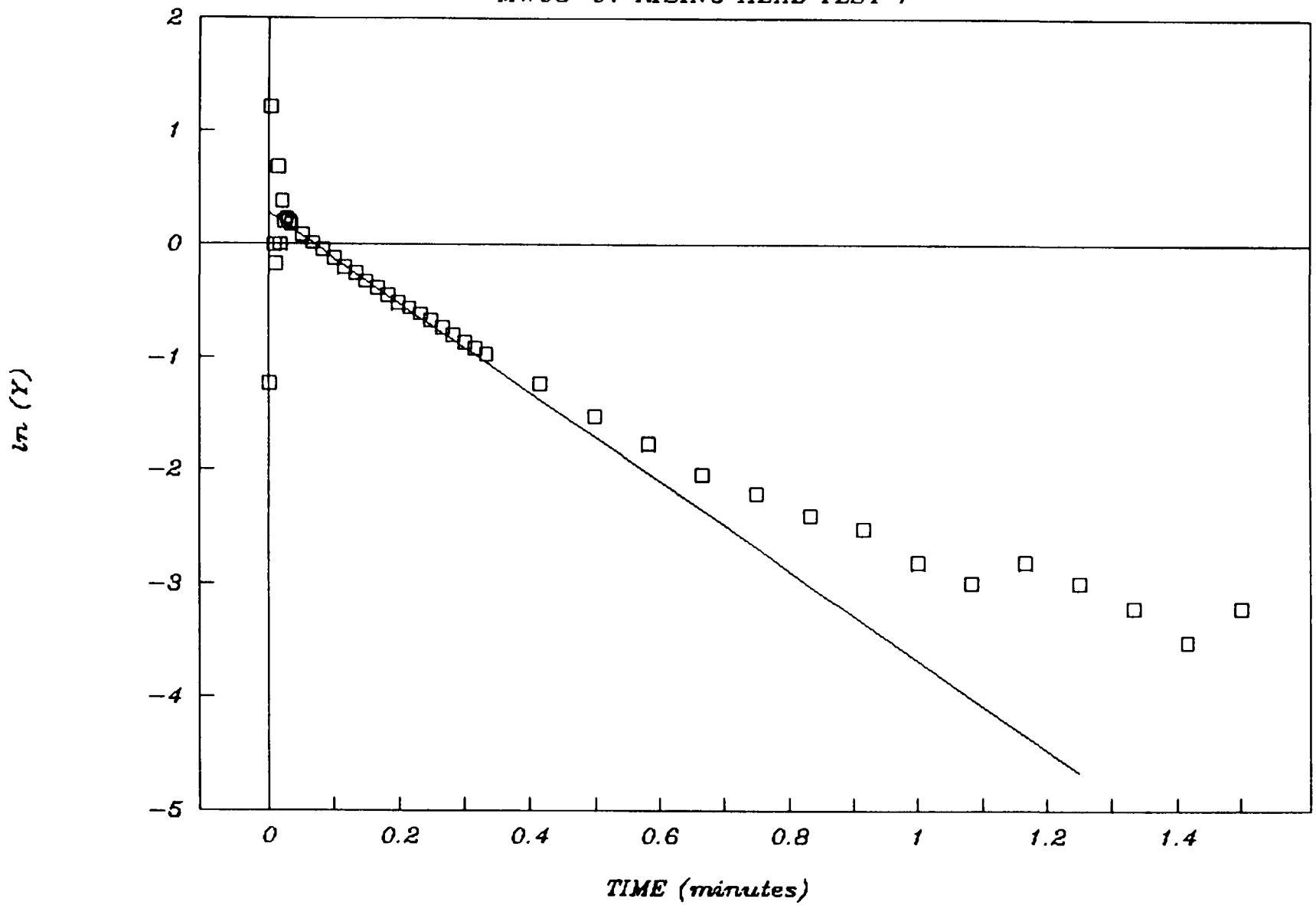
X Coefficient(s) -3.95004
Std Err of Coef. 0.061447

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.29	0.29	-1.23787		0.2699
0.0033	-3.39	3.39	1.220829		0.2569
0.0066	-0.99	0.99	-0.01005		0.2439
0.0099	-0.84	0.84	-0.17435		0.2308
0.0133	-1.99	1.99	0.688134		0.2174
0.0166	-1	1	0		0.2044
0.02	-1.46	1.46	0.378436		0.1909
0.0233	-1.22	1.22	0.198850		0.1779
0.0266	-1.26	1.26	0.231111		0.1649
0.03	-1.22	1.22	0.198850		0.1514
0.0333	-1.19	1.19	0.173953		0.1384
0.05	-1.09	1.09	0.086177		0.0724
0.0666	-1.01	1.01	0.009950	B1	0.0069
0.0833	-0.95	0.95	-0.05129		-0.0591
0.1	-0.88	0.88	-0.12783		-0.1251
0.1166	-0.82	0.82	-0.19845		-0.1906
0.1333	-0.77	0.77	-0.26136		-0.2566
0.15	-0.72	0.72	-0.32850		-0.3226
0.1666	-0.68	0.68	-0.38566		-0.3882
0.1833	-0.64	0.64	-0.44628	E1	-0.4541

0.2	-0.6	0.6	-0.51082	B	-0.5201
0.2166	-0.57	0.57	-0.56211		-0.5857
0.2333	-0.54	0.54	-0.61618		-0.6516
0.25	-0.51	0.51	-0.67334		-0.7176
0.2666	-0.48	0.48	-0.73396		-0.7832
0.2833	-0.45	0.45	-0.79850		-0.8491
0.3	-0.42	0.42	-0.86750		-0.9151
0.3166	-0.4	0.4	-0.91629		-0.9807
0.3333	-0.38	0.38	-0.96758		-1.0466
0.4167	-0.29	0.29	-1.23787		-1.3761
0.5	-0.22	0.22	-1.51412		-1.7051
0.5833	-0.17	0.17	-1.77195	E	-2.0341
0.6667	-0.13	0.13	-2.04022		-2.3636
0.75	-0.11	0.11	-2.20727		-2.6926
0.8333	-0.09	0.09	-2.40794		-3.0216
0.9167	-0.08	0.08	-2.52572		-3.3511
1	-0.06	0.06	-2.81341		-3.6801
1.0833	-0.05	0.05	-2.99573		-4.0092
1.1667	-0.06	0.06	-2.81341		-4.3386
1.25	-0.05	0.05	-2.99573		-4.6676
1.3333	-0.04	0.04	-3.21887		-4.9967
1.4166	-0.03	0.03	-3.50655		-5.3257
1.5	-0.04	0.04	-3.21887		-5.6551
1.5833	-0.04	0.04	-3.21887		-5.9842
1.6667	-0.04	0.04	-3.21887		-6.3136
1.75	-0.04	0.04	-3.21887		-6.6427
1.8333	-0.03	0.03	-3.50655		-6.9717
1.9167	-0.03	0.03	-3.50655		-7.3011
2	-0.03	0.03	-3.50655		-7.6302
2.5	-0.03	0.03	-3.50655		-9.6052
3	-0.03	0.03	-3.50655		-11.5802
3.5	-0.03	0.03	-3.50655		-13.5552
4	-0.03	0.03	-3.50655		-15.5303
4.5	-0.02	0.02	-3.91202		-17.5053
5	-0.03	0.03	-3.50655		-19.4803
5.5	-0.02	0.02	-3.91202		-21.4553
6	-0.03	0.03	-3.50655		-23.4304
6.5	-0.02	0.02	-3.91202		-25.4054
7	-0.02	0.02	-3.91202		-27.3804
7.5	-0.02	0.02	-3.91202		-29.3554
8	-0.02	0.02	-3.91202		-31.3304
8.5	-0.02	0.02	-3.91202		-33.3055
9	-0.02	0.02	-3.91202		-35.2805
9.5	-0.02	0.02	-3.91202		-37.2555
10	-0.03	0.03	-3.50655		-39.2305

ROSE HILL SLUG TEST

MW05-01 RISING HEAD TEST 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 1

Client: EPA — Revised 11/05/91
Site: ROSE HILL — Well ID: MW05-02
Test by: DANIEL H. BERLER — Date: 10/30/91
Analysis: DANIEL H. BERLER — Date: 11/19/91

USER INPUT DATA		WORKSHEET	A=	3.0	3.0
Aquifer Thickness=	23.58	FIGURES	B =		0.46
Exposed Len.(Le) =	10		C =	2.7	2.7
Well Length (Lw) =	22.14	R(eq) =	0.0830	0.0830	0.0830
Casing Radius(Rc)=	0.083	Est. Rw			0.209
Well Radius (Rw) =	0.209	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6809	1.6809
Slug Volume =	0.025	ln(Re/Rw)		3.3632	3.3632
Static Level =	6.71	Max. Y(t)		ERR	
Offset time =	0.0033	Regr. Y(0)		1.42	
Shape Factor =	16.2	Casing Y(0)		1.16	UNDRAINED
(F from est. Rw)	16.2				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	4.7E-03	9.2E-03	6.75
Bouwer & Rice - estimated porosity	4.7E-03	9.2E-03	6.75
Bouwer & Rice - estimated Rw	4.7E-03	9.2E-03	6.75
Hvorslev - user porosity and Rw	5.4E-03	1.1E-02	7.77
Hvorslev - estimated porosity	5.4E-03	1.1E-02	7.77
Hvorslev - estimated Rw	5.4E-03	1.1E-02	7.77

Regression Output:

Constant	0.365701
Std Err of Y Est	0.005189
R Squared	0.999642
No. of Observations	13
Degrees of Freedom	11

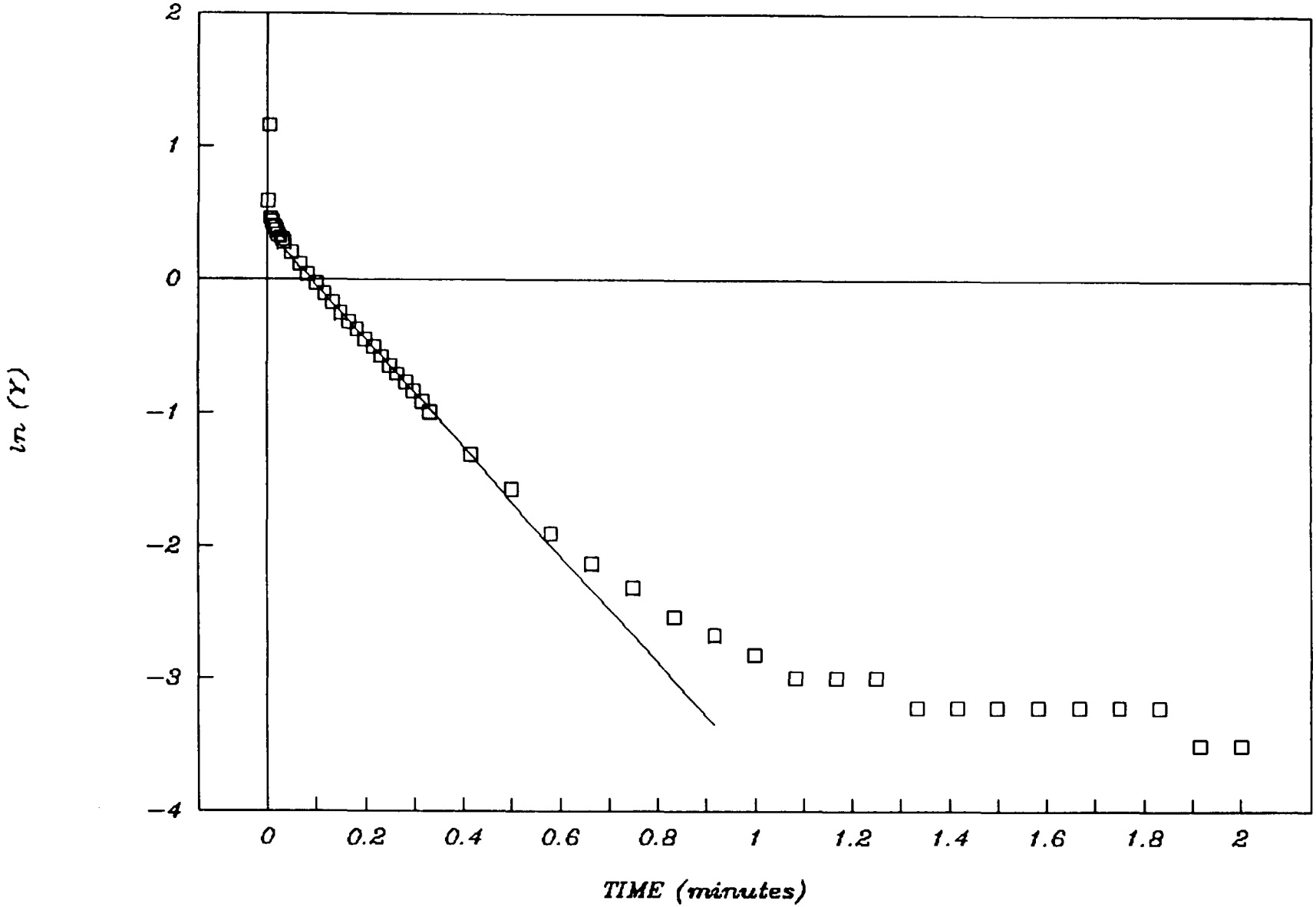
X Coefficient(s) -4.04801
Std Err of Coef. 0.023079

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.82	1.82	0.598836		0.3657
0.0033	-3.19	3.19	1.160020		0.3523
0.0066	-1.6	1.6	0.470003		0.3390
0.0099	-1.55	1.55	0.438254		0.3256
0.0133	-1.5	1.5	0.405465		0.3119
0.0166	-1.49	1.49	0.398776		0.2985
0.02	-1.45	1.45	0.371563		0.2847
0.0233	-1.41	1.41	0.343589		0.2714
0.0266	-1.38	1.38	0.322083		0.2580
0.03	-1.36	1.36	0.307484		0.2443
0.0333	-1.33	1.33	0.285178		0.2309
0.05	-1.23	1.23	0.207014		0.1633
0.0666	-1.13	1.13	0.122217		0.0961
0.0833	-1.04	1.04	0.039220		0.0285
0.1	-0.97	0.97	-0.03045	B	-0.0391
0.1166	-0.9	0.9	-0.10536		-0.1063
0.1333	-0.84	0.84	-0.17435		-0.1739
0.15	-0.78	0.78	-0.24846		-0.2415
0.1666	-0.73	0.73	-0.31471		-0.3087
0.1833	-0.69	0.69	-0.37106		-0.3763

0.2	-0.64	0.64	-0.44628		-0.4439
0.2166	-0.6	0.6	-0.51082		-0.5111
0.2333	-0.56	0.56	-0.57981		-0.5787
0.25	-0.52	0.52	-0.65392		-0.6463
0.2666	-0.49	0.49	-0.71334		-0.7135
0.2833	-0.46	0.46	-0.77652		-0.7811
0.3	-0.43	0.43	-0.84397	E	-0.8487
0.3166	-0.4	0.4	-0.91629		-0.9159
0.3333	-0.37	0.37	-0.99425		-0.9835
0.4167	-0.27	0.27	-1.30933		-1.3211
0.5	-0.21	0.21	-1.56064		-1.6583
0.5833	-0.15	0.15	-1.89711		-1.9955
0.6667	-0.12	0.12	-2.12026		-2.3331
0.75	-0.1	0.1	-2.30258		-2.6703
0.8333	-0.08	0.08	-2.52572		-3.0075
0.9167	-0.07	0.07	-2.65926		-3.3451
1	-0.06	0.06	-2.81341		-3.6823
1.0833	-0.05	0.05	-2.99573		-4.0195
1.1667	-0.05	0.05	-2.99573		-4.3571
1.25	-0.05	0.05	-2.99573		-4.6943
1.3333	-0.04	0.04	-3.21887		-5.0315
1.4166	-0.04	0.04	-3.21887		-5.3687
1.5	-0.04	0.04	-3.21887		-5.7063
1.5833	-0.04	0.04	-3.21887		-6.0435
1.6667	-0.04	0.04	-3.21887		-6.3811
1.75	-0.04	0.04	-3.21887		-6.7183
1.8333	-0.04	0.04	-3.21887		-7.0555
1.9167	-0.03	0.03	-3.50655		-7.3931
2	-0.03	0.03	-3.50655		-7.7303
2.5	-0.03	0.03	-3.50655		-9.7543
3	-0.03	0.03	-3.50655		-11.7784
3.5	-0.04	0.04	-3.21887		-13.8024
4	-0.03	0.03	-3.50655		-15.8264
4.5	-0.03	0.03	-3.50655		-17.8504
5	-0.03	0.03	-3.50655		-19.8744
5.5	-0.03	0.03	-3.50655		-21.8984
6	-0.03	0.03	-3.50655		-23.9224
6.5	-0.03	0.03	-3.50655		-25.9464
7	-0.03	0.03	-3.50655		-27.9704
7.5	-0.03	0.03	-3.50655		-29.9944
8	-0.04	0.04	-3.21887		-32.0185
8.5	-0.03	0.03	-3.50655		-34.0425
9	-0.03	0.03	-3.50655		-36.0665
9.5	-0.03	0.03	-3.50655		-38.0905
10	-0.03	0.03	-3.50655		-40.1145

ROSE HILL SLUG TEST

MW05-02 RISING HEAD TEST 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
(First Rising Head Test)
Site: Rosehill Well ID: MW-06-01
Test by: D.Berler Date: 10/31/91
Analysis:K.Arena Date: 12/03/91

USER INPUT DATA		WORKSHEET	A=	2.5	4.3
Aquifer Thickness=	16.62	FIGURES	B =	0.40	0.69
Exposed Len.(Le) =	15		C =	2.2	4.4
Well Length (Lw) =	14.32	R(eq) =	0.2279	0.1037	0.1037
Casing Radius(Rc)=	0.083	Est. Rw			0.145
Well Radius (Rw) =	0.417	Est. n		0.023	
Sandpack Porosity=	0.270	log(Le/Rw)		1.5362	1.9941
Slug Volume =	0.025	ln(Re/Rw)		2.4751	2.8996
Static Level =	5.30	Max. Y(t)		0.79	
Offset time =	0.02	Regr. Y(0)		0.74	
Shape Factor =	26.3	Casing Y(0)		1.15	DRAINED
(F from est. Rw)	20.3				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.5E-01	3.0E-01	216.26
Bouwer & Rice - estimated porosity	3.1E-02	6.1E-02	44.79
Bouwer & Rice - estimated Rw	3.6E-02	7.2E-02	52.47
Hvorslev - user porosity and Rw	2.1E-01	4.1E-01	298.91
Hvorslev - estimated porosity	4.3E-02	8.5E-02	61.91
Hvorslev - estimated Rw	5.6E-02	1.1E-01	80.13

Regression Output:

Constant	0.367474
Std Err of Y Est	0.028848
R Squared	0.997870
No. of Observations	6
Degrees of Freedom	4

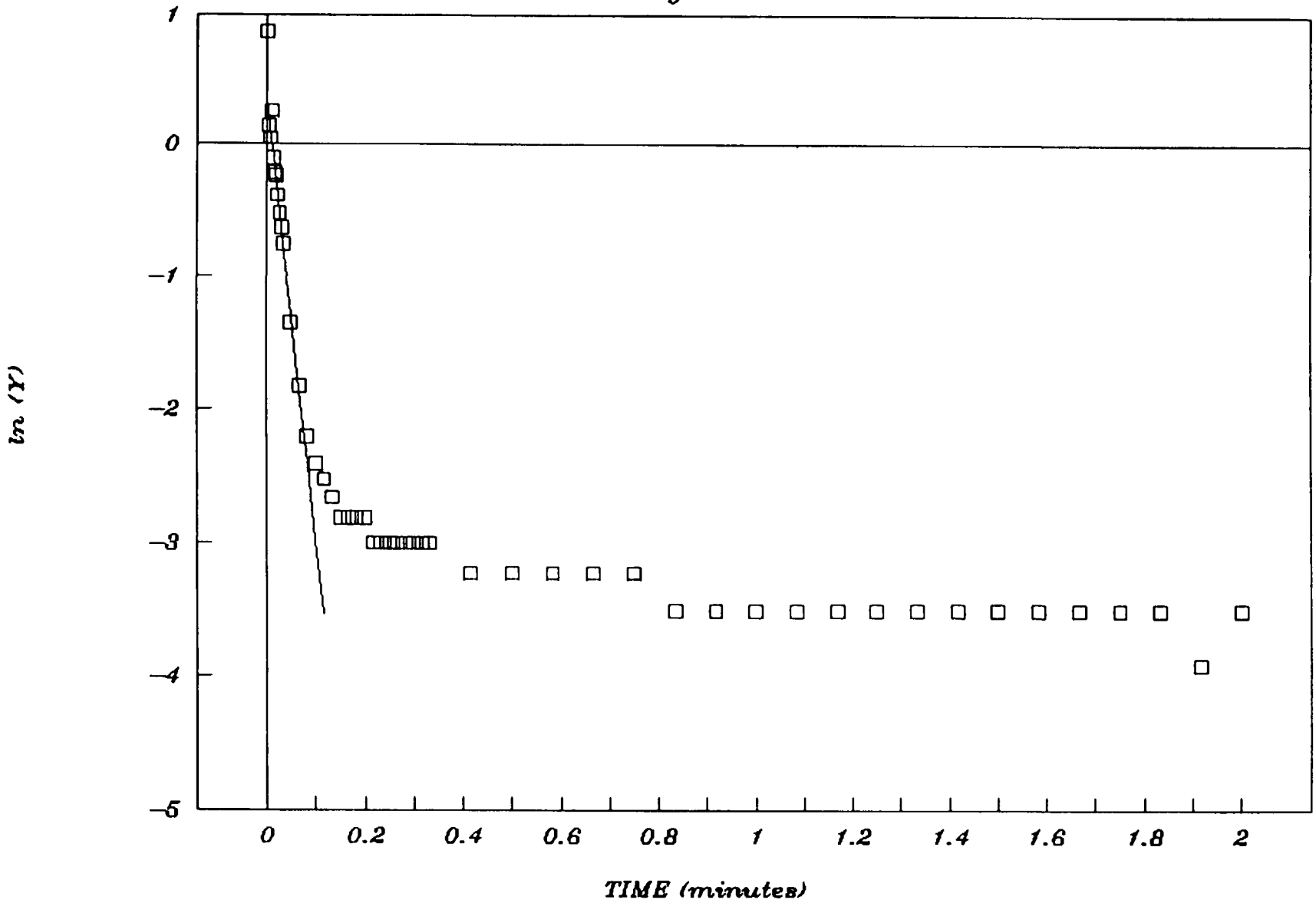
X Coefficient(s) -33.4538
Std Err of Coef. 0.772781

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-2.38	2.38	0.8671		0.3675
0.0033	-1.15	1.15	0.1398		0.2571
0.0066	-1.05	1.05	0.0488		0.1467
0.0099	-1.3	1.30	0.2624		0.0363
0.0133	-0.9	0.90	-0.1054		-0.0775
0.0166	-0.81	0.81	-0.2107		-0.1879
0.02	-0.79	0.79	-0.2357		-0.3016
0.0233	-0.68	0.68	-0.3857	B1	-0.4120
0.0266	-0.59	0.59	-0.5276		-0.5224
0.03	-0.53	0.53	-0.6349		-0.6361
0.0333	-0.47	0.47	-0.7550		-0.7465
0.05	-0.26	0.26	-1.3471		-1.3052
0.0666	-0.16	0.16	-1.8326	E1	-1.8606
0.0833	-0.11	0.11	-2.2073		-2.4192
0.1	-0.09	0.09	-2.4079		-2.9779
0.1166	-0.08	0.08	-2.5257		-3.5332
0.1333	-0.07	0.07	-2.6593		-4.0919
0.15	-0.06	0.06	-2.8134		-4.6506
0.1666	-0.06	0.06	-2.8134		-5.2059
0.1833	-0.06	0.06	-2.8134		-5.7646

0.2	-0.06	0.06	-2.8134	-6.3233
0.2166	-0.05	0.05	-2.9957	-6.8786
0.2333	-0.05	0.05	-2.9957	-7.4373
0.25	-0.05	0.05	-2.9957	-7.9960
0.2666	-0.05	0.05	-2.9957	-8.5513
0.2833	-0.05	0.05	-2.9957	-9.1100
0.3	-0.05	0.05	-2.9957	-9.6687
0.3166	-0.05	0.05	-2.9957	-10.2240
0.3333	-0.05	0.05	-2.9957	-10.7827
0.4167	-0.04	0.04	-3.2189	-13.5728
0.5	-0.04	0.04	-3.2189	-16.3595
0.5833	-0.04	0.04	-3.2189	-19.1462
0.6667	-0.04	0.04	-3.2189	-21.9362
0.75	-0.04	0.04	-3.2189	-24.7229
0.8333	-0.03	0.03	-3.5066	-27.5096
0.9167	-0.03	0.03	-3.5066	-30.2997
1	-0.03	0.03	-3.5066	-33.0864
1.0833	-0.03	0.03	-3.5066	-35.8731
1.1667	-0.03	0.03	-3.5066	-38.6632
1.25	-0.03	0.03	-3.5066	-41.4499
1.3333	-0.03	0.03	-3.5066	-44.2366
1.4166	-0.03	0.03	-3.5066	-47.0233
1.5	-0.03	0.03	-3.5066	-49.8133
1.5833	-0.03	0.03	-3.5066	-52.6000
1.6667	-0.03	0.03	-3.5066	-55.3901
1.75	-0.03	0.03	-3.5066	-58.1768
1.8333	-0.03	0.03	-3.5066	-60.9635
1.9167	-0.02	0.02	-3.9120	-63.7536
2	-0.03	0.03	-3.5066	-66.5403
2.5	-0.02	0.02	-3.9120	-83.2672
3	-0.02	0.02	-3.9120	-99.9941
3.5	-0.02	0.02	-3.9120	-116.7211
4	-0.02	0.02	-3.9120	-133.4480
4.5	-0.02	0.02	-3.9120	-150.1749
5	-0.02	0.02	-3.9120	-166.9019
5.5	-0.02	0.02	-3.9120	-183.6288
6	-0.02	0.02	-3.9120	-200.3557
6.5	-0.02	0.02	-3.9120	-217.0827
7	-0.02	0.02	-3.9120	-233.8096
7.5	-0.02	0.02	-3.9120	-250.5365

ROSEHILL SLUG TEST

MW-06-01 Rising Head Test 1



(First Rising Head Test)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-06-02
Test by:	D.Berler	Date:	10/31/91
Analysis:	K.Arena	Date:	12/03/91

USER INPUT DATA		WORKSHEET FIGURES			
		A=		3.0	3.0
Aquifer Thickness=	30.29	B =		0.46	0.46
Exposed Len.(Le) =	10	C =		2.7	2.7
Well Length (Lw) =	28.19	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.208
Well Radius (Rw) =	0.208	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6812	1.6812
Slug Volume =	0.025	ln(Re/Rw)		3.2489	3.2489
Static Level =	5.50	Max. Y(t)		1.14	
Offset time =	0.0266	Regr. Y(0)		1.13	
Shape Factor =	16.2	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	16.2				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.4E-02	2.8E-02	20.13
Bouwer & Rice - estimated porosity	1.4E-02	2.8E-02	20.13
Bouwer & Rice - estimated Rw	1.4E-02	2.8E-02	20.13
Hvorslev - user porosity and Rw	1.7E-02	3.3E-02	23.99
Hvorslev - estimated porosity	1.7E-02	3.3E-02	23.99
Hvorslev - estimated Rw	1.7E-02	3.3E-02	23.99

Regression Output:

Constant	0.453071
Std Err of Y Est	0.009126
R Squared	0.999445
No. of Observations	7
Degrees of Freedom	5

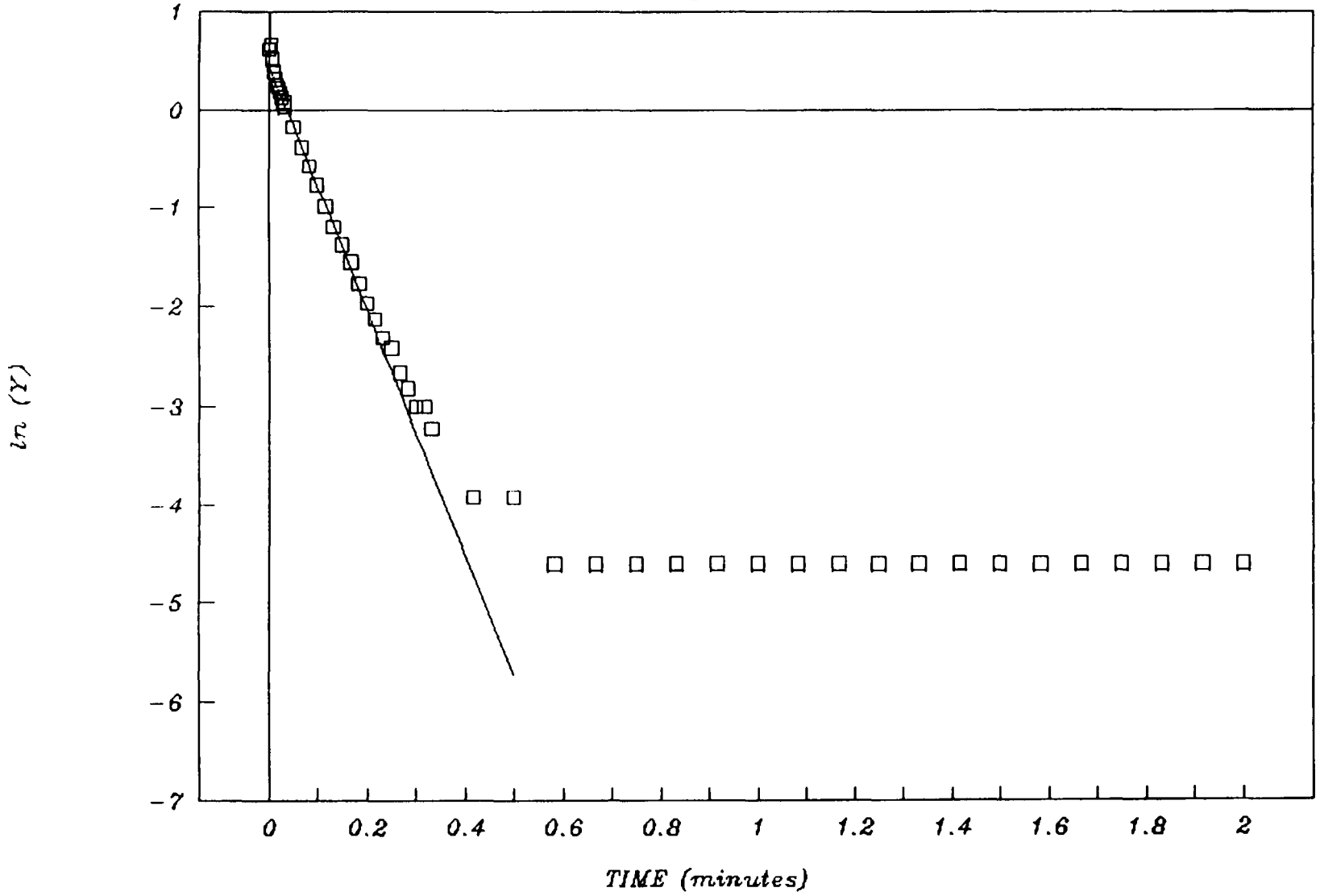
X Coefficient(s)	-12.3946
Std Err of Coef.	0.130590

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.86	1.86	0.6206		0.4531
0.0033	-1.96	1.96	0.6729		0.4122
0.0066	-1.69	1.69	0.5247		0.3713
0.0099	-1.49	1.49	0.3988		0.3304
0.0133	-1.38	1.38	0.3221		0.2882
0.0166	-1.31	1.31	0.2700		0.2473
0.02	-1.26	1.26	0.2311		0.2052
0.0233	-1.2	1.20	0.1823		0.1643
0.0266	-1.14	1.14	0.1310	B	0.1234
0.03	-1.09	1.09	0.0862		0.0812
0.0333	-1.04	1.04	0.0392		0.0403
0.05	-0.84	0.84	-0.1744		-0.1667
0.0666	-0.68	0.68	-0.3857		-0.3724
0.0833	-0.56	0.56	-0.5798		-0.5794
0.1	-0.46	0.46	-0.7765	E	-0.7864
0.1166	-0.37	0.37	-0.9943		-0.9921
0.1333	-0.3	0.30	-1.2040		-1.1991
0.15	-0.25	0.25	-1.3863		-1.4061
0.1666	-0.21	0.21	-1.5606		-1.6119
0.1833	-0.17	0.17	-1.7720		-1.8189

0.2	-0.14	0.14	-1.9661	-2.0259
0.2166	-0.12	0.12	-2.1203	-2.2316
0.2333	-0.1	0.10	-2.3026	-2.4386
0.25	-0.09	0.09	-2.4079	-2.6456
0.2666	-0.07	0.07	-2.6593	-2.8513
0.2833	-0.06	0.06	-2.8134	-3.0583
0.3	-0.05	0.05	-2.9957	-3.2653
0.3166	-0.05	0.05	-2.9957	-3.4711
0.3333	-0.04	0.04	-3.2189	-3.6781
0.4167	-0.02	0.02	-3.9120	-4.7118
0.5	-0.02	0.02	-3.9120	-5.7443
0.5833	-0.01	0.01	-4.6052	-6.7767
0.6667	-0.01	0.01	-4.6052	-7.8104
0.75	-0.01	0.01	-4.6052	-8.8429
0.8333	-0.01	0.01	-4.6052	-9.8754
0.9167	-0.01	0.01	-4.6052	-10.9091
1	-0.01	0.01	-4.6052	-11.9416
1.0833	-0.01	0.01	-4.6052	-12.9741
1.1667	-0.01	0.01	-4.6052	-14.0078
1.25	-0.01	0.01	-4.6052	-15.0403
1.3333	-0.01	0.01	-4.6052	-16.0727
1.4166	-0.01	0.01	-4.6052	-17.1052
1.5	-0.01	0.01	-4.6052	-18.1389
1.5833	-0.01	0.01	-4.6052	-19.1714
1.6667	-0.01	0.01	-4.6052	-20.2051
1.75	-0.01	0.01	-4.6052	-21.2376
1.8333	-0.01	0.01	-4.6052	-22.2701
1.9167	-0.01	0.01	-4.6052	-23.3038
2	-0.01	0.01	-4.6052	-24.3363
2.5	-0.01	0.01	-4.6052	-30.5336
3	-0.01	0.01	-4.6052	-36.7309
3.5	-0.01	0.01	-4.6052	-42.9282
4	-0.01	0.01	-4.6052	-49.1256
4.5	0	0.00	ERR	-55.3229
5	0	0.00	ERR	-61.5202
5.5	-0.01	0.01	-4.6052	-67.7176
6	-0.01	0.01	-4.6052	-73.9149
6.5	-0.01	0.01	-4.6052	-80.1122
7	0	0.00	ERR	-86.3096
7.5	-0.01	0.01	-4.6052	-92.5069
8	0	0.00	ERR	-98.7042
8.5	0	0.00	ERR	-104.9015
9	0	0.00	ERR	-111.0989
9.5	0	0.00	ERR	-117.2962
10	0	0.00	ERR	-123.4935

ROSEHILL SLUG TEST

MW-06-02 Rising Head Test 1



(Rising Head Test 1 MW-07-01)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-07-01
Test by: K.Arena Date: 10/31/91
Analysis:K.Arena Date: 11/26/91

USER INPUT DATA		WORKSHEET	A=	2.5	5.4
Aquifer Thickness=	25.53	FIGURES	B =	0.40	0.98
Exposed Len.(Le) =	15		C =	2.2	6.0
Well Length (Lw) =	14.13	R(eq) =	0.2279	0.0841	0.0841
Casing Radius(Rc)=	0.083	Est. Rw			0.086
Well Radius (Rw) =	0.417	Est. n		0.001	
Sandpack Porosity=	0.270	log(Le/Rw)		1.5304	2.2141
Slug Volume =	0.025	ln(Re/Rw)		2.3547	2.8838
Static Level =	20.15	Max. Y(t)		1.12	
Offset time =	0.0166	Regr. Y(0)		1.12	
Shape Factor =	26.3	Casing Y(0)		1.15	DRAINED
(F from est. Rw)	18.3				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	2.5E-02	5.0E-02	36.62
Bouwer & Rice - estimated porosity	3.5E-03	6.8E-03	4.99
Bouwer & Rice - estimated Rw	4.2E-03	8.4E-03	6.11
Hvorslev - user porosity and Rw	3.6E-02	7.2E-02	52.50
Hvorslev - estimated porosity	5.0E-03	9.8E-03	7.16
Hvorslev - estimated Rw	7.2E-03	1.4E-02	10.30

Regression Output:

Constant	0.214298
Std Err of Y Est	0.004371
R Squared	0.994244
No. of Observations	9
Degrees of Freedom	7

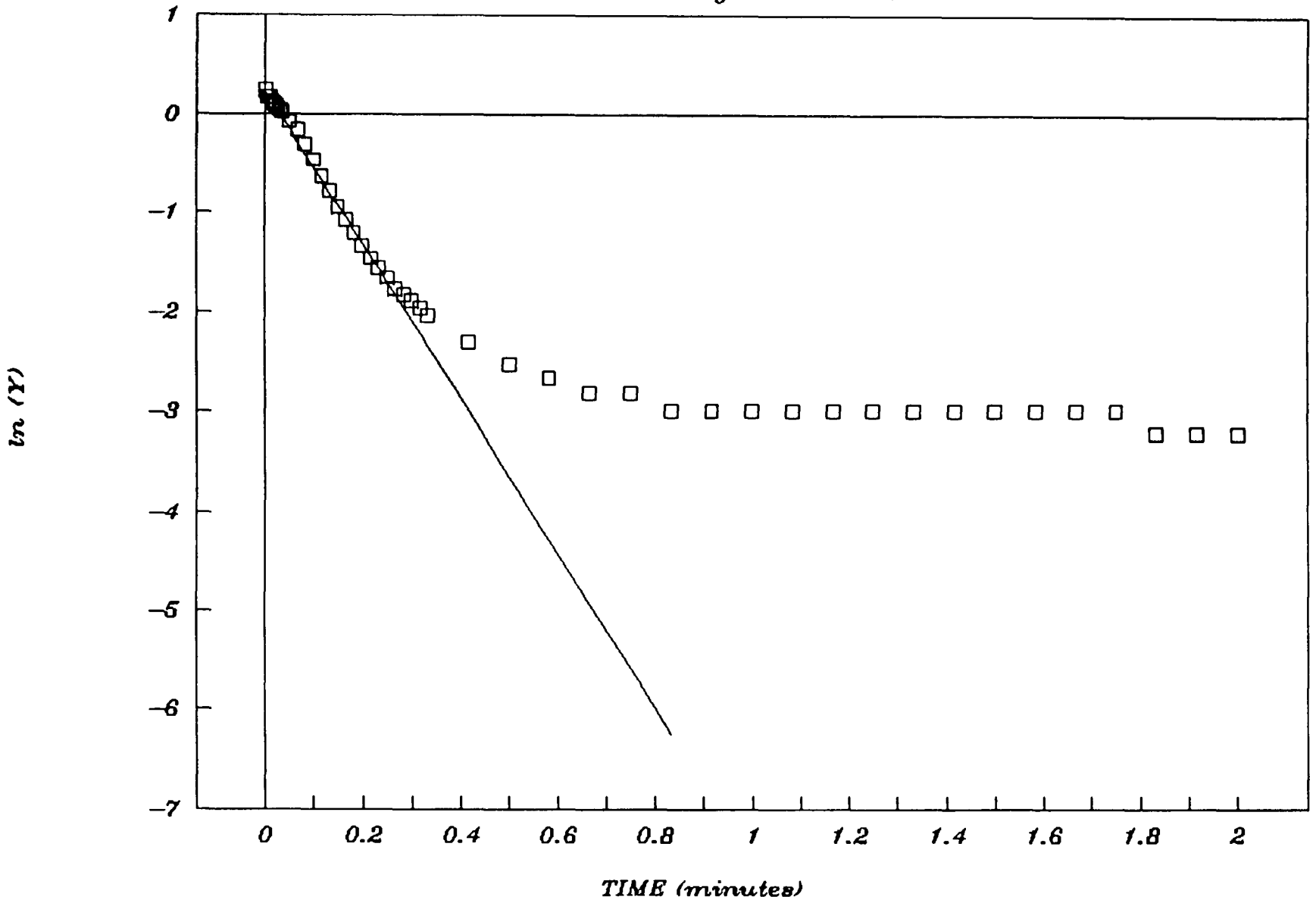
X Coefficient(s) -5.87581
Std Err of Coef. 0.168977

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.28	1.28	0.2469		0.2143
0.0033	-1.19	1.19	0.1740		0.1949
0.0066	-1.19	1.19	0.1740	B	0.1755
0.0099	-1.18	1.18	0.1655		0.1561
0.0133	-1.14	1.14	0.1310		0.1361
0.0166	-1.12	1.12	0.1133		0.1168
0.02	-1.1	1.10	0.0953		0.0968
0.0233	-1.08	1.08	0.0770		0.0774
0.0266	-1.06	1.06	0.0583		0.0580
0.03	-1.04	1.04	0.0392		0.0380
0.0333	-1.02	1.02	0.0198	E	0.0186
0.05	-0.93	0.93	-0.0726		-0.0795
0.0666	-0.85	0.85	-0.1625		-0.1770
0.0833	-0.74	0.74	-0.3011		-0.2752
0.1	-0.63	0.63	-0.4620		-0.3733
0.1166	-0.53	0.53	-0.6349		-0.4708
0.1333	-0.46	0.46	-0.7765		-0.5689
0.15	-0.39	0.39	-0.9416		-0.6671
0.1666	-0.34	0.34	-1.0788		-0.7646
0.1833	-0.3	0.30	-1.2040		-0.8627

0.2	-0.26	0.26	-1.3471	-0.9609
0.2166	-0.23	0.23	-1.4697	-1.0584
0.2333	-0.21	0.21	-1.5606	-1.1565
0.25	-0.19	0.19	-1.6607	-1.2547
0.2666	-0.17	0.17	-1.7720	-1.3522
0.2833	-0.16	0.16	-1.8326	-1.4503
0.3	-0.15	0.15	-1.8971	-1.5484
0.3166	-0.14	0.14	-1.9661	-1.6460
0.3333	-0.13	0.13	-2.0402	-1.7441
0.4167	-0.1	0.10	-2.3026	-2.2342
0.5	-0.08	0.08	-2.5257	-2.7236
0.5833	-0.07	0.07	-2.6593	-3.2131
0.6667	-0.06	0.06	-2.8134	-3.7031
0.75	-0.06	0.06	-2.8134	-4.1926
0.8333	-0.05	0.05	-2.9957	-4.6820
0.9167	-0.05	0.05	-2.9957	-5.1721
1	-0.05	0.05	-2.9957	-5.6615
1.0833	-0.05	0.05	-2.9957	-6.1510
1.1667	-0.05	0.05	-2.9957	-6.6410
1.25	-0.05	0.05	-2.9957	-7.1305
1.3333	-0.05	0.05	-2.9957	-7.6199
1.4166	-0.05	0.05	-2.9957	-8.1094
1.5	-0.05	0.05	-2.9957	-8.5994
1.5833	-0.05	0.05	-2.9957	-9.0889
1.6667	-0.05	0.05	-2.9957	-9.5789
1.75	-0.05	0.05	-2.9957	-10.0684
1.8333	-0.04	0.04	-3.2189	-10.5578
1.9167	-0.04	0.04	-3.2189	-11.0479
2	-0.04	0.04	-3.2189	-11.5373
2.5	-0.04	0.04	-3.2189	-14.4752
3	-0.05	0.05	-2.9957	-17.4131
3.5	-0.05	0.05	-2.9957	-20.3511
4	-0.05	0.05	-2.9957	-23.2890
4.5	-0.05	0.05	-2.9957	-26.2269
5	-0.05	0.05	-2.9957	-29.1648
5.5	-0.05	0.05	-2.9957	-32.1027
6	-0.05	0.05	-2.9957	-35.0406
6.5	-0.05	0.05	-2.9957	-37.9785
7	-0.05	0.05	-2.9957	-40.9164
7.5	-0.05	0.05	-2.9957	-43.8543
8	-0.05	0.05	-2.9957	-46.7922
8.5	-0.05	0.05	-2.9957	-49.7301
9	-0.05	0.05	-2.9957	-52.6680
9.5	-0.05	0.05	-2.9957	-55.6059
10	-0.05	0.05	-2.9957	-58.5439

ROSEHILL SLUG TEST

MW-07-01 Rising Head Test 1



Rising Head test 1
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-07-02
Test by: K.Arena Date: 10/31/91
Analysis: K.Arena Date: 12/05/91

USER INPUT DATA		WORKSHEET	A=	4.3	5.3
Aquifer Thickness=	300	FIGURES	B =	0.70	0.94
Exposed Len.(Le) =	25		C =	4.4	5.8
Well Length (Lw) =	52.78	R(eq) =	0.1928	0.1658	0.1658
Casing Radius(Rc)=	0.167	Est. Rw			0.163
Well Radius (Rw) =	0.250	Est. n		-0.009	
Sandpack Porosity=	0.270	log(Le/Rw)		2.0000	2.1851
Slug Volume =	0.153	ln(Rc/Rw)		3.4433	3.6329
Static Level =	19.84	Max. Y(t)		1.79	
Offset time =	0.1	Regr. Y(0)		1.77	
Shape Factor =	265.9	Casing Y(0)		1.75	DRAINED
(F from est. Rw)	250.8				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	2.6E-03	5.1E-03	3.75
Bouwer & Rice - estimated porosity	1.9E-03	3.8E-03	2.77
Bouwer & Rice - estimated Rw	2.0E-03	4.0E-03	2.92
Hvorslev - user porosity and Rw	4.5E-04	8.8E-04	0.64
Hvorslev - estimated porosity	3.3E-04	6.5E-04	0.48
Hvorslev - estimated Rw	3.5E-04	6.9E-04	0.50

Regression Output:

Constant	0.674256
Std Err of Y Est	0.036362
R Squared	0.726661
No. of Observations	11
Degrees of Freedom	9

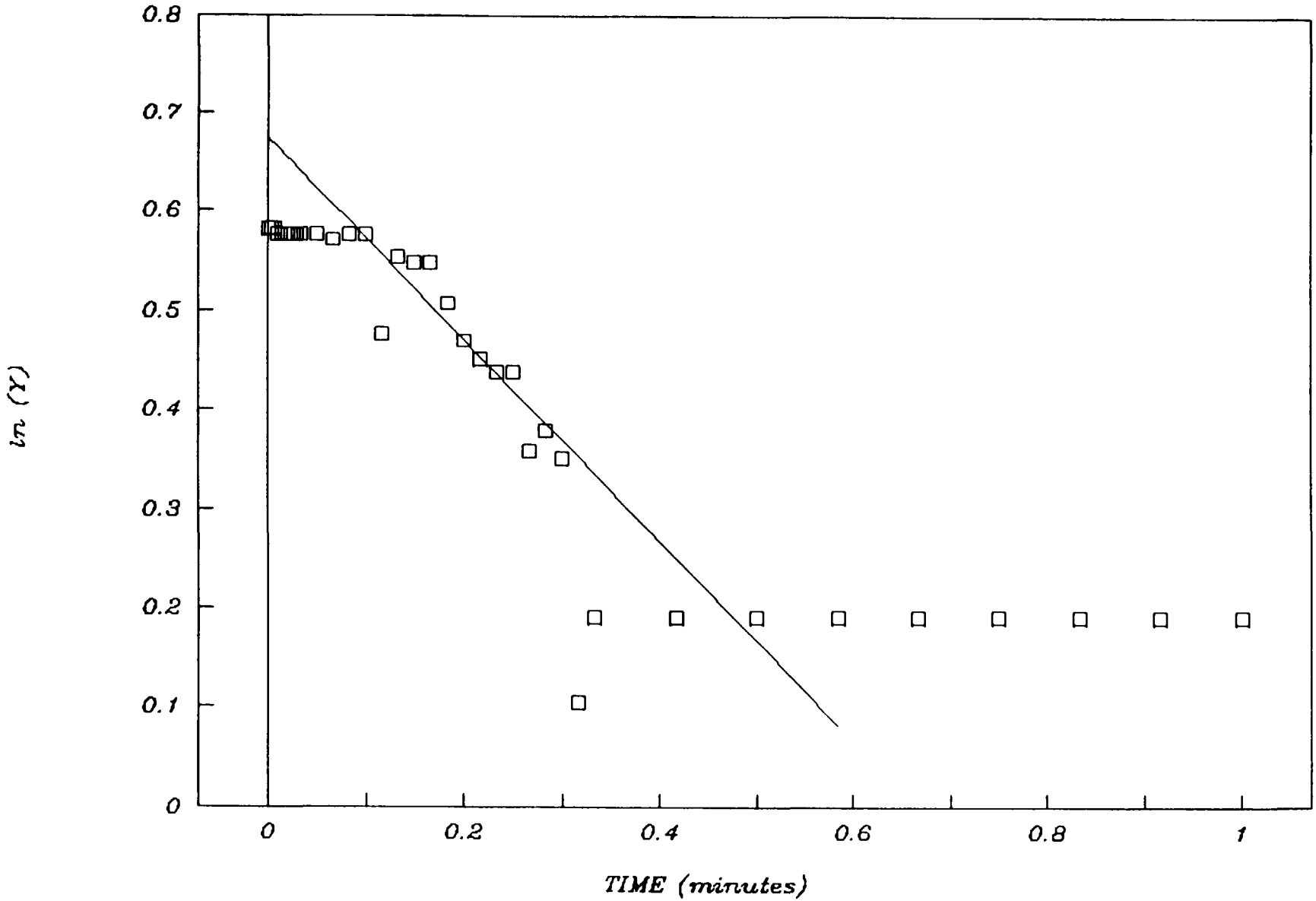
X Coefficient(s) -1.01759
Std Err of Coef. 0.208034

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.79	1.79	0.5822		0.6743
0.0033	-1.79	1.79	0.5822		0.6709
0.0066	-1.79	1.79	0.5822		0.6675
0.0099	-1.78	1.78	0.5766		0.6642
0.0133	-1.78	1.78	0.5766		0.6607
0.0166	-1.78	1.78	0.5766		0.6574
0.02	-1.78	1.78	0.5766		0.6539
0.0233	-1.78	1.78	0.5766		0.6505
0.0266	-1.78	1.78	0.5766		0.6472
0.03	-1.78	1.78	0.5766		0.6437
0.0333	-1.78	1.78	0.5766		0.6404
0.05	-1.78	1.78	0.5766		0.6234
0.0666	-1.77	1.77	0.5710		0.6065
0.0833	-1.78	1.78	0.5766		0.5895
0.1	-1.78	1.78	0.5766	B1	0.5725
0.1166	-1.61	1.61	0.4762		0.5556
0.1333	-1.74	1.74	0.5539		0.5386
0.15	-1.73	1.73	0.5481		0.5216
0.1666	-1.73	1.73	0.5481		0.5047
0.1833	-1.66	1.66	0.5068		0.4877

0.2	-1.6	1.60	0.4700		0.4707
0.2166	-1.57	1.57	0.4511		0.4538
0.2333	-1.55	1.55	0.4383		0.4369
0.25	-1.55	1.55	0.4383		0.4199
0.2666	-1.43	1.43	0.3577	e1	0.4030
0.2833	-1.46	1.46	0.3784		0.3860
0.3	-1.42	1.42	0.3507		0.3690
0.3166	-1.11	1.11	0.1044		0.3521
0.3333	-1.21	1.21	0.1906		0.3351
0.4167	-1.21	1.21	0.1906		0.2502
0.5	-1.21	1.21	0.1906		0.1655
0.5833	-1.21	1.21	0.1906		0.0807
0.6667	-1.21	1.21	0.1906		-0.0042
0.75	-1.21	1.21	0.1906		-0.0889
0.8333	-1.21	1.21	0.1906		-0.1737
0.9167	-1.21	1.21	0.1906		-0.2586
1	-1.21	1.21	0.1906		-0.3433
1.0833	-1.21	1.21	0.1906		-0.4281
1.1667	-1.21	1.21	0.1906		-0.5130
1.25	-1.21	1.21	0.1906		-0.5977
1.3333	-1.21	1.21	0.1906		-0.6825
1.4166	-1.21	1.21	0.1906		-0.7673
1.5	-1.21	1.21	0.1906		-0.8521
1.5833	-1.21	1.21	0.1906		-0.9369
1.6667	-1.21	1.21	0.1906		-1.0218
1.75	-1.21	1.21	0.1906		-1.1065
1.8333	-1.21	1.21	0.1906		-1.1913
1.9167	-1.21	1.21	0.1906		-1.2762
2	-1.21	1.21	0.1906		-1.3609
2.5	-1.21	1.21	0.1906		-1.8697
3	-1.21	1.21	0.1906		-2.3785
3.5	-1.21	1.21	0.1906		-2.8873
4	-1.21	1.21	0.1906		-3.3961
4.5	-1.21	1.21	0.1906		-3.9049
5	-1.22	1.22	0.1989		-4.4137
5.5	-1.22	1.22	0.1989		-4.9225
6	-1.22	1.22	0.1989		-5.4313
6.5	-1.22	1.22	0.1989		-5.9401
7	-1.22	1.22	0.1989		-6.4489
7.5	-1.22	1.22	0.1989		-6.9577
8	-1.22	1.22	0.1989		-7.4665
8.5	-1.22	1.22	0.1989		-7.9753
9	-1.22	1.22	0.1989		-8.4841
9.5	-1.22	1.22	0.1989		-8.9929
10	-1.22	1.22	0.1989		-9.5016
12	-1.23	1.23	0.2070		-11.5368
14	-1.23	1.23	0.2070		-13.5720
16	-1.24	1.24	0.2151		-15.6072
18	-1.24	1.24	0.2151		-17.6424
20	-1.25	1.25	0.2231		-19.6776
22	-1.25	1.25	0.2231		-21.7127
24	-1.25	1.25	0.2231		-23.7479
26	-1.25	1.25	0.2231		-25.7831

ROSEHILL SLUG TEST

MW-07-02 RISING HEAD TEST 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 1

Client: EPA — Revised 11/05/91
Site: ROSE HILL — Well ID: MW08-01
Test by: DANIEL H. BERLER — Date: 10/29/91
Analysis: DANIEL H. BERLER — Date: 11/18/91

USER INPUT DATA		WORKSHEET FIGURES			
		A=	2.2	4.4
Aquifer Thickness=	10.89	B =		0.71
Exposed Len.(Le) =	10	C =	1.9	4.5
Well Length (Lw) =	8.4	R(eq) =	0.1871	0.0827	0.0827
Casing Radius(Rc)=	0.083	Est. Rw			0.081
Well Radius (Rw) =	0.333	Est. n		-0.001	
Sandpack Porosity=	0.270	log(Le/Rw)		1.4018	2.0151
Slug Volume =	0.025	ln(Re/Rw)		2.3321	3.0762
Static Level =	6.86	Max. Y(t)		1.16	
Offset time =	0.05	Regr. Y(0)		1.16	
Shape Factor =	18.5	Casing Y(0)		1.15	DRAINED
(F from est. Rw)	13.1				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	3.0E-02	5.8E-02	42.77
Bouwer & Rice - estimated porosity	5.8E-03	1.1E-02	8.36
Bouwer & Rice - estimated Rw	7.7E-03	1.5E-02	11.03
Hvorslev - user porosity and Rw	3.6E-02	7.2E-02	52.41
Hvorslev - estimated porosity	7.1E-03	1.4E-02	10.25
Hvorslev - estimated Rw	1.0E-02	2.0E-02	14.50

Regression Output:

Constant	0.455963
Std Err of Y Est	0.003010
R Squared	0.999875
No. of Observations	8
Degrees of Freedom	6

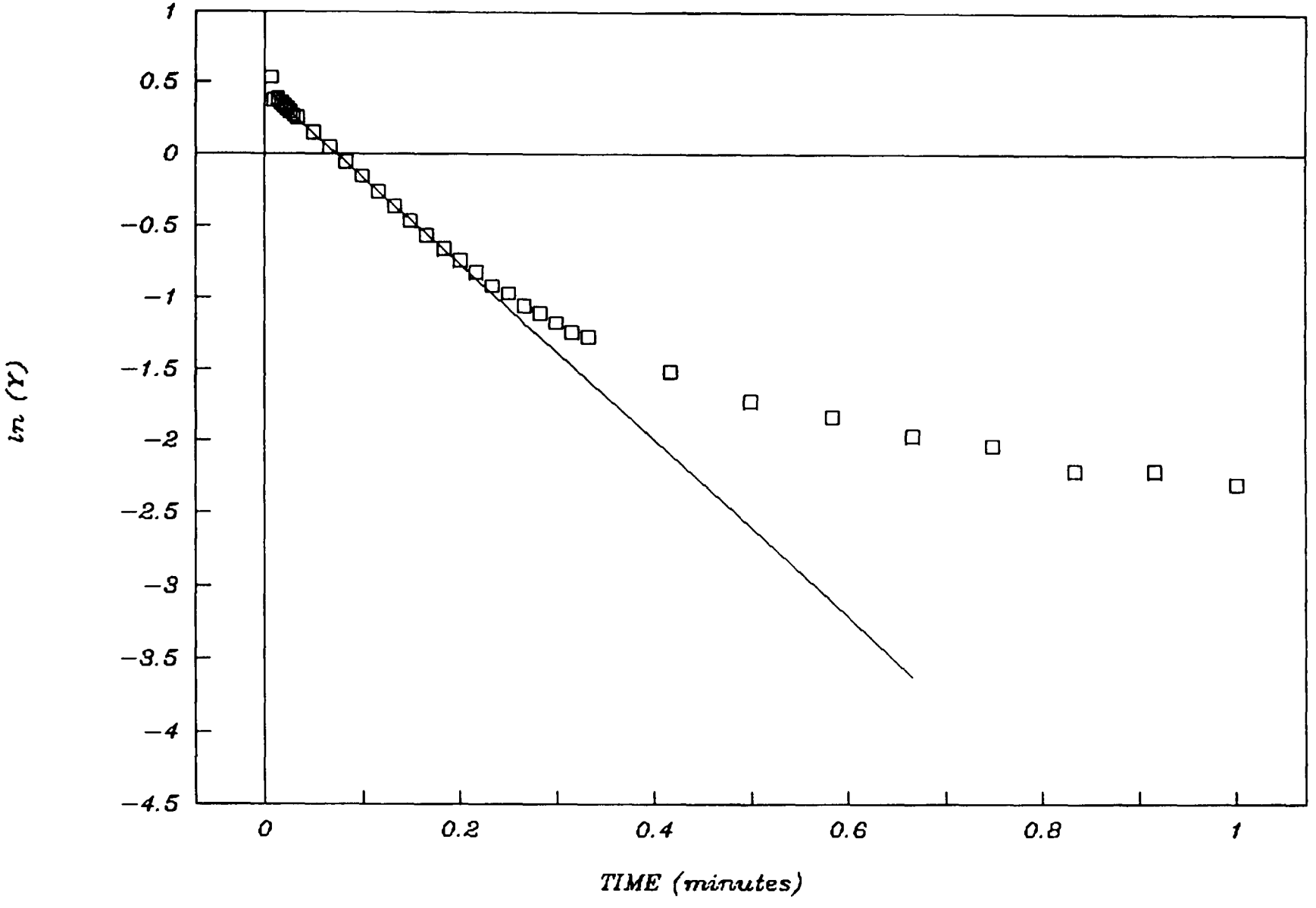
X Coefficient(s) -6.11127
Std Err of Coef. 0.027871

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-4.93	4.93	1.595338		0.4560
0.0033	-0.55	0.55	-0.59783		0.4358
0.0066	-1.71	1.71	0.536493		0.4156
0.0099	-1.46	1.46	0.378436		0.3955
0.0133	-1.47	1.47	0.385262		0.3747
0.0166	-1.43	1.43	0.357674		0.3545
0.02	-1.4	1.4	0.336472		0.3337
0.0233	-1.37	1.37	0.314810		0.3136
0.0266	-1.34	1.34	0.292669		0.2934
0.03	-1.31	1.31	0.270027		0.2726
0.0333	-1.29	1.29	0.254642		0.2525
0.05	-1.16	1.16	0.148420	B	0.1504
0.0666	-1.05	1.05	0.048790		0.0490
0.0833	-0.95	0.95	-0.05129		-0.0531
0.1	-0.86	0.86	-0.15082		-0.1552
0.1166	-0.77	0.77	-0.26136		-0.2566
0.1333	-0.7	0.7	-0.35667		-0.3587
0.15	-0.63	0.63	-0.46203		-0.4607
0.1666	-0.57	0.57	-0.56211	E	-0.5622
0.1833	-0.52	0.52	-0.65392		-0.6642

0.2	-0.48	0.48	-0.73396	-0.7663
0.2166	-0.44	0.44	-0.82098	-0.8677
0.2333	-0.4	0.4	-0.91629	-0.9698
0.25	-0.38	0.38	-0.96758	-1.0719
0.2666	-0.35	0.35	-1.04982	-1.1733
0.2833	-0.33	0.33	-1.10866	-1.2754
0.3	-0.31	0.31	-1.17118	-1.3774
0.3166	-0.29	0.29	-1.23787	-1.4789
0.3333	-0.28	0.28	-1.27296	-1.5809
0.4167	-0.22	0.22	-1.51412	-2.0906
0.5	-0.18	0.18	-1.71479	-2.5997
0.5833	-0.16	0.16	-1.83258	-3.1087
0.6667	-0.14	0.14	-1.96611	-3.6184
0.75	-0.13	0.13	-2.04022	-4.1275
0.8333	-0.11	0.11	-2.20727	-4.6366
0.9167	-0.11	0.11	-2.20727	-5.1462
1	-0.1	0.1	-2.30258	-5.6553
1.0833	-0.09	0.09	-2.40794	-6.1644
1.1667	-0.09	0.09	-2.40794	-6.6741
1.25	-0.09	0.09	-2.40794	-7.1831
1.3333	-0.07	0.07	-2.65926	-7.6922
1.4166	-0.08	0.08	-2.52572	-8.2013
1.5	-0.07	0.07	-2.65926	-8.7109
1.5833	-0.07	0.07	-2.65926	-9.2200
1.6667	-0.07	0.07	-2.65926	-9.7297
1.75	-0.06	0.06	-2.81341	-10.2388
1.8333	-0.06	0.06	-2.81341	-10.7478
1.9167	-0.06	0.06	-2.81341	-11.2575
2	-0.06	0.06	-2.81341	-11.7666
2.5	-0.05	0.05	-2.99573	-14.8222
3	-0.05	0.05	-2.99573	-17.8779
3.5	-0.04	0.04	-3.21887	-20.9335
4	-0.04	0.04	-3.21887	-23.9891
4.5	-0.03	0.03	-3.50655	-27.0448
5	-0.03	0.03	-3.50655	-30.1004
5.5	-0.03	0.03	-3.50655	-33.1561
6	-0.03	0.03	-3.50655	-36.2117
6.5	-0.02	0.02	-3.91202	-39.2673
7	-0.02	0.02	-3.91202	-42.3230
7.5	-0.02	0.02	-3.91202	-45.3786
8	-0.02	0.02	-3.91202	-48.4342
8.5	-0.02	0.02	-3.91202	-51.4899
9	-0.02	0.02	-3.91202	-54.5455
9.5	-0.02	0.02	-3.91202	-57.6012
10	-0.02	0.02	-3.91202	-60.6568

ROSE HILL SLUG TEST

MW08-01 RISING HEAD TEST 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 1
Client: EPA Revised 11/05/91
Site: ROSE HILL Well ID: MW-08-02
Test by: DANIEL H. BERLER Date: 10/29/91
Analysis: DANIEL H. BERLER Date: 11/19/91

USER INPUT DATA		WORKSHEET	A=	2.2	2.2
Aquifer Thickness=	300	FIGURES	B =		0.35
Exposed Len.(Le) =	5		C =	1.9	1.9
Well Length (Lw) =	19.75	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.208
Well Radius (Rw) =	0.208	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.3809	1.3809
Slug Volume =	0.025	ln(Re/Rw)		3.0082	3.0082
Static Level =	8.05	Max. Y(t)		1.4	
Offset time =	0.0666	Regr. Y(0)		1.40	
Shape Factor =	9.9	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	9.9				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	6.6E-03	1.3E-02	9.49
Bouwer & Rice - estimated porosity	6.6E-03	1.3E-02	9.49
Bouwer & Rice - estimated Rw	6.6E-03	1.3E-02	9.49
Hvorslev - user porosity and Rw	7.0E-03	1.4E-02	10.03
Hvorslev - estimated porosity	7.0E-03	1.4E-02	10.03
Hvorslev - estimated Rw	7.0E-03	1.4E-02	10.03

Regression Output:

Constant	0.545237
Std Err of Y Est	0.002933
R Squared	0.999637
No. of Observations	9
Degrees of Freedom	7

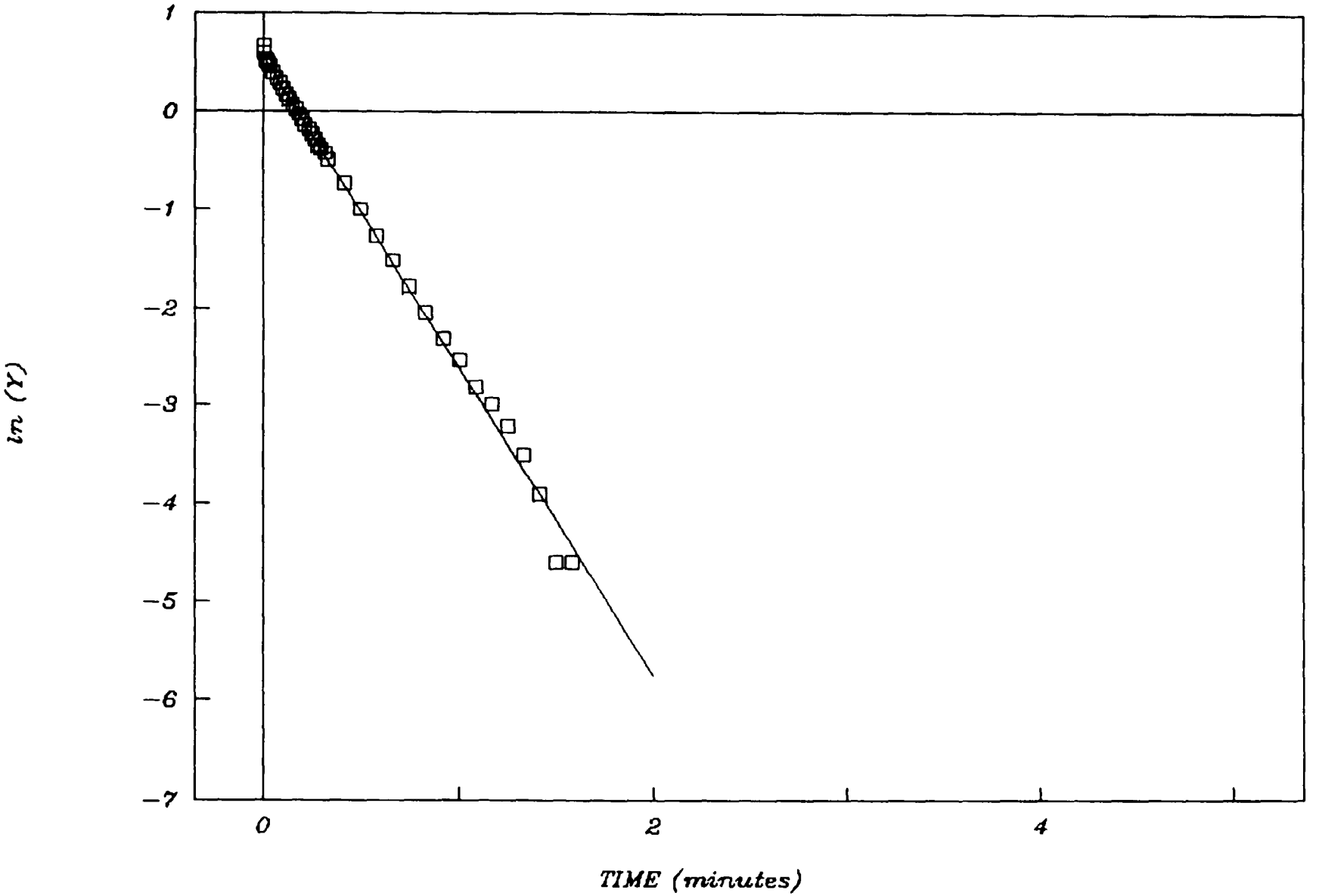
X Coefficient(s) -3.15460
Std Err of Coef. 0.022719

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.79	1.79	0.582215		0.5452
0.0033	-1.93	1.93	0.657520		0.5348
0.0066	-1.71	1.71	0.536493		0.5244
0.0099	-1.67	1.67	0.512823		0.5140
0.0133	-1.7	1.7	0.530628		0.5033
0.0166	-1.68	1.68	0.518793		0.4929
0.02	-1.65	1.65	0.500775		0.4821
0.0233	-1.63	1.63	0.488580		0.4717
0.0266	-1.61	1.61	0.476234		0.4613
0.03	-1.59	1.59	0.463734		0.4506
0.0333	-1.57	1.57	0.451075		0.4402
0.05	-1.48	1.48	0.392042		0.3875
0.0666	-1.4	1.4	0.336472	B	0.3351
0.0833	-1.33	1.33	0.285178		0.2825
0.1	-1.26	1.26	0.231111		0.2298
0.1166	-1.19	1.19	0.173953		0.1774
0.1333	-1.13	1.13	0.122217		0.1247
0.15	-1.07	1.07	0.067658		0.0720
0.1666	-1.02	1.02	0.019802		0.0197
0.1833	-0.97	0.97	-0.03045		-0.0330

0.2	-0.92	0.92	-0.08338 E	-0.0857
0.2166	-0.87	0.87	-0.13926	-0.1381
0.2333	-0.83	0.83	-0.18632	-0.1907
0.25	-0.79	0.79	-0.23572	-0.2434
0.2666	-0.75	0.75	-0.28768	-0.2958
0.2833	-0.71	0.71	-0.34249	-0.3485
0.3	-0.68	0.68	-0.38566	-0.4011
0.3166	-0.65	0.65	-0.43078	-0.4535
0.3333	-0.61	0.61	-0.49429	-0.5062
0.4167	-0.48	0.48	-0.73396	-0.7693
0.5	-0.37	0.37	-0.99425	-1.0321
0.5833	-0.28	0.28	-1.27296	-1.2948
0.6667	-0.22	0.22	-1.51412	-1.5579
0.75	-0.17	0.17	-1.77195	-1.8207
0.8333	-0.13	0.13	-2.04022	-2.0835
0.9167	-0.1	0.1	-2.30258	-2.3466
1	-0.08	0.08	-2.52572	-2.6094
1.0833	-0.06	0.06	-2.81341	-2.8722
1.1667	-0.05	0.05	-2.99573	-3.1352
1.25	-0.04	0.04	-3.21887	-3.3980
1.3333	-0.03	0.03	-3.50655	-3.6608
1.4166	-0.02	0.02	-3.91202	-3.9236
1.5	-0.01	0.01	-4.60517	-4.1867
1.5833	-0.01	0.01	-4.60517	-4.4495
1.6667	0	0	ERR	-4.7125
1.75	0	0	ERR	-4.9753
1.8333	0	0	ERR	-5.2381
1.9167	0	0	ERR	-5.5012
2	0	0	ERR	-5.7640
2.5	0	0	ERR	-7.3413
3	0	0	ERR	-8.9186
3.5	0	0	ERR	-10.4959
4	0	0	ERR	-12.0732
4.5	0	0	ERR	-13.6505
5	0	0	ERR	-15.2278
5.5	0	0	ERR	-16.8051
6	0	0	ERR	-18.3824
6.5	0	0	ERR	-19.9597
7	0	0	ERR	-21.5370
7.5	0	0	ERR	-23.1143
8	0	0	ERR	-24.6916
8.5	0	0	ERR	-26.2689
9	0	0	ERR	-27.8462
9.5	0	0	ERR	-29.4236
10	0	0	ERR	-31.0009

ROSE HILL SLUG TEST

MW08-02 RISING HEAD TEST 1



(Rising head test 1 for MW-09-01)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-09-01
Test by:	K.Arena	Date:	10/31/91
Analysis:	K.Arena	Date:	11/26/91

USER INPUT DATA		WORKSHEET	A=	3.0	3.0
Aquifer Thickness=	20.14	FIGURES	B =	0.46	0.46
Exposed Len.(Le) =	10		C =	2.7	2.7
Well Length (Lw) =	17.91	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.208
Well Radius (Rw) =	0.208	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6812	1.6812
Slug Volume =	0.025	ln(Re/Rw)		3.0193	3.0193
Static Level =	17.59	Max. Y(t)		1.46	
Offset time =	0	Regr. Y(0)		1.35	
Shape Factor =	16.2	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	16.2				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	3.8E-03	7.5E-03	5.52
Bouwer & Rice - estimated porosity	3.8E-03	7.5E-03	5.52
Bouwer & Rice - estimated Rw	3.8E-03	7.5E-03	5.52
Hvorslev - user porosity and Rw	4.9E-03	9.7E-03	7.07
Hvorslev - estimated porosity	4.9E-03	9.7E-03	7.07
Hvorslev - estimated Rw	4.9E-03	9.7E-03	7.07

Regression Output:

Constant	0.297528
Std Err of Y Est	0.004276
R Squared	0.999655
No. of Observations	12
Degrees of Freedom	10

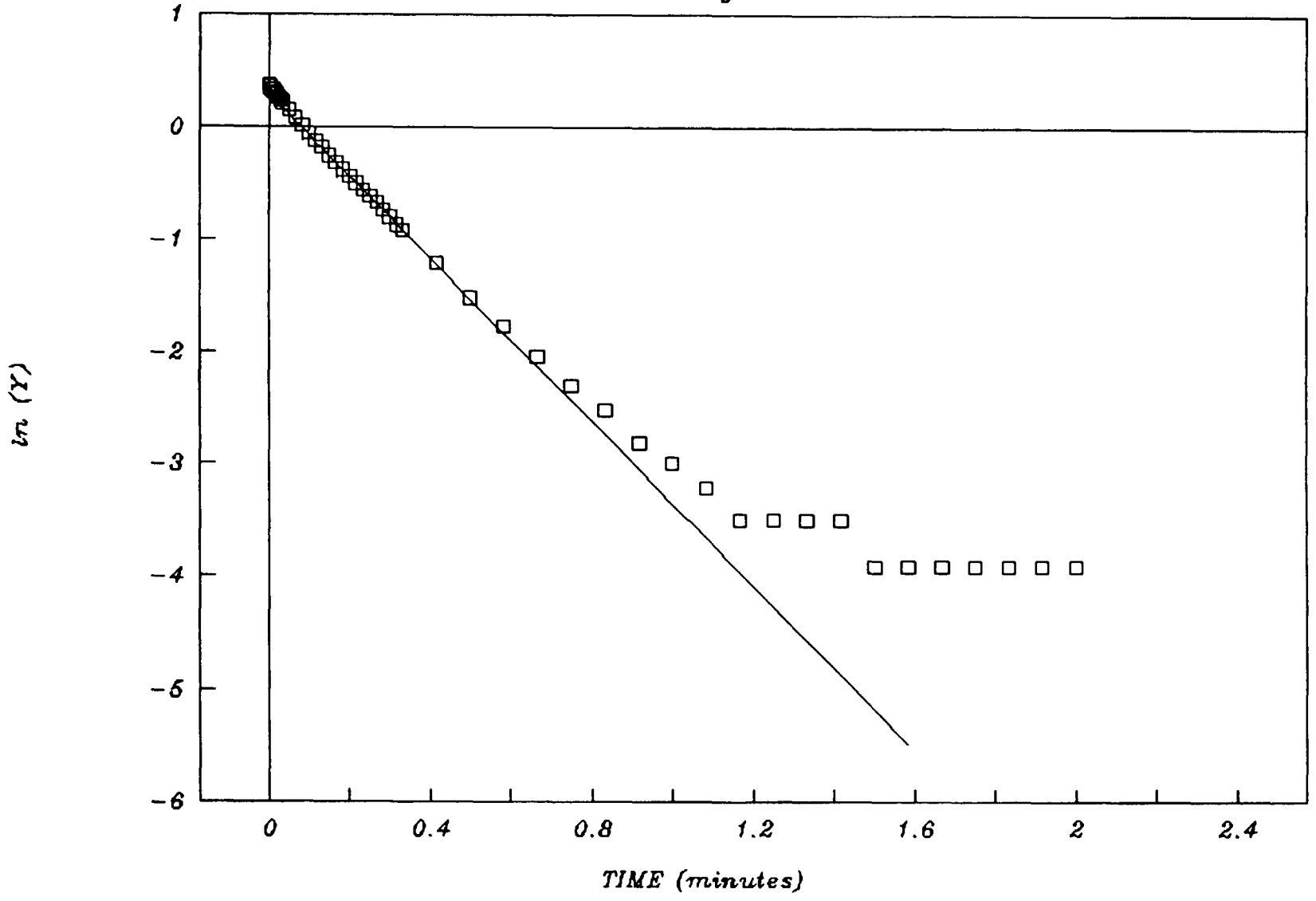
X Coefficient(s)	-3.65484
Std Err of Coef.	0.021456

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.46	1.46	0.3784		0.2975
0.0033	-1.43	1.43	0.3577		0.2855
0.0066	-1.4	1.40	0.3365		0.2734
0.0099	-1.39	1.39	0.3293		0.2613
0.0133	-1.37	1.37	0.3148		0.2489
0.0166	-1.35	1.35	0.3001		0.2369
0.02	-1.33	1.33	0.2852		0.2244
0.0233	-1.31	1.31	0.2700		0.2124
0.0266	-1.29	1.29	0.2546		0.2003
0.03	-1.27	1.27	0.2390		0.1879
0.0333	-1.25	1.25	0.2231		0.1758
0.05	-1.17	1.17	0.1570		0.1148
0.0666	-1.09	1.09	0.0862		0.0541
0.0833	-1.02	1.02	0.0198		-0.0069
0.1	-0.95	0.95	-0.0513		-0.0680
0.1166	-0.89	0.89	-0.1165		-0.1286
0.1333	-0.84	0.84	-0.1744		-0.1897
0.15	-0.78	0.78	-0.2485	B	-0.2507
0.1666	-0.73	0.73	-0.3147		-0.3114
0.1833	-0.69	0.69	-0.3711		-0.3724

0.2	-0.65	0.65	-0.4308		-0.4334
0.2166	-0.61	0.61	-0.4943		-0.4941
0.2333	-0.57	0.57	-0.5621		-0.5551
0.25	-0.54	0.54	-0.6162		-0.6162
0.2666	-0.51	0.51	-0.6733		-0.6769
0.2833	-0.48	0.48	-0.7340		-0.7379
0.3	-0.45	0.45	-0.7985		-0.7989
0.3166	-0.42	0.42	-0.8675		-0.8596
0.3333	-0.4	0.40	-0.9163	E	-0.9206
0.4167	-0.3	0.30	-1.2040		-1.2254
0.5	-0.22	0.22	-1.5141		-1.5299
0.5833	-0.17	0.17	-1.7720		-1.8343
0.6667	-0.13	0.13	-2.0402		-2.1392
0.75	-0.1	0.10	-2.3026		-2.4436
0.8333	-0.08	0.08	-2.5257		-2.7480
0.9167	-0.06	0.06	-2.8134		-3.0529
1	-0.05	0.05	-2.9957		-3.3573
1.0833	-0.04	0.04	-3.2189		-3.6618
1.1667	-0.03	0.03	-3.5066		-3.9666
1.25	-0.03	0.03	-3.5066		-4.2710
1.3333	-0.03	0.03	-3.5066		-4.5755
1.4166	-0.03	0.03	-3.5066		-4.8799
1.5	-0.02	0.02	-3.9120		-5.1847
1.5833	-0.02	0.02	-3.9120		-5.4892
1.6667	-0.02	0.02	-3.9120		-5.7940
1.75	-0.02	0.02	-3.9120		-6.0984
1.8333	-0.02	0.02	-3.9120		-6.4029
1.9167	-0.02	0.02	-3.9120		-6.7077
2	-0.02	0.02	-3.9120		-7.0122
2.5	-0.01	0.01	-4.6052		-8.8396
3	-0.02	0.02	-3.9120		-10.6670
3.5	-0.01	0.01	-4.6052		-12.4944
4	-0.01	0.01	-4.6052		-14.3218
4.5	-0.01	0.01	-4.6052		-16.1493
5	-0.01	0.01	-4.6052		-17.9767
5.5	-0.01	0.01	-4.6052		-19.8041
6	-0.01	0.01	-4.6052		-21.6315
6.5	-0.01	0.01	-4.6052		-23.4589
7	-0.01	0.01	-4.6052		-25.2864
7.5	-0.01	0.01	-4.6052		-27.1138
8	-0.01	0.01	-4.6052		-28.9412
8.5	-0.01	0.01	-4.6052		-30.7686
9	-0.01	0.01	-4.6052		-32.5960
9.5	-0.01	0.01	-4.6052		-34.4235
10	-0.01	0.01	-4.6052		-36.2509
12	-0.01	0.01	-4.6052		-43.5606

ROSEHILL SLUG TEST

MW-09-01 Rising Head Test 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 1

Client: EPA — Revised 11/05/91
Site: ROSE HILL — Well ID: MW10-01
Test by: DANIEL H. BERLER — Date: 10/30/91
Analysis: DANIEL H. BERLER — Date: 11/19/91

USER INPUT DATA		WORKSHEET FIGURES			
			A=	3.0	3.0
Aquifer Thickness=	30.56		B =		0.46
Exposed Len.(Le) =	10		C =	2.7	2.7
Well Length (Lw) =	28.99	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.208
Well Radius (Rw) =	0.208	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6819	1.6819
Slug Volume =	0.025	ln(Re/Rw)		3.5178	3.5178
Static Level =	8.51	Max. Y(t)		ERR	
Offset time =	0.0033	Regr. Y(0)		1.43	
Shape Factor =	16.2	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	16.2				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.2E-02	2.3E-02	16.68
Bouwer & Rice - estimated porosity	1.2E-02	2.3E-02	16.68
Bouwer & Rice - estimated Rw	1.2E-02	2.3E-02	16.68
Hvorslev - user porosity and Rw	1.3E-02	2.5E-02	18.37
Hvorslev - estimated porosity	1.3E-02	2.5E-02	18.37
Hvorslev - estimated Rw	1.3E-02	2.5E-02	18.37

Regression Output:

Constant	0.389842
Std Err of Y Est	0.019517
R Squared	0.998524
No. of Observations	10
Degrees of Freedom	8

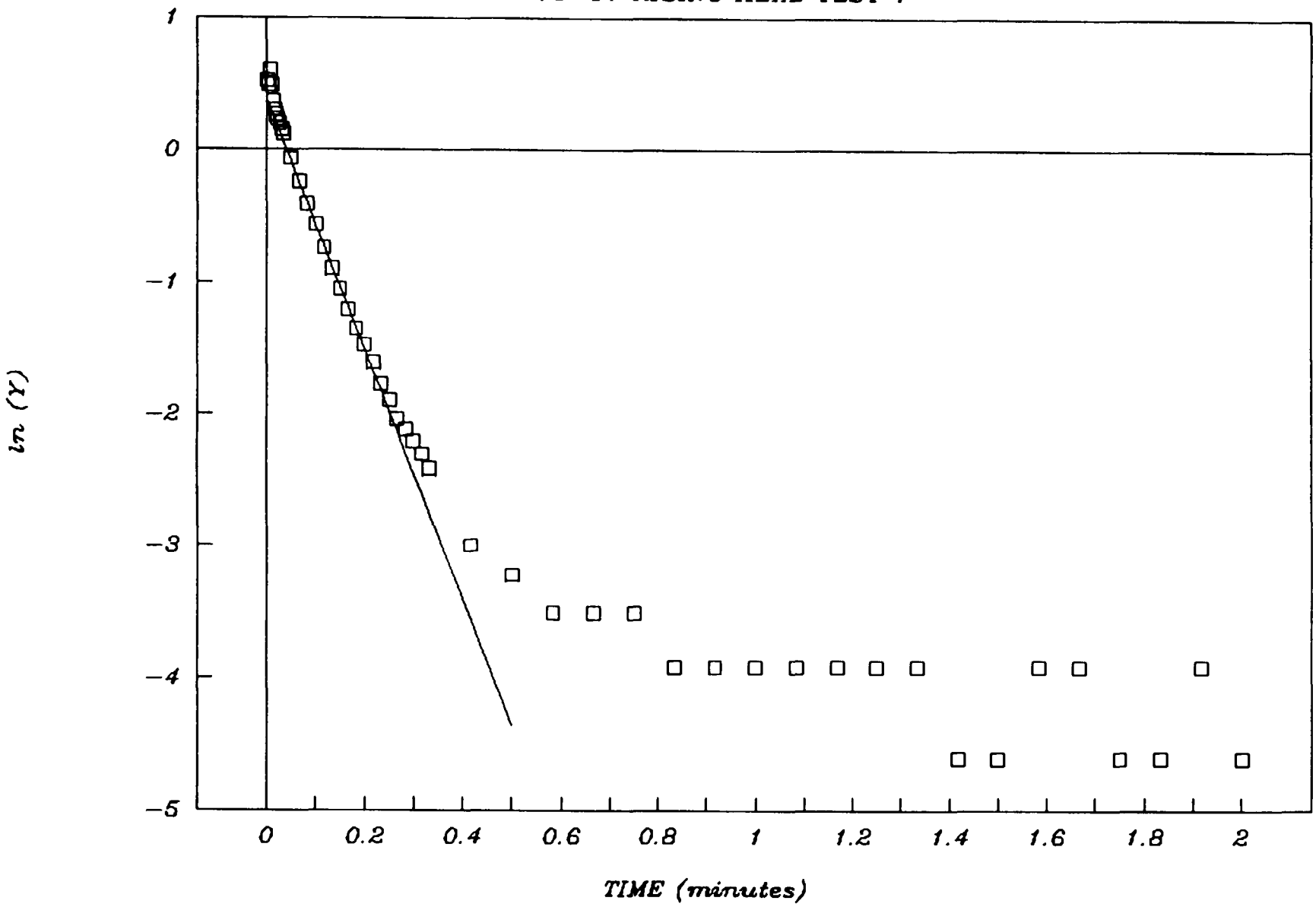
X Coefficient(s) -9.48606
Std Err of Coef. 0.128922

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.68	1.68	0.518793		0.3898
0.0033	-1.63	1.63	0.488580		0.3585
0.0066	-1.83	1.83	0.604315		0.3272
0.0099	-1.64	1.64	0.494696		0.2959
0.0133	-1.44	1.44	0.364643		0.2637
0.0166	-1.36	1.36	0.307484		0.2324
0.02	-1.31	1.31	0.270027		0.2001
0.0233	-1.26	1.26	0.231111		0.1688
0.0266	-1.22	1.22	0.198850		0.1375
0.03	-1.17	1.17	0.157003		0.1053
0.0333	-1.13	1.13	0.122217		0.0740
0.05	-0.94	0.94	-0.06187	B	-0.0845
0.0666	-0.79	0.79	-0.23572		-0.2419
0.0833	-0.67	0.67	-0.40047		-0.4003
0.1	-0.57	0.57	-0.56211		-0.5588
0.1166	-0.48	0.48	-0.73396		-0.7162
0.1333	-0.41	0.41	-0.89159		-0.8746
0.15	-0.35	0.35	-1.04982		-1.0331
0.1666	-0.3	0.3	-1.20397		-1.1905
0.1833	-0.26	0.26	-1.34707		-1.3490

0.2	-0.23	0.23	-1.46967 E	-1.5074
0.2166	-0.2	0.2	-1.60943	-1.6648
0.2333	-0.17	0.17	-1.77195	-1.8233
0.25	-0.15	0.15	-1.89711	-1.9817
0.2666	-0.13	0.13	-2.04022	-2.1391
0.2833	-0.12	0.12	-2.12026	-2.2976
0.3	-0.11	0.11	-2.20727	-2.4560
0.3166	-0.1	0.1	-2.30258	-2.6134
0.3333	-0.09	0.09	-2.40794	-2.7719
0.4167	-0.05	0.05	-2.99573	-3.5630
0.5	-0.04	0.04	-3.21887	-4.3532
0.5833	-0.03	0.03	-3.50655	-5.1434
0.6667	-0.03	0.03	-3.50655	-5.9345
0.75	-0.03	0.03	-3.50655	-6.7247
0.8333	-0.02	0.02	-3.91202	-7.5149
0.9167	-0.02	0.02	-3.91202	-8.3060
1	-0.02	0.02	-3.91202	-9.0962
1.0833	-0.02	0.02	-3.91202	-9.8864
1.1667	-0.02	0.02	-3.91202	-10.6775
1.25	-0.02	0.02	-3.91202	-11.4677
1.3333	-0.02	0.02	-3.91202	-12.2579
1.4166	-0.01	0.01	-4.60517	-13.0481
1.5	-0.01	0.01	-4.60517	-13.8393
1.5833	-0.02	0.02	-3.91202	-14.6294
1.6667	-0.02	0.02	-3.91202	-15.4206
1.75	-0.01	0.01	-4.60517	-16.2108
1.8333	-0.01	0.01	-4.60517	-17.0010
1.9167	-0.02	0.02	-3.91202	-17.7921
2	-0.01	0.01	-4.60517	-18.5823
2.5	-0.01	0.01	-4.60517	-23.3253
3	-0.01	0.01	-4.60517	-28.0683
3.5	-0.01	0.01	-4.60517	-32.8114
4	-0.01	0.01	-4.60517	-37.5544
4.5	-0.01	0.01	-4.60517	-42.2974
5	-0.01	0.01	-4.60517	-47.0405
5.5	-0.01	0.01	-4.60517	-51.7835
6	-0.01	0.01	-4.60517	-56.5265
6.5	-0.01	0.01	-4.60517	-61.2696
7	-0.01	0.01	-4.60517	-66.0126
7.5	-0.01	0.01	-4.60517	-70.7556
8	-0.01	0.01	-4.60517	-75.4987
8.5	-0.01	0.01	-4.60517	-80.2417
9	-0.01	0.01	-4.60517	-84.9847
9.5	-0.01	0.01	-4.60517	-89.7277

ROSE HILL SLUG TEST

MW10-01 RISING HEAD TEST 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 2

Client:	EPA			Revised	11/05/91
Site:	ROSE HILL			Well ID:	MW11-01
Test by:	DANIEL H. BERLER			Date:	10/31/91
Analysis:	DANIEL H. BERLER			Date:	11/21/91
USER INPUT DATA		WORKSHEET	A=	2.9	2.9
Aquifer Thickness=	40.7	FIGURES	B =		0.45
Exposed Len.(Le) =	15		C =	2.6	2.6
Well Length (Lw) =	16.05	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.333
Well Radius (Rw) =	0.333	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6532	1.6532
Slug Volume =	0.025	ln(Re/Rw)		2.8781	2.8781
Static Level =	8.20	Max. Y(t)		1.09	
Offset time =	0	Regr. Y(0)		0.95	
Shape Factor =	24.8	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	24.8				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.3E-03	2.5E-03	1.85
Bouwer & Rice - estimated porosity	1.3E-03	2.5E-03	1.85
Bouwer & Rice - estimated Rw	1.3E-03	2.5E-03	1.85
Hvorslev - user porosity and Rw	1.7E-03	3.3E-03	2.44
Hvorslev - estimated porosity	1.7E-03	3.3E-03	2.44
Hvorslev - estimated Rw	1.7E-03	3.3E-03	2.44

Rw: If radius is thought to be variable
ESTIMATED POROSITY: If radius is thought to remain the same ove screened length

Regression Output:

Constant	-0.04849
Std Err of Y Est	0.021893
R Squared	0.972628
No. of Observations	13
Degrees of Freedom	11

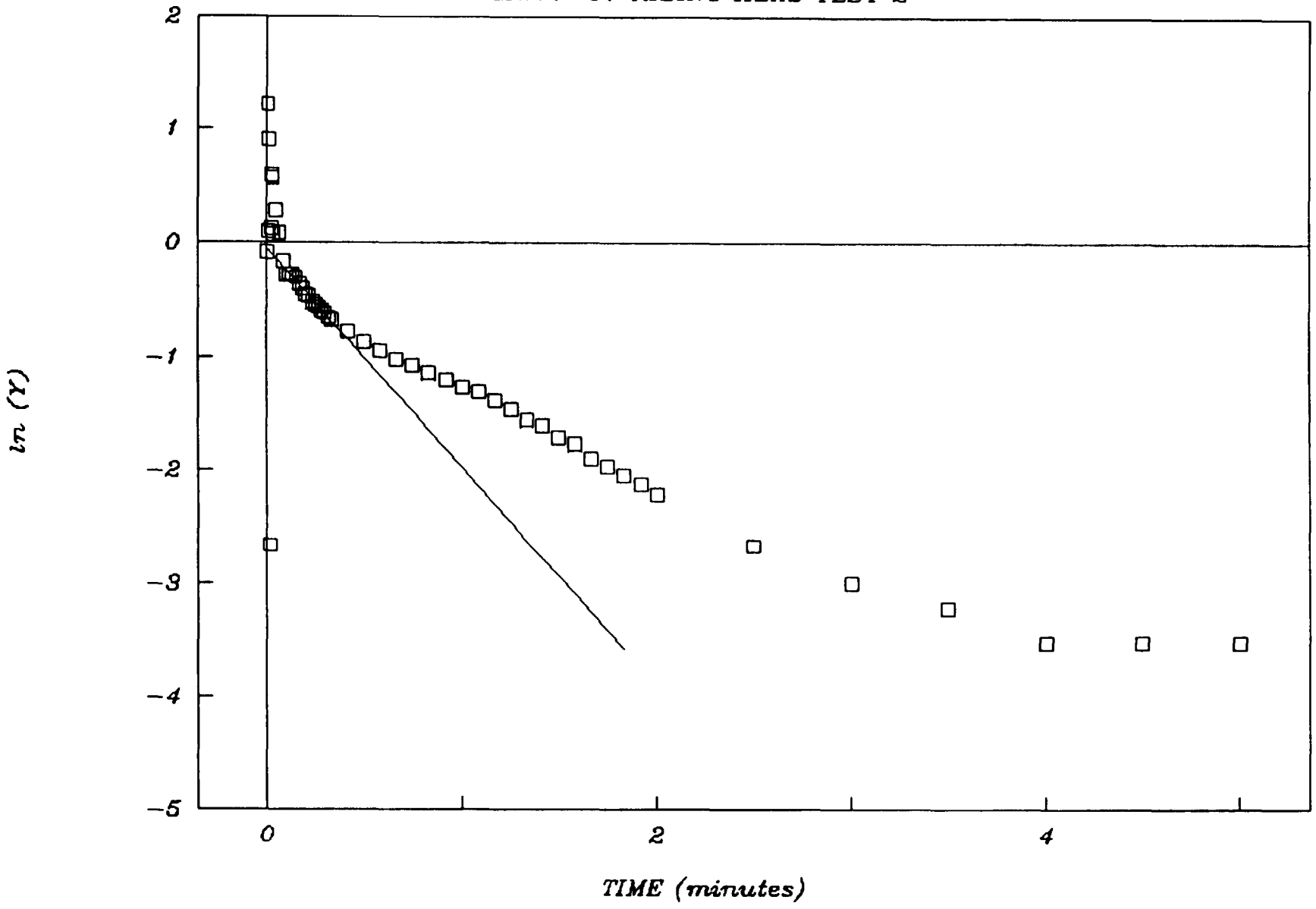
X Coefficient(s) -1.92508
Std Err of Coef. 0.097370

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0.0033	-0.92	0.92	-0.08338		-0.0548
0.0066	-3.36	3.36	1.211940		-0.0612
0.0099	-2.48	2.48	0.908258		-0.0675
0.0133	-1.1	1.1	0.095310		-0.0741
0.0166	0	0	ERR		-0.0804
0.02	0.07	0.07	-2.65926		-0.0870
0.0233	-1.13	1.13	0.122217		-0.0933
0.0266	-1.8	1.8	0.587786		-0.0997
0.03	-1.75	1.75	0.559615		-0.1062
0.0333	-1.07	1.07	0.067658		-0.1126
0.05	-1.32	1.32	0.277631		-0.1447
0.0666	-1.09	1.09	0.086177		-0.1767
0.0833	-0.85	0.85	-0.16251		-0.2088
0.1	-0.75	0.75	-0.28768	B	-0.2410
0.1166	-0.76	0.76	-0.27443		-0.2730
0.1333	-0.76	0.76	-0.27443		-0.3051
0.15	-0.74	0.74	-0.30110		-0.3373

0.1666	-0.7	0.7	-0.35667		-0.3692
0.1833	-0.67	0.67	-0.40047		-0.4014
0.2	-0.64	0.64	-0.44628		-0.4335
0.2166	-0.63	0.63	-0.46203		-0.4655
0.2333	-0.6	0.6	-0.51082		-0.4976
0.25	-0.58	0.58	-0.54472		-0.5298
0.2666	-0.57	0.57	-0.56211		-0.5617
0.2833	-0.55	0.55	-0.59783		-0.5939
0.3	-0.54	0.54	-0.61618	E	-0.6260
0.3166	-0.52	0.52	-0.65392		-0.6580
0.3333	-0.51	0.51	-0.67334		-0.6901
0.4167	-0.46	0.46	-0.77652		-0.8507
0.5	-0.42	0.42	-0.86750		-1.0110
0.5833	-0.39	0.39	-0.94160		-1.1714
0.6667	-0.36	0.36	-1.02165		-1.3319
0.75	-0.34	0.34	-1.07880		-1.4923
0.8333	-0.32	0.32	-1.13943		-1.6527
0.9167	-0.3	0.3	-1.20397		-1.8132
1	-0.28	0.28	-1.27296		-1.9736
1.0833	-0.27	0.27	-1.30933		-2.1339
1.1667	-0.25	0.25	-1.38629		-2.2945
1.25	-0.23	0.23	-1.46967		-2.4549
1.3333	-0.21	0.21	-1.56064		-2.6152
1.4166	-0.2	0.2	-1.60943		-2.7756
1.5	-0.18	0.18	-1.71479		-2.9361
1.5833	-0.17	0.17	-1.77195		-3.0965
1.6667	-0.15	0.15	-1.89711		-3.2570
1.75	-0.14	0.14	-1.96611		-3.4174
1.8333	-0.13	0.13	-2.04022		-3.5778
1.9167	-0.12	0.12	-2.12026		-3.7383
2	-0.11	0.11	-2.20727		-3.8987
2.5	-0.07	0.07	-2.65926		-4.8612
3	-0.05	0.05	-2.99573		-5.8238
3.5	-0.04	0.04	-3.21887		-6.7863
4	-0.03	0.03	-3.50655		-7.7488
4.5	-0.03	0.03	-3.50655		-8.7114
5	-0.03	0.03	-3.50655		-9.6739
5.5	-0.03	0.03	-3.50655		-10.6365
6	-0.02	0.02	-3.91202		-11.5990
6.5	-0.02	0.02	-3.91202		-12.5616
7	-0.02	0.02	-3.91202		-13.5241
7.5	-0.02	0.02	-3.91202		-14.4867
8	-0.02	0.02	-3.91202		-15.4492
8.5	-0.02	0.02	-3.91202		-16.4117
9	-0.02	0.02	-3.91202		-17.3743
9.5	-0.02	0.02	-3.91202		-18.3368
10	-0.02	0.02	-3.91202		-19.2994

ROSE HILL SLUG TEST

MW11-01 RISING HEAD TEST 2



(Slug Test for 1st rising head test in MW-11-02)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	ROSEHILL	Well ID:	MW-11-02
Test by:	K.ARENA	Date:	10/29/91
Analysis:	K.ARENA	Date:	11/21/91

USER INPUT DATA		WORKSHEET		A=	3.0	3.0
Aquifer Thickness=	41.94	FIGURES		B =	0.46	0.46
Exposed Len.(Le) =	10			C =	2.7	2.7
Well Length (Lw) =	39.64	R(eq) =	0.0833		0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw				0.208
Well Radius (Rw) =	0.208	Est. n			NA	
Sandpack Porosity=	0.270	log(Le/Rw)			1.6812	1.6812
Slug Volume =	0.025	ln(Re/Rw)			3.4001	3.4001
Static Level =	7.35	Max. Y(t)			0.43	
Offset time =	0.0133	Regr. Y(0)			0.43	
Shape Factor =	16.2	Casing Y(0)			1.15	UNDRAINED
(F from est. Rw)	16.2					

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	3.7E-02	7.4E-02	53.88
Bouwer & Rice - estimated porosity	3.7E-02	7.4E-02	53.88
Bouwer & Rice - estimated Rw	3.7E-02	7.4E-02	53.88
Hvorslev - user porosity and Rw	4.3E-02	8.4E-02	61.34
Hvorslev - estimated porosity	4.3E-02	8.4E-02	61.34
Hvorslev - estimated Rw	4.3E-02	8.4E-02	61.34

Regression Output:

Constant	-0.41134
Std Err of Y Est	0.019563
R Squared	0.989796
No. of Observations	5
Degrees of Freedom	3

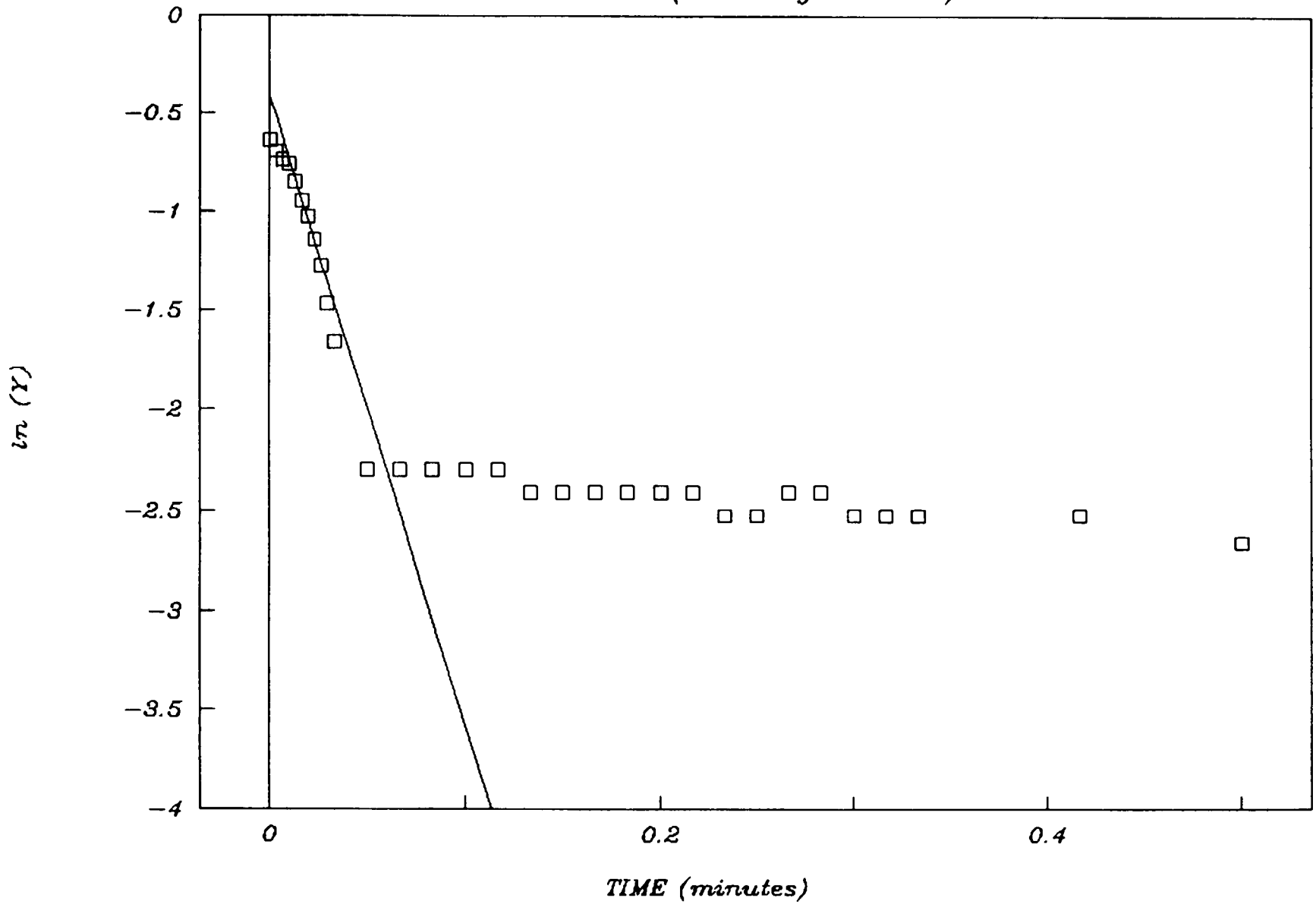
X Coefficient(s)	-31.6923
Std Err of Coef.	1.857816

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.53	0.53	-0.6349		-0.4113
0.0033	-0.5	0.50	-0.6931		-0.5159
0.0066	-0.48	0.48	-0.7340		-0.6205
0.0099	-0.47	0.47	-0.7550		-0.7251
0.0133	-0.43	0.43	-0.8440	B	-0.8329
0.0166	-0.39	0.39	-0.9416		-0.9374
0.02	-0.36	0.36	-1.0217		-1.0452
0.0233	-0.32	0.32	-1.1394		-1.1498
0.0266	-0.28	0.28	-1.2730	E	-1.2544
0.03	-0.23	0.23	-1.4697		-1.3621
0.0333	-0.19	0.19	-1.6607		-1.4667
0.05	-0.1	0.10	-2.3026		-1.9960
0.0666	-0.1	0.10	-2.3026		-2.5221
0.0833	-0.1	0.10	-2.3026		-3.0513
0.1	-0.1	0.10	-2.3026		-3.5806
0.1166	-0.1	0.10	-2.3026		-4.1067
0.1333	-0.09	0.09	-2.4079		-4.6359
0.15	-0.09	0.09	-2.4079		-5.1652
0.1666	-0.09	0.09	-2.4079		-5.6913
0.1833	-0.09	0.09	-2.4079		-6.2205

0.2	-0.09	0.09	-2.4079	-6.7498
0.2166	-0.09	0.09	-2.4079	-7.2759
0.2333	-0.08	0.08	-2.5257	-7.8052
0.25	-0.08	0.08	-2.5257	-8.3344
0.2666	-0.09	0.09	-2.4079	-8.8605
0.2833	-0.09	0.09	-2.4079	-9.3898
0.3	-0.08	0.08	-2.5257	-9.9190
0.3166	-0.08	0.08	-2.5257	-10.4451
0.3333	-0.08	0.08	-2.5257	-10.9744
0.4167	-0.08	0.08	-2.5257	-13.6175
0.5	-0.07	0.07	-2.6593	-16.2575
0.5833	-0.07	0.07	-2.6593	-18.8975
0.6667	-0.07	0.07	-2.6593	-21.5406
0.75	-0.07	0.07	-2.6593	-24.1806
0.8333	-0.07	0.07	-2.6593	-26.8205
0.9167	-0.06	0.06	-2.8134	-29.4637
1	-0.07	0.07	-2.6593	-32.1037
1.0833	-0.07	0.07	-2.6593	-34.7436
1.1667	-0.07	0.07	-2.6593	-37.3868
1.25	-0.06	0.06	-2.8134	-40.0267
1.3333	-0.07	0.07	-2.6593	-42.6667
1.4166	-0.06	0.06	-2.8134	-45.3067
1.5	-0.06	0.06	-2.8134	-47.9498
1.5833	-0.06	0.06	-2.8134	-50.5898
1.6667	-0.06	0.06	-2.8134	-53.2329
1.75	-0.06	0.06	-2.8134	-55.8729
1.8333	-0.06	0.06	-2.8134	-58.5129
1.9167	-0.07	0.07	-2.6593	-61.1560
2	-0.06	0.06	-2.8134	-63.7960
2.5	-0.06	0.06	-2.8134	-79.6421
3	-0.06	0.06	-2.8134	-95.4883
3.5	-0.06	0.06	-2.8134	-111.3344
4	-0.06	0.06	-2.8134	-127.1806
4.5	-0.07	0.07	-2.6593	-143.0267
5	-0.06	0.06	-2.8134	-158.8729
5.5	-0.06	0.06	-2.8134	-174.7190
6	-0.06	0.06	-2.8134	-190.5652
6.5	-0.06	0.06	-2.8134	-206.4113
7	-0.06	0.06	-2.8134	-222.2575
7.5	-0.06	0.06	-2.8134	-238.1036
8	-0.06	0.06	-2.8134	-253.9498
8.5	-0.06	0.06	-2.8134	-269.7960
9	-0.06	0.06	-2.8134	-285.6421
9.5	-0.06	0.06	-2.8134	-301.4883
10	-0.06	0.06	-2.8134	-317.3344
12	-0.07	0.07	-2.6593	-380.7190

ROSEHILL

Well MW-11-02 (1st rising head test)



(Rising head test 1)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-11-03
Test by: K.Arena Date: 10/29/91
Analysis:K.Arena Date: 12/04/91

USER INPUT DATA		WORKSHEET	A=	4.7	4.7
Aquifer Thickness=	78.15	FIGURES	B =	0.79	0.79
Exposed Len.(Le) =	30		C =	5.0	5.0
Well Length (Lw) =	74.54	R(eq) =	0.1667	0.1667	0.1667
Casing Radius(Rc)=	0.167	Est. Rw			0.250
Well Radius (Rw) =	0.250	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		2.0792	2.0792
Slug Volume =	0.153	ln(Re/Rw)		4.0031	4.0031
Static Level =	5.32	Max. Y(t)		1.83	
Offset time =	0.03	Regr. Y(0)		1.76	
Shape Factor =	39.4	Casing Y(0)		1.75	UNDRAINED
(F from est. Rw)	39.4				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	7.6E-05	1.5E-04	0.11
Bouwer & Rice - estimated porosity	7.6E-05	1.5E-04	0.11
Bouwer & Rice - estimated Rw	7.6E-05	1.5E-04	0.11
Hvorslev - user porosity and Rw	9.1E-05	1.8E-04	0.13
Hvorslev - estimated porosity	9.1E-05	1.8E-04	0.13
Hvorslev - estimated Rw	9.1E-05	1.8E-04	0.13

Regression Output:

Constant	0.564232
Std Err of Y Est	0.004017
R Squared	0.997963
No. of Observations	14
Degrees of Freedom	12

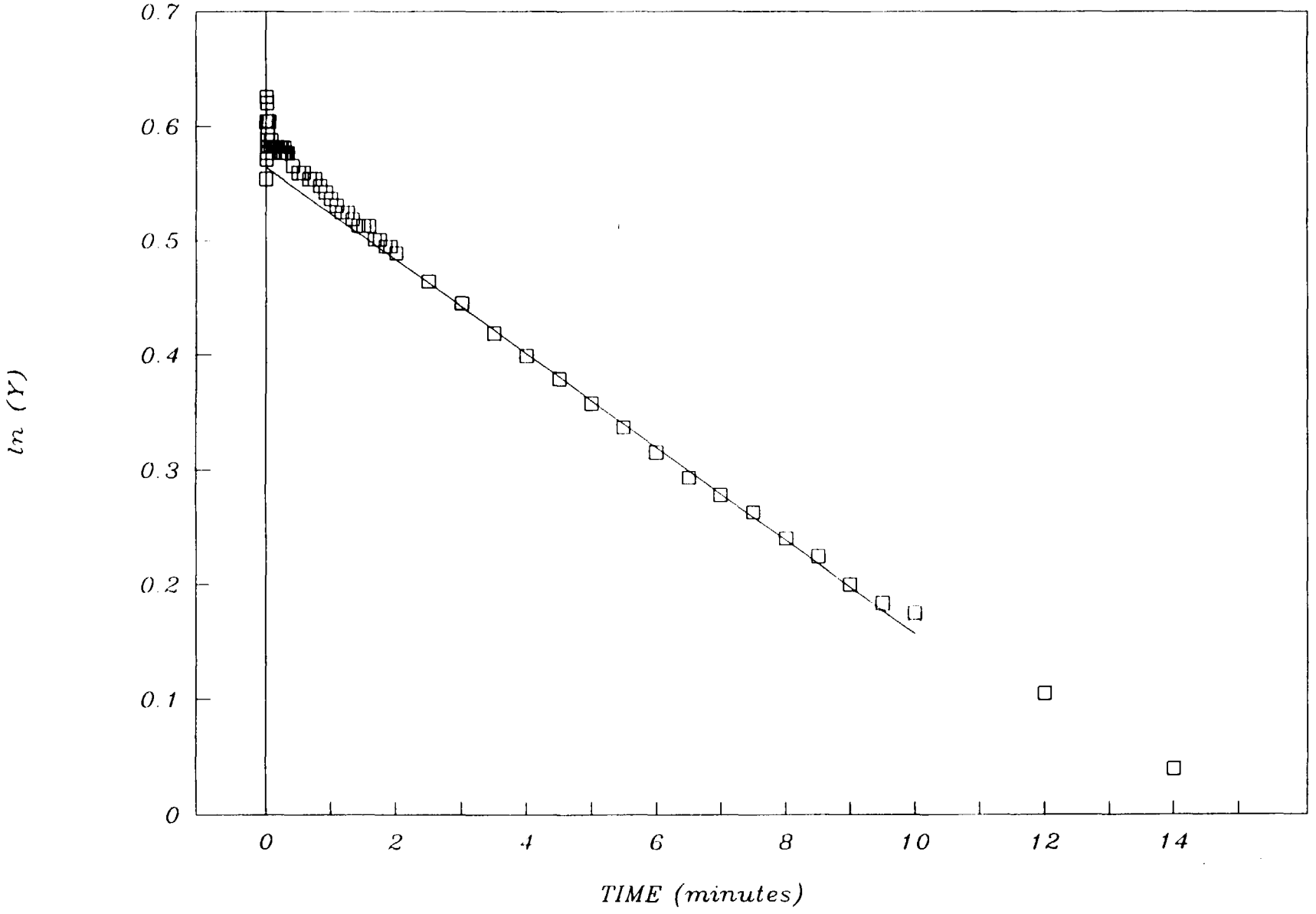
X Coefficient(s)	-0.04085
Std Err of Coef.	0.000532

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.74	1.74	0.5539		0.5642
0.0033	-1.83	1.83	0.6043		0.5641
0.0066	-1.87	1.87	0.6259		0.5640
0.0099	-1.77	1.77	0.5710		0.5638
0.0133	-1.79	1.79	0.5822		0.5637
0.0166	-1.86	1.86	0.6206		0.5636
0.02	-1.8	1.80	0.5878		0.5634
0.0233	-1.78	1.78	0.5766		0.5633
0.0266	-1.83	1.83	0.6043		0.5631
0.03	-1.81	1.81	0.5933		0.5630
0.0333	-1.79	1.79	0.5822		0.5629
0.05	-1.83	1.83	0.6043		0.5622
0.0666	-1.79	1.79	0.5822		0.5615
0.0833	-1.8	1.80	0.5878		0.5608
0.1	-1.79	1.79	0.5822		0.5601
0.1166	-1.79	1.79	0.5822		0.5595
0.1333	-1.79	1.79	0.5822		0.5588
0.15	-1.79	1.79	0.5822		0.5581
0.1666	-1.79	1.79	0.5822		0.5574
0.1833	-1.79	1.79	0.5822		0.5567

0.2	-1.78	1.78	0.5766		0.5561
0.2166	-1.79	1.79	0.5822		0.5554
0.2333	-1.78	1.78	0.5766		0.5547
0.25	-1.79	1.79	0.5822		0.5540
0.2666	-1.78	1.78	0.5766		0.5533
0.2833	-1.79	1.79	0.5822	B1	0.5527
0.3	-1.78	1.78	0.5766		0.5520
0.3166	-1.78	1.78	0.5766		0.5513
0.3333	-1.78	1.78	0.5766		0.5506
0.4167	-1.76	1.76	0.5653		0.5472
0.5	-1.75	1.75	0.5596		0.5438
0.5833	-1.75	1.75	0.5596		0.5404
0.6667	-1.74	1.74	0.5539		0.5370
0.75	-1.74	1.74	0.5539		0.5336
0.8333	-1.73	1.73	0.5481	E1	0.5302
0.9167	-1.72	1.72	0.5423		0.5268
1	-1.71	1.71	0.5365		0.5234
1.0833	-1.7	1.70	0.5306		0.5200
1.1667	-1.69	1.69	0.5247		0.5166
1.25	-1.69	1.69	0.5247		0.5132
1.3333	-1.68	1.68	0.5188		0.5098
1.4166	-1.67	1.67	0.5128		0.5064
1.5	-1.67	1.67	0.5128		0.5030
1.5833	-1.67	1.67	0.5128		0.4996
1.6667	-1.65	1.65	0.5008		0.4961
1.75	-1.65	1.65	0.5008		0.4927
1.8333	-1.64	1.64	0.4947		0.4893
1.9167	-1.64	1.64	0.4947		0.4859
2	-1.63	1.63	0.4886	B2	0.4825
2.5	-1.59	1.59	0.4637		0.4621
3	-1.56	1.56	0.4447		0.4417
3.5	-1.52	1.52	0.4187		0.4213
4	-1.49	1.49	0.3988		0.4008
4.5	-1.46	1.46	0.3784		0.3804
5	-1.43	1.43	0.3577		0.3600
5.5	-1.4	1.40	0.3365		0.3396
6	-1.37	1.37	0.3148		0.3191
6.5	-1.34	1.34	0.2927		0.2987
7	-1.32	1.32	0.2776		0.2783
7.5	-1.3	1.30	0.2624		0.2578
8	-1.27	1.27	0.2390		0.2374
8.5	-1.25	1.25	0.2231	E2	0.2170
9	-1.22	1.22	0.1989		0.1966
9.5	-1.2	1.20	0.1823		0.1761
10	-1.19	1.19	0.1740		0.1557
12	-1.11	1.11	0.1044		0.0740
14	-1.04	1.04	0.0392		-0.0077
16	-0.98	0.98	-0.0202		-0.0894
18	-0.93	0.93	-0.0726		-0.1711

ROSEHILL SLUG TEST

MW-11-03 Rising Head Test 1



(Rising Head Test 1 MW-12-01)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA Revised 11/05/91
Site: Rosehill Well ID: MW-12-01
Test by: K.Arena Date: 11/01/91
Analysis:K.Arena Date: 11/26/91

USER INPUT DATA		WORKSHEET	A=	2.9	2.9
Aquifer Thickness=	44.94	FIGURES	B =	0.45	0.45
Exposed Len.(Le) =	15		C =	2.6	2.6
Well Length (Lw) =	20.44	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.333
Well Radius (Rw) =	0.333	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.6532	1.6532
Slug Volume =	0.025	ln(Re/Rw)		2.6780	2.6780
Static Level =	2.05	Max. Y(t)		ERR	
Offset time =	0	Regr. Y(0)		1.38	
Shape Factor =	24.8	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	24.8				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.4E-03	2.8E-03	2.02
Bouwer & Rice - estimated porosity	1.4E-03	2.8E-03	2.02
Bouwer & Rice - estimated Rw	1.4E-03	2.8E-03	2.02
Hvorslev - user porosity and Rw	2.0E-03	3.9E-03	2.88
Hvorslev - estimated porosity	2.0E-03	3.9E-03	2.88
Hvorslev - estimated Rw	2.0E-03	3.9E-03	2.88

Regression Output:

Constant	0.324627
Std Err of Y Est	0.016322
R Squared	0.999446
No. of Observations	20
Degrees of Freedom	18

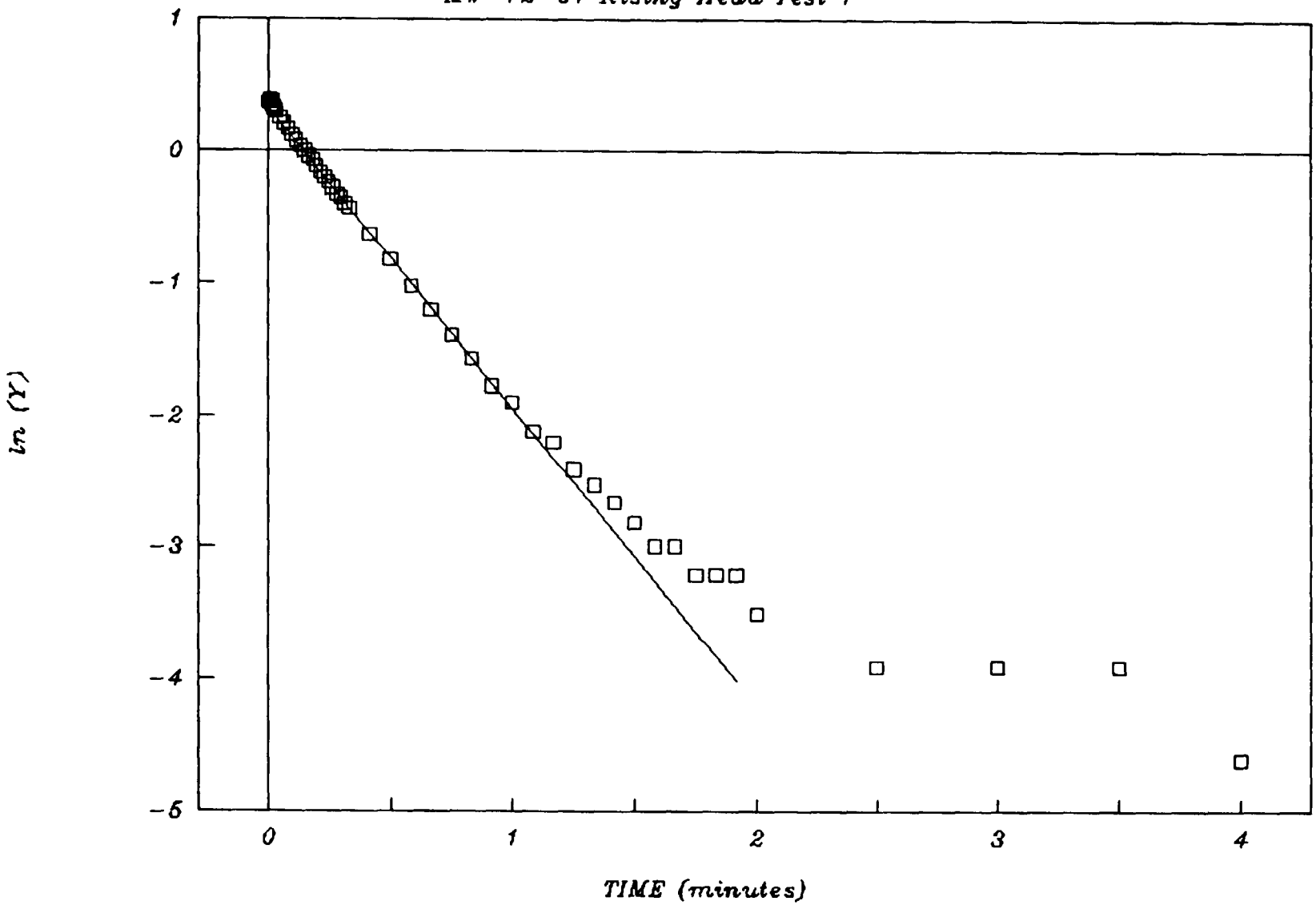
X Coefficient(s) -2.26617
Std Err of Coef. 0.012574

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.44	1.44	0.3646		0.3246
0.0033	-1.44	1.44	0.3646		0.3171
0.0066	-1.47	1.47	0.3853		0.3097
0.0099	-1.44	1.44	0.3646		0.3022
0.0133	-1.42	1.42	0.3507		0.2945
0.0166	-1.45	1.45	0.3716		0.2870
0.02	-1.4	1.40	0.3365		0.2793
0.0233	-1.38	1.38	0.3221		0.2718
0.0266	-1.37	1.37	0.3148		0.2643
0.03	-1.36	1.36	0.3075		0.2566
0.0333	-1.34	1.34	0.2927		0.2492
0.05	-1.28	1.28	0.2469		0.2113
0.0666	-1.23	1.23	0.2070		0.1737
0.0833	-1.18	1.18	0.1655		0.1359
0.1	-1.13	1.13	0.1222		0.0980
0.1166	-1.08	1.08	0.0770		0.0604
0.1333	-1.04	1.04	0.0392		0.0225
0.15	-1	1.00	0.0000		-0.0153
0.1666	-0.96	0.96	-0.0408	B	-0.0529
0.1833	-0.93	0.93	-0.0726		-0.0908

0.2	-0.89	0.89	-0.1165		-0.1286
0.2166	-0.85	0.85	-0.1625		-0.1662
0.2333	-0.82	0.82	-0.1985		-0.2041
0.25	-0.79	0.79	-0.2357		-0.2419
0.2666	-0.76	0.76	-0.2744		-0.2795
0.2833	-0.72	0.72	-0.3285		-0.3174
0.3	-0.7	0.70	-0.3567		-0.3552
0.3166	-0.67	0.67	-0.4005		-0.3928
0.3333	-0.65	0.65	-0.4308		-0.4307
0.4167	-0.53	0.53	-0.6349		-0.6197
0.5	-0.44	0.44	-0.8210		-0.8085
0.5833	-0.36	0.36	-1.0217		-0.9972
0.6667	-0.3	0.30	-1.2040		-1.1862
0.75	-0.25	0.25	-1.3863		-1.3750
0.8333	-0.21	0.21	-1.5606		-1.5638
0.9167	-0.17	0.17	-1.7720		-1.7528
1	-0.15	0.15	-1.8971		-1.9416
1.0833	-0.12	0.12	-2.1203	E	-2.1303
1.1667	-0.11	0.11	-2.2073		-2.3193
1.25	-0.09	0.09	-2.4079		-2.5081
1.3333	-0.08	0.08	-2.5257		-2.6969
1.4166	-0.07	0.07	-2.6593		-2.8856
1.5	-0.06	0.06	-2.8134		-3.0746
1.5833	-0.05	0.05	-2.9957		-3.2634
1.6667	-0.05	0.05	-2.9957		-3.4524
1.75	-0.04	0.04	-3.2189		-3.6412
1.8333	-0.04	0.04	-3.2189		-3.8300
1.9167	-0.04	0.04	-3.2189		-4.0190
2	-0.03	0.03	-3.5066		-4.2077
2.5	-0.02	0.02	-3.9120		-5.3408
3	-0.02	0.02	-3.9120		-6.4739
3.5	-0.02	0.02	-3.9120		-7.6070
4	-0.01	0.01	-4.6052		-8.7401
4.5	-0.02	0.02	-3.9120		-9.8732
5	-0.02	0.02	-3.9120		-11.0063
5.5	-0.02	0.02	-3.9120		-12.1394
6	-0.01	0.01	-4.6052		-13.2725
6.5	-0.01	0.01	-4.6052		-14.4055
7	-0.01	0.01	-4.6052		-15.5386
7.5	-0.01	0.01	-4.6052		-16.6717
8	-0.01	0.01	-4.6052		-17.8048
8.5	-0.01	0.01	-4.6052		-18.9379

ROSEHILL SLUG TEST

MW-12-01 Rising Head Test 1



(MW-12-02 rising head test 1)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)

Client:	EPA	Revised	11/05/91
Site:	Rosehill	Well ID:	MW-12-02
Test by:	K.Arena	Date:	11/01/91
Analysis:	K.Arena	Date:	11/26/91

USER INPUT DATA		WORKSHEET	A=	2.2	2.2
Aquifer Thickness=	44.67	FIGURES	B =	0.35	0.35
Exposed Len.(Le) =	10		C =	1.9	1.9
Well Length (Lw) =	44.67	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.417
Well Radius (Rw) =	0.417	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.3802	1.3802
Slug Volume =	0.025	ln(Re/Rw)		3.1970	3.1970
Static Level =	2.64	Max. Y(t)		0.69	
Offset time =	0	Regr. Y(0)		0.69	
Shape Factor =	19.8	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	19.8				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	2.3E-02	4.4E-02	32.44
Bouwer & Rice - estimated porosity	2.3E-02	4.4E-02	32.44
Bouwer & Rice - estimated Rw	2.3E-02	4.4E-02	32.44
Hvorslev - user porosity and Rw	2.2E-02	4.4E-02	32.25
Hvorslev - estimated porosity	2.2E-02	4.4E-02	32.25
Hvorslev - estimated Rw	2.2E-02	4.4E-02	32.25

Regression Output:

Constant	-0.37675
Std Err of Y Est	0.005171
R Squared	0.998956
No. of Observations	7
Degrees of Freedom	5

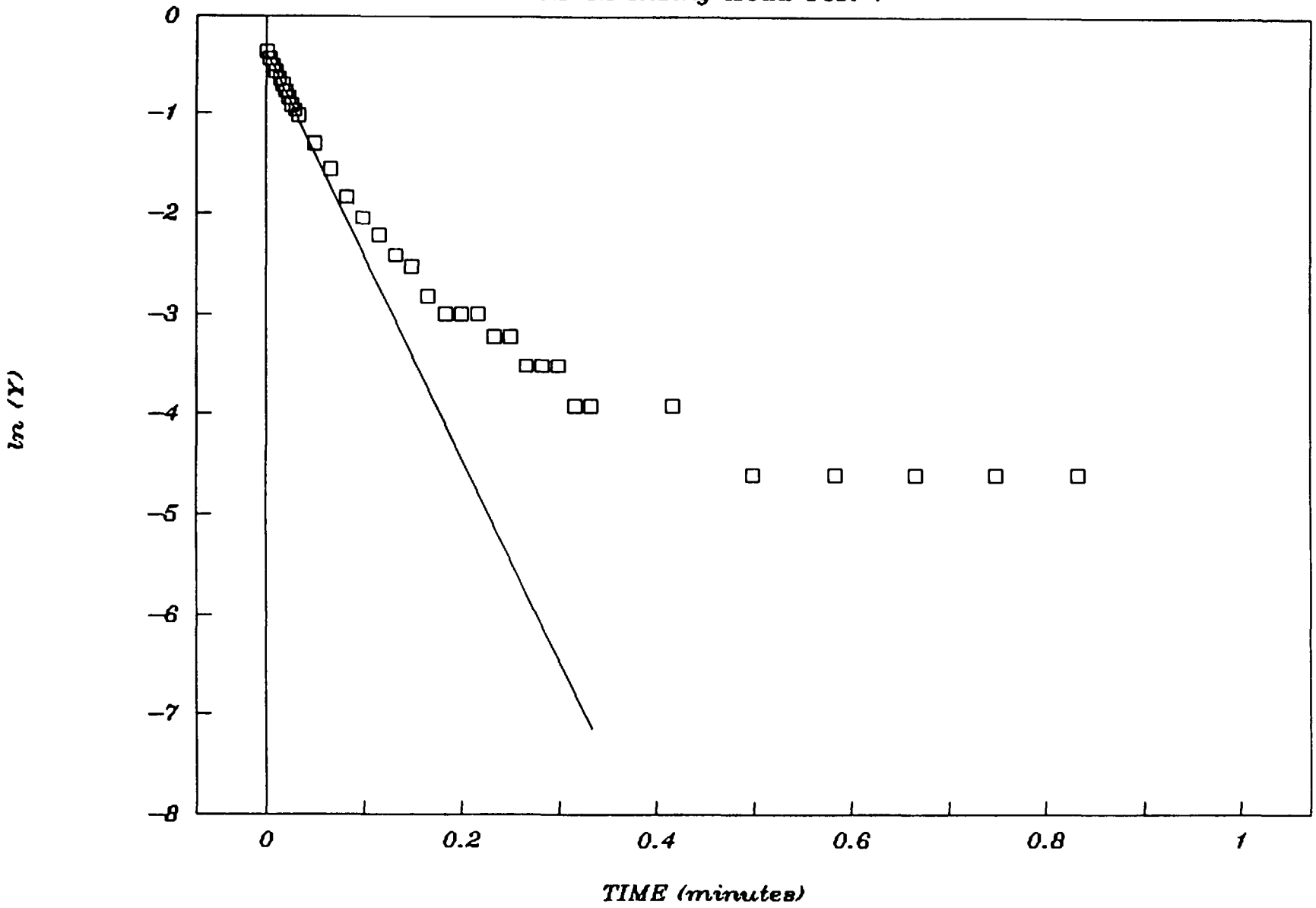
X Coefficient(s)	-20.2943
Std Err of Coef.	0.293272

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.69	0.69	-0.3711	B	-0.3768
0.0033	-0.64	0.64	-0.4463		-0.4437
0.0066	-0.6	0.60	-0.5108		-0.5107
0.0099	-0.56	0.56	-0.5798		-0.5777
0.0133	-0.52	0.52	-0.6539		-0.6467
0.0166	-0.49	0.49	-0.7133		-0.7136
0.02	-0.46	0.46	-0.7765	E	-0.7826
0.0233	-0.43	0.43	-0.8440		-0.8496
0.0266	-0.4	0.40	-0.9163		-0.9166
0.03	-0.38	0.38	-0.9676		-0.9856
0.0333	-0.36	0.36	-1.0217		-1.0526
0.05	-0.27	0.27	-1.3093		-1.3915
0.0666	-0.21	0.21	-1.5606		-1.7284
0.0833	-0.16	0.16	-1.8326		-2.0673
0.1	-0.13	0.13	-2.0402		-2.4062
0.1166	-0.11	0.11	-2.2073		-2.7431
0.1333	-0.09	0.09	-2.4079		-3.0820
0.15	-0.08	0.08	-2.5257		-3.4209
0.1666	-0.06	0.06	-2.8134		-3.7578
0.1833	-0.05	0.05	-2.9957		-4.0967

0.2	-0.05	0.05	-2.9957	-4.4356
0.2166	-0.05	0.05	-2.9957	-4.7725
0.2333	-0.04	0.04	-3.2189	-5.1114
0.25	-0.04	0.04	-3.2189	-5.4503
0.2666	-0.03	0.03	-3.5066	-5.7872
0.2833	-0.03	0.03	-3.5066	-6.1261
0.3	-0.03	0.03	-3.5066	-6.4651
0.3166	-0.02	0.02	-3.9120	-6.8019
0.3333	-0.02	0.02	-3.9120	-7.1409
0.4167	-0.02	0.02	-3.9120	-8.8334
0.5	-0.01	0.01	-4.6052	-10.5239
0.5833	-0.01	0.01	-4.6052	-12.2144
0.6667	-0.01	0.01	-4.6052	-13.9070
0.75	-0.01	0.01	-4.6052	-15.5975
0.8333	-0.01	0.01	-4.6052	-17.2880
0.9167	0	0.00	ERR	-18.9806
1	0	0.00	ERR	-20.6711
1.0833	0	0.00	ERR	-22.3616
1.1667	0	0.00	ERR	-24.0542
1.25	0	0.00	ERR	-25.7447
1.3333	0	0.00	ERR	-27.4352
1.4166	0	0.00	ERR	-29.1257
1.5	0	0.00	ERR	-30.8183
1.5833	0	0.00	ERR	-32.5088
1.6667	0	0.00	ERR	-34.2013
1.75	0	0.00	ERR	-35.8919
1.8333	0	0.00	ERR	-37.5824
1.9167	0	0.00	ERR	-39.2749
2	0	0.00	ERR	-40.9654
2.5	0	0.00	ERR	-51.1126
3	0	0.00	ERR	-61.2598
3.5	0	0.00	ERR	-71.4070
4	0	0.00	ERR	-81.5541
4.5	0	0.00	ERR	-91.7013
5	0	0.00	ERR	-101.8485
5.5	0	0.00	ERR	-111.9956
6	0	0.00	ERR	-122.1428
6.5	0	0.00	ERR	-132.2900
7	0	0.00	ERR	-142.4372
7.5	0	0.00	ERR	-152.5843
8	0	0.00	ERR	-162.7315
8.5	0	0.00	ERR	-172.8787
9	0	0.00	ERR	-183.0259
9.5	0	0.00	ERR	-193.1730
10	0	0.00	ERR	-203.3202

ROSEHILL SLUG TEST

MW-12-02 Rising Head Test 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 1

Client: EPA — Revised 11/05/91
Site: ROSE HILL — Well ID: MW-13-01
Test by: DANIEL H. BERLER — Date: 10/28/91
Analysis: DANIEL H. BERLER — Date: 11/11/91

USER INPUT DATA		WORKSHEET FIGURES	A=	2.2	4.1
Aquifer Thickness=	22.96		B =	0.36	0.65
Exposed Len.(Le) =	10.02		C =	1.9	4.1
Well Length (Lw) =	8.39	R(eq) =	0.1871	0.0865	0.0865
Casing Radius(Rc)=	0.083	Est. Rw			0.094
Well Radius (Rw) =	0.333	Est. n		0.005	
Sandpack Porosity=	0.270	log(Le/Rw)		1.4013	1.9488
Slug Volume =	0.025	ln(Re/Rw)		2.0717	2.4701
Static Level =	9.05	Max. Y(t)		1.1	
Offset time =	0.05	Regr. Y(0)		1.06	
Shape Factor =	18.5	Casing Y(0)		1.15	DRAINED
(F from est. Rw)	13.5				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	7.0E-02	1.4E-01	100.69
Bouwer & Rice - estimated porosity	1.5E-02	2.9E-02	21.50
Bouwer & Rice - estimated Rw	1.8E-02	3.5E-02	25.63
Hvorslev - user porosity and Rw	9.6E-02	1.9E-01	138.54
Hvorslev - estimated porosity	2.1E-02	4.0E-02	29.58
Hvorslev - estimated Rw	2.8E-02	5.5E-02	40.53

Regression Output:

Constant	0.871417
Std Err of Y Est	0.038965
R Squared	0.997024
No. of Observations	8
Degrees of Freedom	6

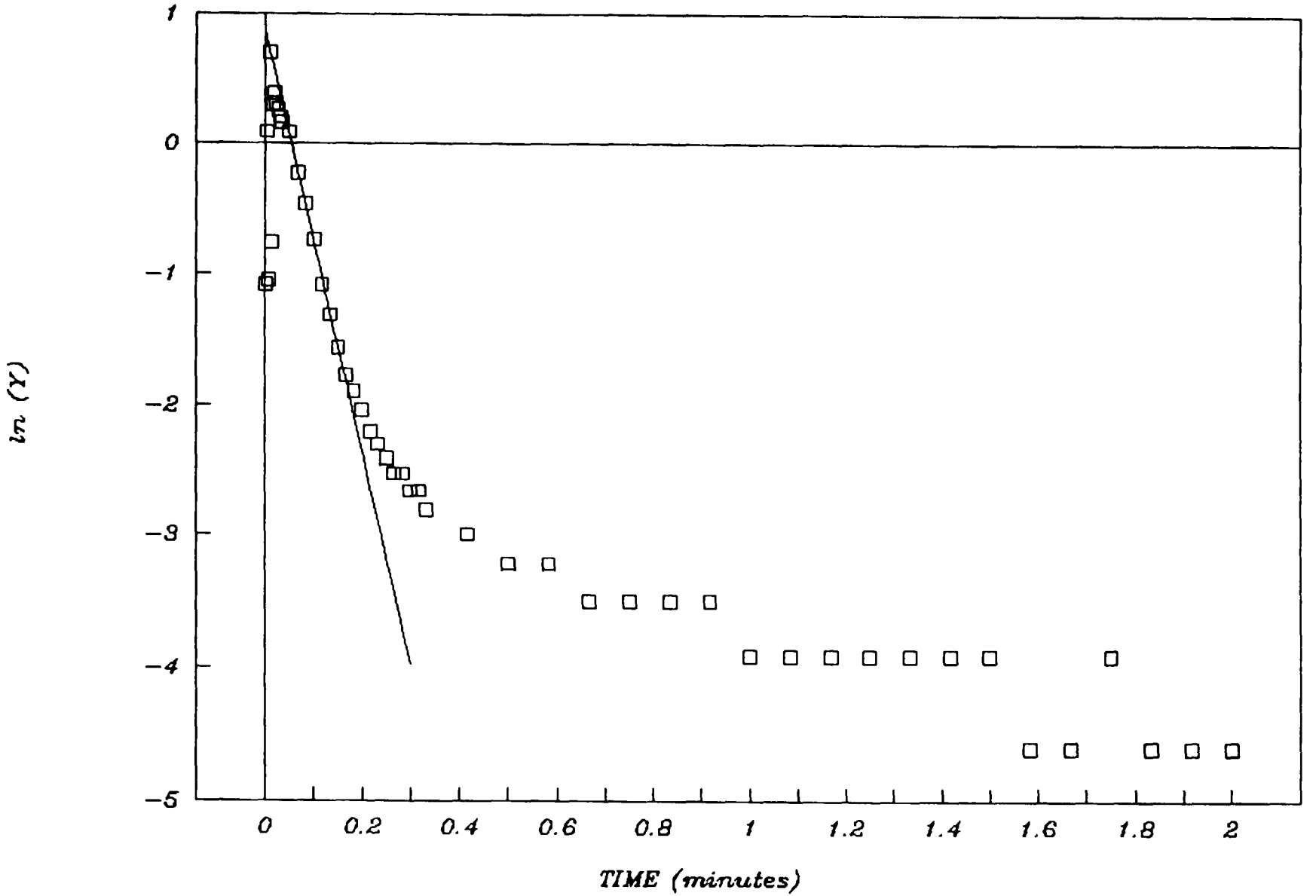
X Coefficient(s) -16.1772
Std Err of Coef. 0.360799

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0		0.34	-1.0788		0.8714
0.0033		1.1	0.0953		0.8180
0.0066		0.35	-1.0498		0.7646
0.0099		2.01	0.6981		0.7113
0.0133		0.47	-0.7550		0.6563
0.0166		1.34	0.2927		0.6029
0.02		1.47	0.3853		0.5479
0.0233		1.37	0.3148		0.4945
0.0266		1.31	0.2700		0.4411
0.03		1.23	0.2070		0.3861
0.0333		1.18	0.1655		0.3327
0.05		1.1	0.0953	B	0.0626
0.0666		0.8	-0.2231		-0.2060
0.0833		0.63	-0.4620		-0.4761
0.1		0.48	-0.7340		-0.7463
0.1166		0.34	-1.0788		-1.0148
0.1333		0.27	-1.3093		-1.2850
0.15		0.21	-1.5606		-1.5552
0.1666		0.17	-1.7720	E	-1.8237

0.1833	0.15	-1.8971	-2.0939
0.2	0.13	-2.0402	-2.3640
0.2166	0.11	-2.2073	-2.6326
0.2333	0.1	-2.3026	-2.9027
0.25	0.09	-2.4079	-3.1729
0.2666	0.08	-2.5257	-3.4414
0.2833	0.08	-2.5257	-3.7116
0.3	0.07	-2.6593	-3.9817
0.3166	0.07	-2.6593	-4.2503
0.3333	0.06	-2.8134	-4.5204
0.4167	0.05	-2.9957	-5.8696
0.5	0.04	-3.2189	-7.2172
0.5833	0.04	-3.2189	-8.5647
0.6667	0.03	-3.5066	-9.9139
0.75	0.03	-3.5066	-11.2615
0.8333	0.03	-3.5066	-12.6090
0.9167	0.03	-3.5066	-13.9582
1	0.02	-3.9120	-15.3058
1.0833	0.02	-3.9120	-16.6533
1.1667	0.02	-3.9120	-18.0025
1.25	0.02	-3.9120	-19.3501
1.3333	0.02	-3.9120	-20.6976
1.4166	0.02	-3.9120	-22.0452
1.5	0.02	-3.9120	-23.3944
1.5833	0.01	-4.6052	-24.7419
1.6667	0.01	-4.6052	-26.0911
1.75	0.02	-3.9120	-27.4387
1.8333	0.01	-4.6052	-28.7862
1.9167	0.01	-4.6052	-30.1354
2	0.01	-4.6052	-31.4830
2.5	0.01	-4.6052	-39.5716
3	0.01	-4.6052	-47.6602
3.5	0.01	-4.6052	-55.7488
4	0.01	-4.6052	-63.8374
4.5	0.01	-4.6052	-71.9260
5	0.01	-4.6052	-80.0146
5.5	0.01	-4.6052	-88.1032
6	0.01	-4.6052	-96.1918
6.5	0.01	-4.6052	-104.2804
7	0.01	-4.6052	-112.3690
7.5	0.01	-4.6052	-120.4576
8	0.01	-4.6052	-128.5462
8.5	0.01	-4.6052	-136.6348
9	0.01	-4.6052	-144.7234
9.5	0	ERR	-152.8120
10	0	ERR	-160.9006
	0	ERR	0.8714
	0	ERR	0.8714
	0	ERR	0.8714
	0	ERR	0.8714
	0	ERR	0.8714

ROSE HILL SLUG TEST

MW13-01 RISING HEAD TEST 1



Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
RISING OR FALLING TEST: RISING TEST 1

Client: EPA — Revised 11/05/91
Site: ROSE HILL — Well ID: MW13-02
Test by: DANIEL H. BERLER — Date: 10/29/91
Analysis: DANIEL H. BERLER — Date: 11/13/91

USER INPUT DATA		WORKSHEET	A=	2.3	2.3
Aquifer Thickness=	22.86	FIGURES	B =		0.37
Exposed Len.(Le) =	9.5		C =	2.0	2.0
Well Length (Lw) =	20.11	R(eq) =	0.0833	0.0833	0.0833
Casing Radius(Rc)=	0.083	Est. Rw			0.333
Well Radius (Rw) =	0.333	Est. n		NA	
Sandpack Porosity=	0.270	log(Le/Rw)		1.4553	1.4553
Slug Volume =	0.025	ln(Re/Rw)		2.8595	2.8595
Static Level =	9.29	Max. Y(t)		2.09	
Offset time =	0.0066	Regr. Y(0)		1.34	
Shape Factor =	17.8	Casing Y(0)		1.15	UNDRAINED
(F from est. Rw)	17.8				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.2E-02	2.3E-02	17.06
Bouwer & Rice - estimated porosity	1.2E-02	2.3E-02	17.06
Bouwer & Rice - estimated Rw	1.2E-02	2.3E-02	17.06
Hvorslev - user porosity and Rw	1.4E-02	2.7E-02	19.99
Hvorslev - estimated porosity	1.4E-02	2.7E-02	19.99
Hvorslev - estimated Rw	1.4E-02	2.7E-02	19.99

Regression Output:

Constant	0.367349
Std Err of Y Est	0.018967
R Squared	0.999175
No. of Observations	11
Degrees of Freedom	9

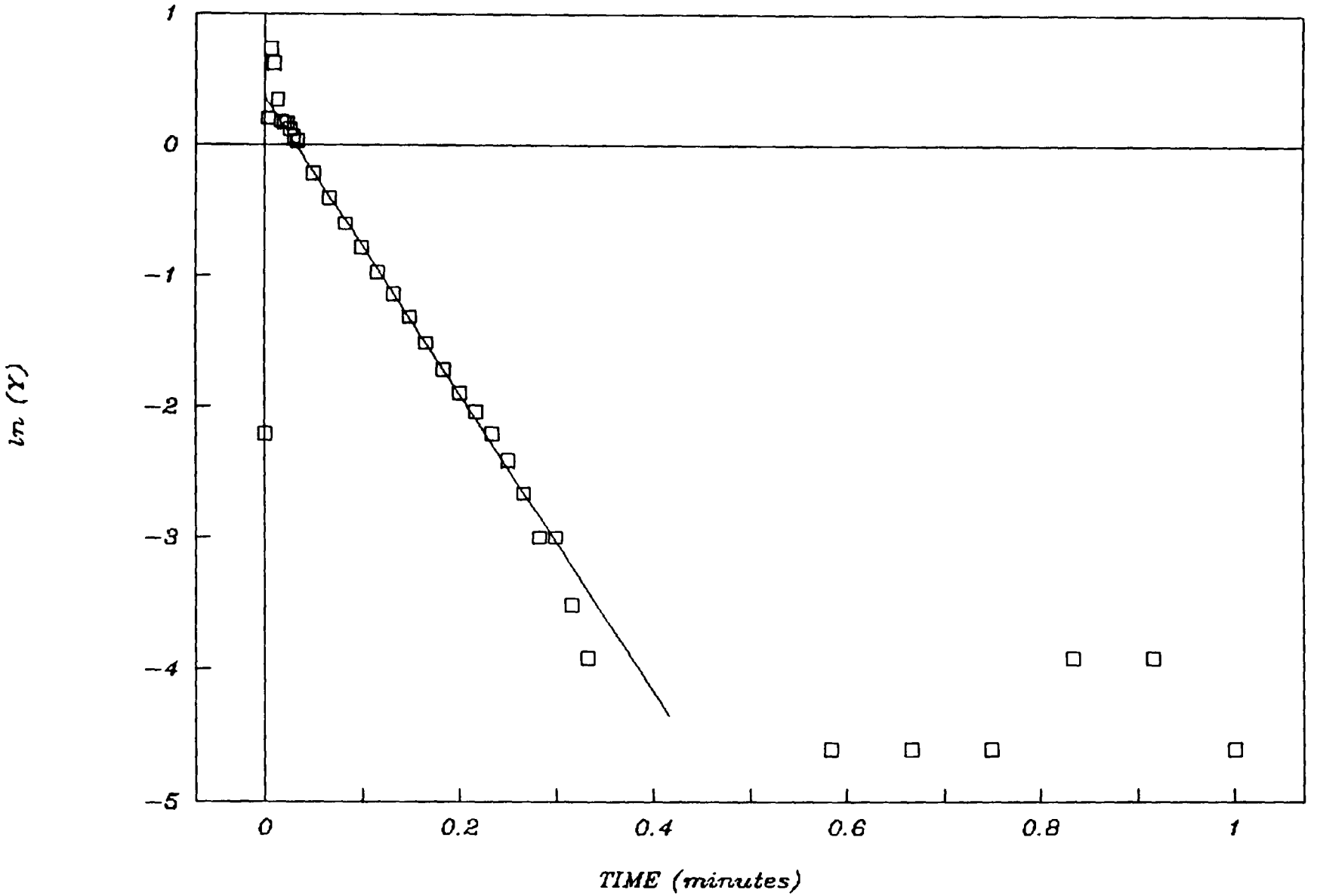
X Coefficient(s) -11.3322
Std Err of Coef. 0.108506

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-0.11	0.11	-2.2073		0.3673
0.0033	-1.23	1.23	0.2070		0.3300
0.0066	-2.09	2.09	0.7372		0.2926
0.0099	-1.87	1.87	0.6259		0.2552
0.0133	-1.41	1.41	0.3436		0.2166
0.0166	-1.2	1.2	0.1823		0.1792
0.02	-1.19	1.19	0.1740		0.1407
0.0233	-1.19	1.19	0.1740		0.1033
0.0266	-1.13	1.13	0.1222		0.0659
0.03	-1.07	1.07	0.0677		0.0274
0.0333	-1.03	1.03	0.0296	B	-0.0100
0.05	-0.81	0.81	-0.2107		-0.1993
0.0666	-0.67	0.67	-0.4005		-0.3874
0.0833	-0.55	0.55	-0.5978		-0.5766
0.1	-0.46	0.46	-0.7765		-0.7659
0.1166	-0.38	0.38	-0.9676		-0.9540
0.1333	-0.32	0.32	-1.1394		-1.1432
0.15	-0.27	0.27	-1.3093		-1.3325
0.1666	-0.22	0.22	-1.5141		-1.5206

0.1833	-0.18	0.18	-1.7148	-1.7098
0.2	-0.15	0.15	-1.8971 E	-1.8991
0.2166	-0.13	0.13	-2.0402	-2.0872
0.2333	-0.11	0.11	-2.2073	-2.2765
0.25	-0.09	0.09	-2.4079	-2.4657
0.2666	-0.07	0.07	-2.6593	-2.6538
0.2833	-0.05	0.05	-2.9957	-2.8431
0.3	-0.05	0.05	-2.9957	-3.0323
0.3166	-0.03	0.03	-3.5066	-3.2204
0.3333	-0.02	0.02	-3.9120	-3.4097
0.4167	0	0	ERR	-4.3548
0.5	0	0	ERR	-5.2988
0.5833	0.01	0.01	-4.6052	-6.2427
0.6667	0.01	0.01	-4.6052	-7.1878
0.75	0.01	0.01	-4.6052	-8.1318
0.8333	0.02	0.02	-3.9120	-9.0758
0.9167	0.02	0.02	-3.9120	-10.0209
1	0.01	0.01	-4.6052	-10.9649
1.0833	0.02	0.02	-3.9120	-11.9089
1.1667	0.02	0.02	-3.9120	-12.8540
1.25	0.02	0.02	-3.9120	-13.7979
1.3333	0.02	0.02	-3.9120	-14.7419
1.4166	0.02	0.02	-3.9120	-15.6859
1.5	0.02	0.02	-3.9120	-16.6310
1.5833	0.02	0.02	-3.9120	-17.5750
1.6667	0.02	0.02	-3.9120	-18.5201
1.75	0.02	0.02	-3.9120	-19.4640
1.8333	0.02	0.02	-3.9120	-20.4080
1.9167	0.02	0.02	-3.9120	-21.3531
2	0.02	0.02	-3.9120	-22.2971
2.5	0.02	0.02	-3.9120	-27.9632
3	0.02	0.02	-3.9120	-33.6293
3.5	0.02	0.02	-3.9120	-39.2954
4	0.02	0.02	-3.9120	-44.9616
4.5	0.02	0.02	-3.9120	-50.6277
5	0.02	0.02	-3.9120	-56.2938

ROSE HILL SLUG TEST

MW13-02 RISING HEAD TEST 1



(First Rising Head Test)
Slug Test Analysis - Bouwer & Rice/Hvorslev's Methods (V2.4.5)
Client: EPA — Revised 11/05/91
Site: Rosehill — Well ID: MW-14-01
Test by: K.Arena — Date: 10/29/91
Analysis: K.Arena — Date: 12/03/91

USER INPUT DATA		WORKSHEET	A=	2.1	2.9
Aquifer Thickness=	11.1	FIGURES	B =	0.34	0.46
Exposed Len.(Le) =	10		C =	1.8	2.7
Well Length (Lw) =	7.1	R(eq) =	0.1873	0.1056	0.1056
Casing Radius(Rc)=	0.083	Est. Rw			0.150
Well Radius (Rw) =	0.333	Est. n		0.040	
Sandpack Porosity=	0.270	log(Le/Rw)		1.3284	1.6746
Slug Volume =	0.025	ln(Re/Rw)		2.0085	2.2926
Static Level =	28.10	Max. Y(t)		0.72	
Offset time =	0.1666	Regr. Y(0)		0.71	
Shape Factor =	18.5	Casing Y(0)		1.15	DRAINED
(F from est. Rw)	15.0				

	ft/min	cm/sec	ft/day
Bouwer & Rice - user porosity & Rw	1.3E-02	2.6E-02	19.25
Bouwer & Rice - estimated porosity	4.3E-03	8.4E-03	6.13
Bouwer & Rice - estimated Rw	4.9E-03	9.6E-03	6.99
Hvorslev - user porosity and Rw	1.6E-02	3.2E-02	23.15
Hvorslev - estimated porosity	5.1E-03	1.0E-02	7.36
Hvorslev - estimated Rw	6.3E-03	1.2E-02	9.09

Regression Output:

Constant	0.110892
Std Err of Y Est	0.008050
R Squared	0.994296
No. of Observations	7
Degrees of Freedom	5

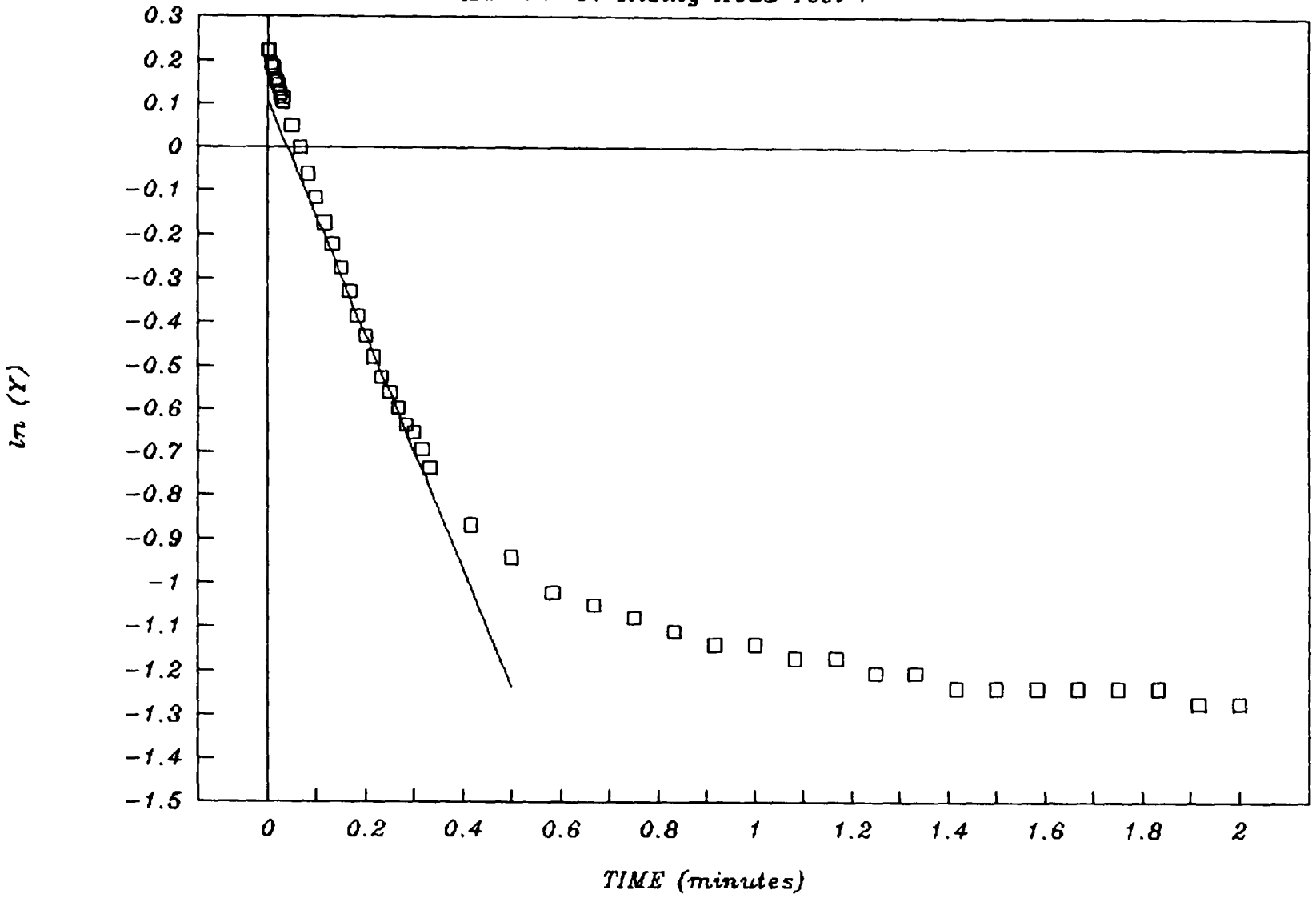
X Coefficient(s) -2.69507
Std Err of Coef. 0.091281

Time (min)	level (ft)	Drawdown Y(t) ft	ln(Y)	Indicate Regress. Range	EST lnY
0	-1.25	1.25	0.2231		0.1109
0.0033	-1.25	1.25	0.2231		0.1020
0.0066	-1.21	1.21	0.1906		0.0931
0.0099	-1.2	1.20	0.1823		0.0842
0.0133	-1.2	1.20	0.1823		0.0750
0.0166	-1.17	1.17	0.1570		0.0662
0.02	-1.16	1.16	0.1484		0.0570
0.0233	-1.15	1.15	0.1398		0.0481
0.0266	-1.13	1.13	0.1222		0.0392
0.03	-1.12	1.12	0.1133		0.0300
0.0333	-1.11	1.11	0.1044		0.0211
0.05	-1.05	1.05	0.0488		-0.0239
0.0666	-1	1.00	0.0000		-0.0686
0.0833	-0.94	0.94	-0.0619		-0.1136
0.1	-0.89	0.89	-0.1165		-0.1586
0.1166	-0.84	0.84	-0.1744		-0.2034
0.1333	-0.8	0.80	-0.2231		-0.2484
0.15	-0.76	0.76	-0.2744		-0.2934
0.1666	-0.72	0.72	-0.3285	b	-0.3381
0.1833	-0.68	0.68	-0.3857		-0.3831

0.2	-0.65	0.65	-0.4308		-0.4281
0.2166	-0.62	0.62	-0.4780		-0.4729
0.2333	-0.59	0.59	-0.5276		-0.5179
0.25	-0.57	0.57	-0.5621		-0.5629
0.2666	-0.55	0.55	-0.5978	E	-0.6076
0.2833	-0.53	0.53	-0.6349		-0.6526
0.3	-0.52	0.52	-0.6539		-0.6976
0.3166	-0.5	0.50	-0.6931		-0.7424
0.3333	-0.48	0.48	-0.7340		-0.7874
0.4167	-0.42	0.42	-0.8675		-1.0121
0.5	-0.39	0.39	-0.9416		-1.2366
0.5833	-0.36	0.36	-1.0217		-1.4611
0.6667	-0.35	0.35	-1.0498		-1.6859
0.75	-0.34	0.34	-1.0788		-1.9104
0.8333	-0.33	0.33	-1.1087		-2.1349
0.9167	-0.32	0.32	-1.1394		-2.3597
1	-0.32	0.32	-1.1394		-2.5842
1.0833	-0.31	0.31	-1.1712		-2.8087
1.1667	-0.31	0.31	-1.1712		-3.0335
1.25	-0.3	0.30	-1.2040		-3.2580
1.3333	-0.3	0.30	-1.2040		-3.4825
1.4166	-0.29	0.29	-1.2379		-3.7070
1.5	-0.29	0.29	-1.2379		-3.9317
1.5833	-0.29	0.29	-1.2379		-4.1562
1.6667	-0.29	0.29	-1.2379		-4.3810
1.75	-0.29	0.29	-1.2379		-4.6055
1.8333	-0.29	0.29	-1.2379		-4.8300
1.9167	-0.28	0.28	-1.2730		-5.0548
2	-0.28	0.28	-1.2730		-5.2793
2.5	-0.27	0.27	-1.3093		-6.6268
3	-0.26	0.26	-1.3471		-7.9743
3.5	-0.25	0.25	-1.3863		-9.3219
4	-0.25	0.25	-1.3863		-10.6694
4.5	-0.24	0.24	-1.4271		-12.0170
5	-0.24	0.24	-1.4271		-13.3645
5.5	-0.24	0.24	-1.4271		-14.7120
6	-0.23	0.23	-1.4697		-16.0596
6.5	-0.23	0.23	-1.4697		-17.4071
7	-0.23	0.23	-1.4697		-18.7547
7.5	-0.22	0.22	-1.5141		-20.1022
8	-0.22	0.22	-1.5141		-21.4497
8.5	-0.22	0.22	-1.5141		-22.7973
9	-0.21	0.21	-1.5606		-24.1448
9.5	-0.21	0.21	-1.5606		-25.4924
10	-0.21	0.21	-1.5606		-26.8399
12	-0.2	0.20	-1.6094		-32.2301
14	-0.19	0.19	-1.6607		-37.6202

ROSEHILL SLUG TEST

MW-14-01 Rising Head Test 1



Cooper, Bredehoeft and Papdopulous Method

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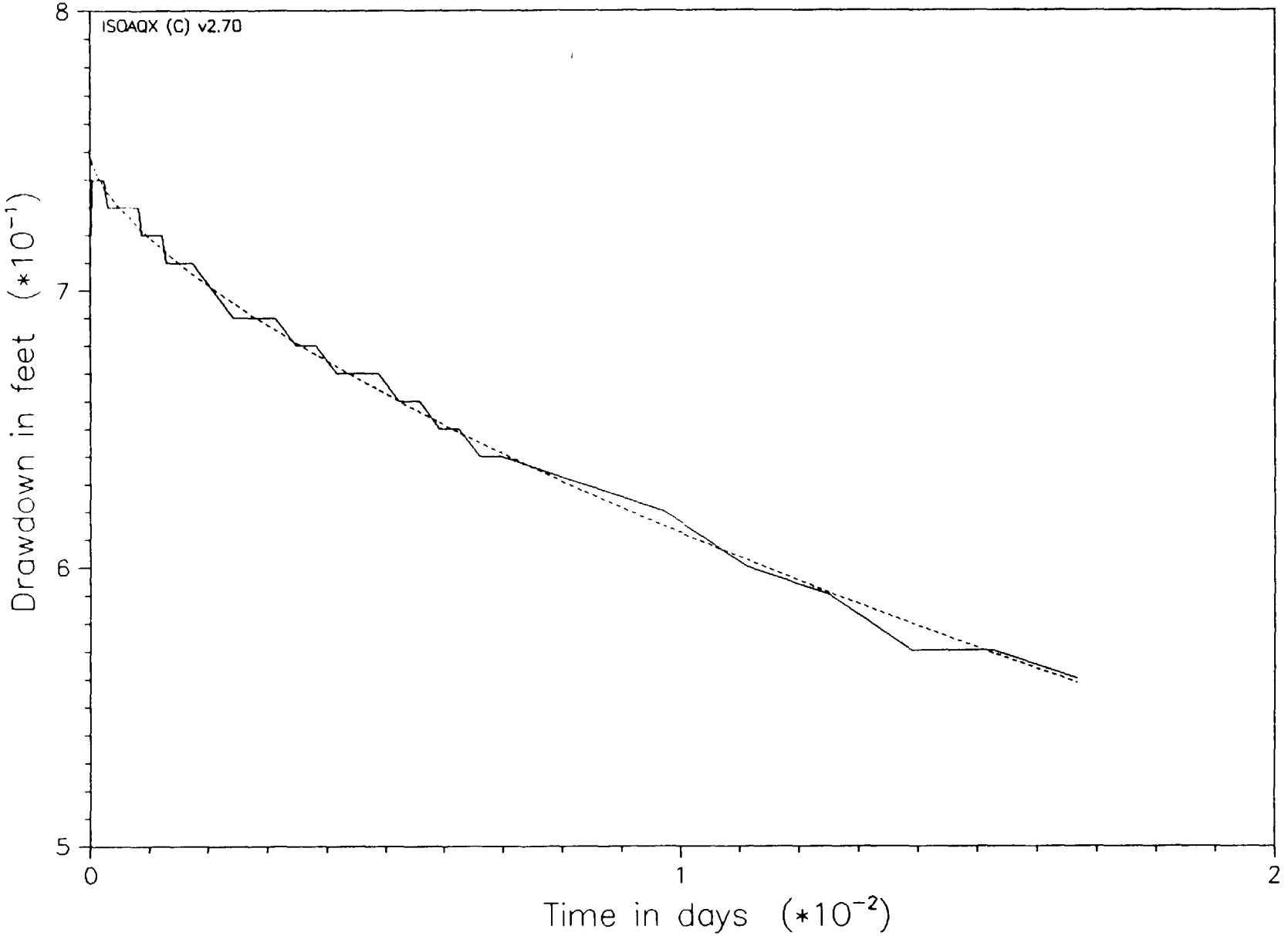
-----------------------------------------------------------------
              ISOAQX (C) v2.70 --- FILE C:MW01-02.01
test # comb:  2
-----------------------------------------------------------------
    unbiased C-B-P SLUG TEST MODEL:
    full analysis:                all active data points used
    using closure tolerance setting          =      3.00E-03
    root mean squared error (ft)             =     -5.68E-03
    transmissivity (ft**2/day)               =      1.01
    storativity (dimensionless)              =      9.82E-03
    initial head (ft)                        =      0.750
    casing radius (ft)                       =      0.250
    screen radius (ft)                       =      0.250
-----------------------------------------------------------------
```

MW01-02 RISING HEAD TEST 1
SLUG TEST
ROSE HILL



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-----------------------------------------------------------------
              ISOAQX (C) v2.70 --- FILE c:mw03a.01
test # comb:  1
-----------------------------------------------------------------
    unbiased C-B-P SLUG TEST MODEL:
    full analysis:                all active data points used
    using closure tolerance setting          =      1.00E-03
    root mean squared error (ft)             =     -2.02E-02
    transmissivity (ft**2/day)               =    396.98
    storativity (dimensionless)              =      5.64E-08
    initial head (ft)                        =      0.780
    casing radius (ft)                       =      0.250
    screen radius (ft)                       =      0.250
-----------------------------------------------------------------
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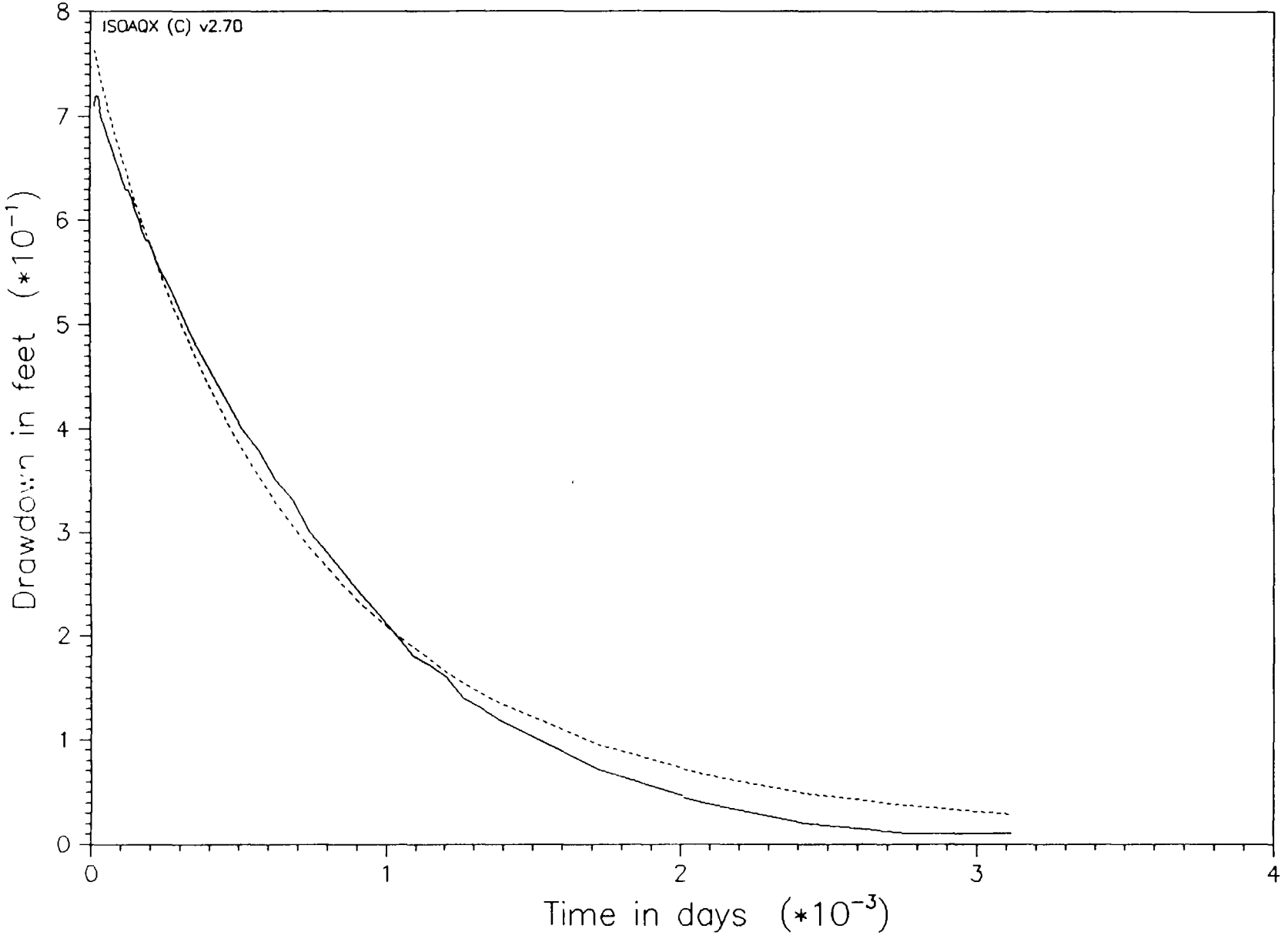
Test run with connected data

mw03-03 RISING HEAD TEST
SLUG TEST USING CORRECTED TIMES FOR START OF TEST AND A BEG.
ROSE HILL



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-----------------------------------------------------------------
             ISOAQX (C) v2.70 --- FILE A:MW04-03.01
test # comb:  6
-----------------------------------------------------------------
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    transmissivity (ft**2/day)               =      6.31E-02
    storativity (dimensionless)              =      5.67E-02
    initial head (ft)                        =      0.770
    casing radius (ft)                       =      0.250
    screen radius (ft)                       =      0.250
-----------------------------------------------------------------
```
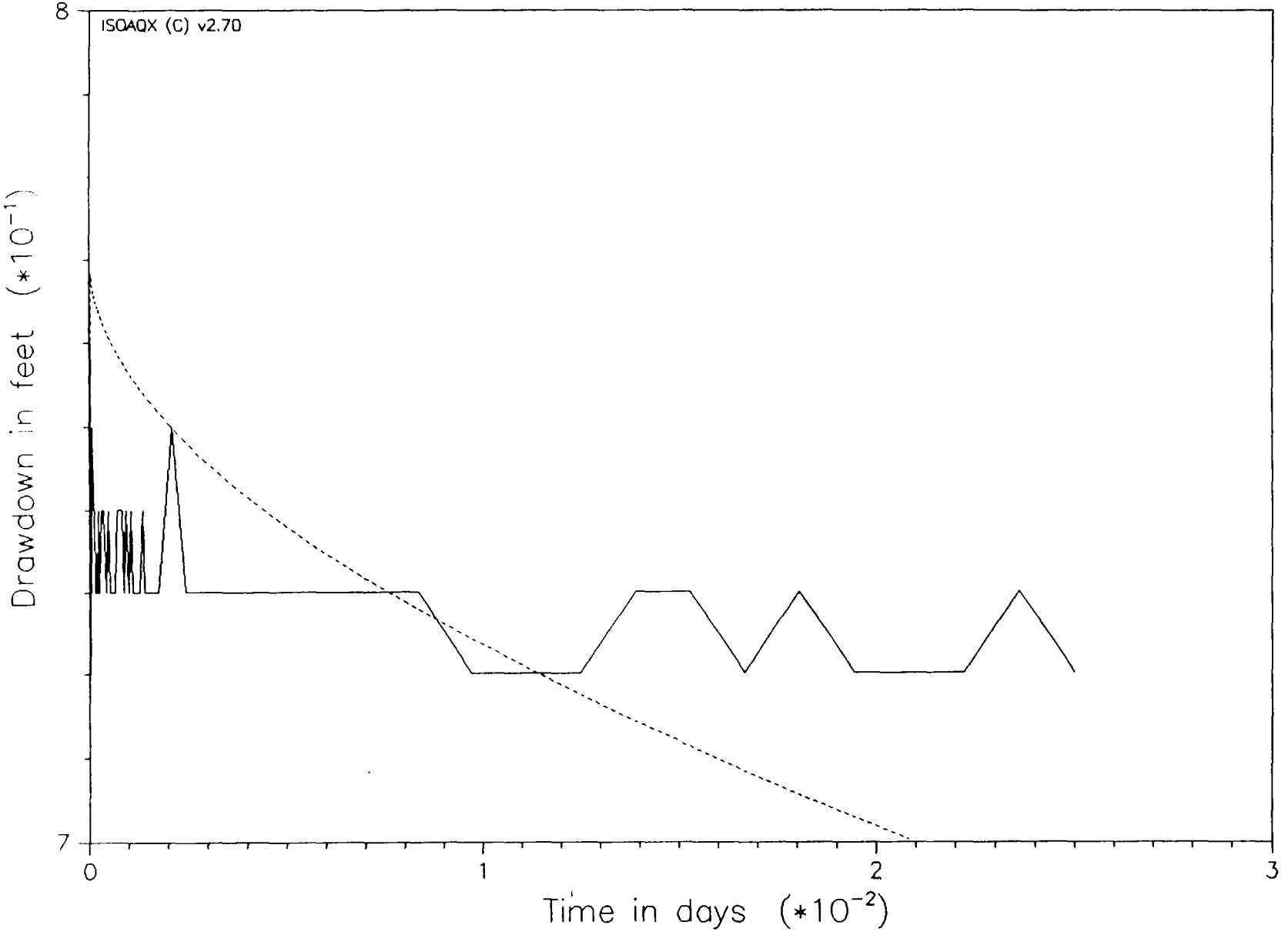

MW04-03 RISING HEAD TEST 1
SLUG TEST
ROSE HILL



```
-----------------------------------------------------------------
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-----------------------------------------------------------------
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    root mean squared error (ft)             =     -4.24E-01
    transmissivity (ft**2/day)               =      2.38E-01
    storativity (dimensionless)              =      3.56E-01
    initial head (ft)                        =      1.790
    casing radius (ft)                       =      0.250
    screen radius (ft)                       =      0.250
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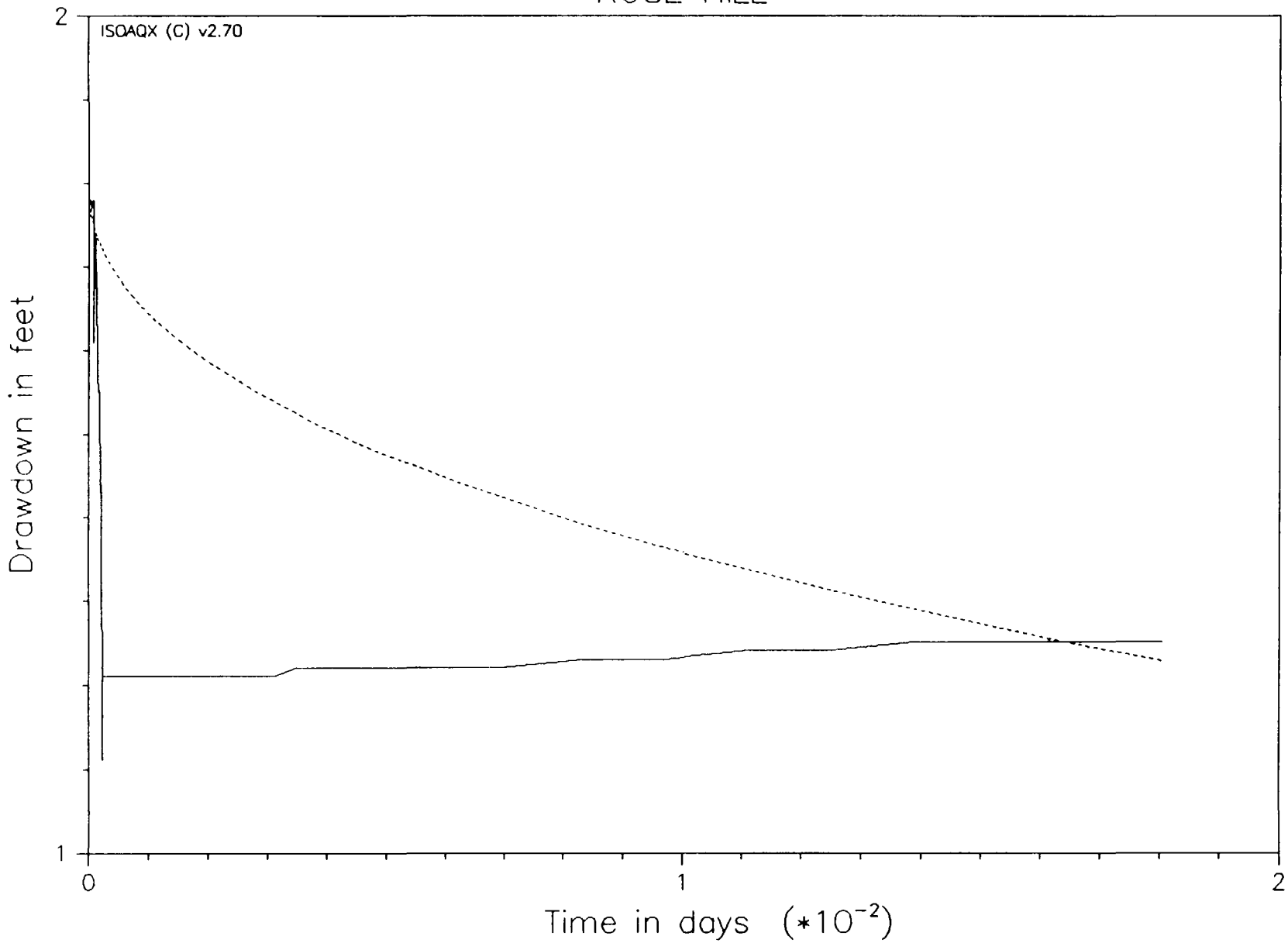
MW07-02 RISING HEAD TEST 1
SLUG TEST
ROSE HILL



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-----------------------------------------------------------------
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    root mean squared error (ft)             =     -4.33E-02
    transmissivity (ft**2/day)               =     92.22
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    screen radius (ft)                       =      0.083
-----------------------------------------------------------------
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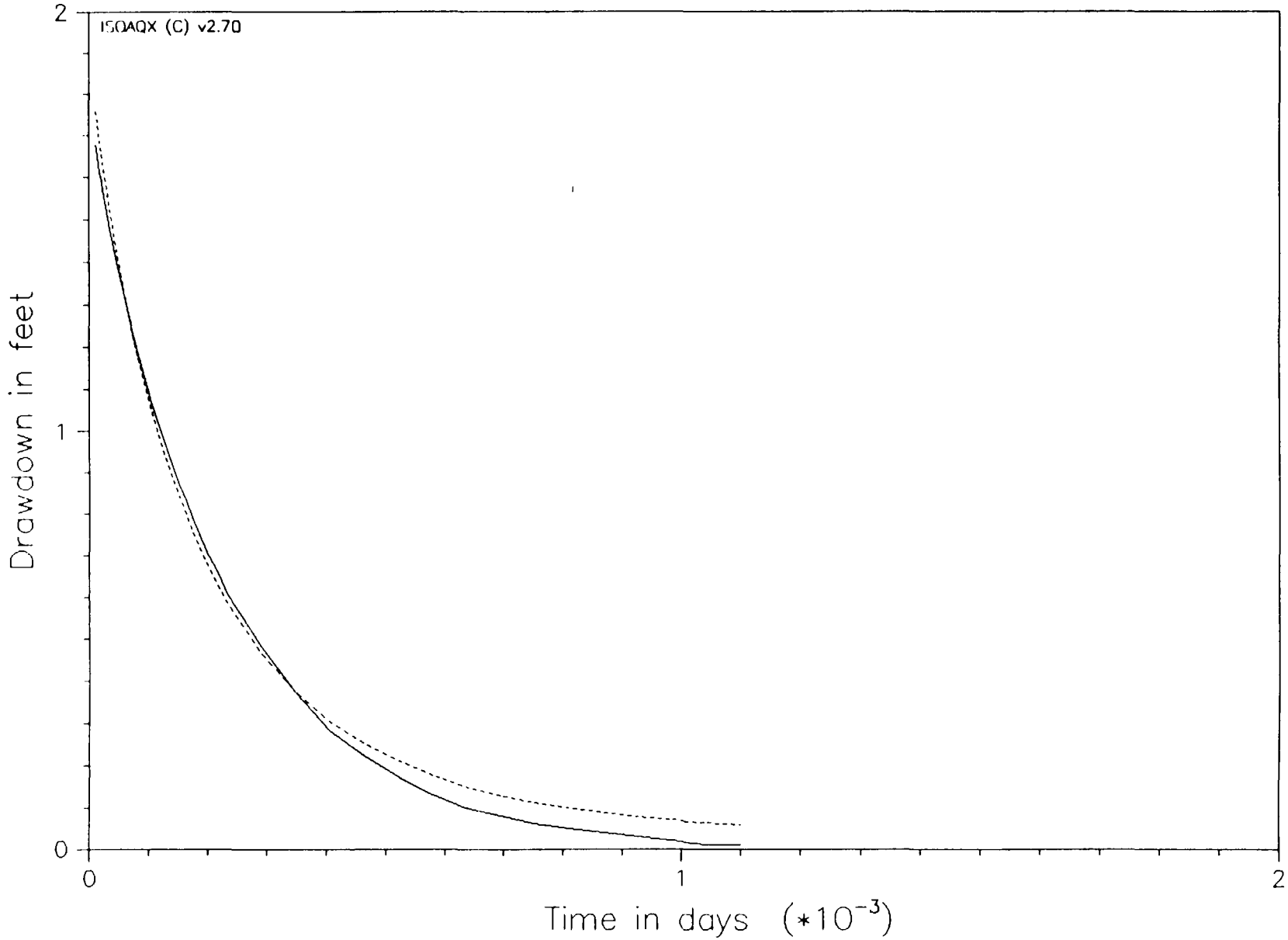
MW08-02 RISING HEAD TEST 1
SLUG TEST
ROSE HILL



```
-----------------------------------------------------------------
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test # comb:  4
-----------------------------------------------------------------
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    full analysis:                all active data points used
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    root mean squared error (ft)             =     -2.10E-02
    transmissivity (ft**2/day)               =      3.72
    storativity (dimensionless)              =      1.69E-02
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-----------------------------------------------------------------
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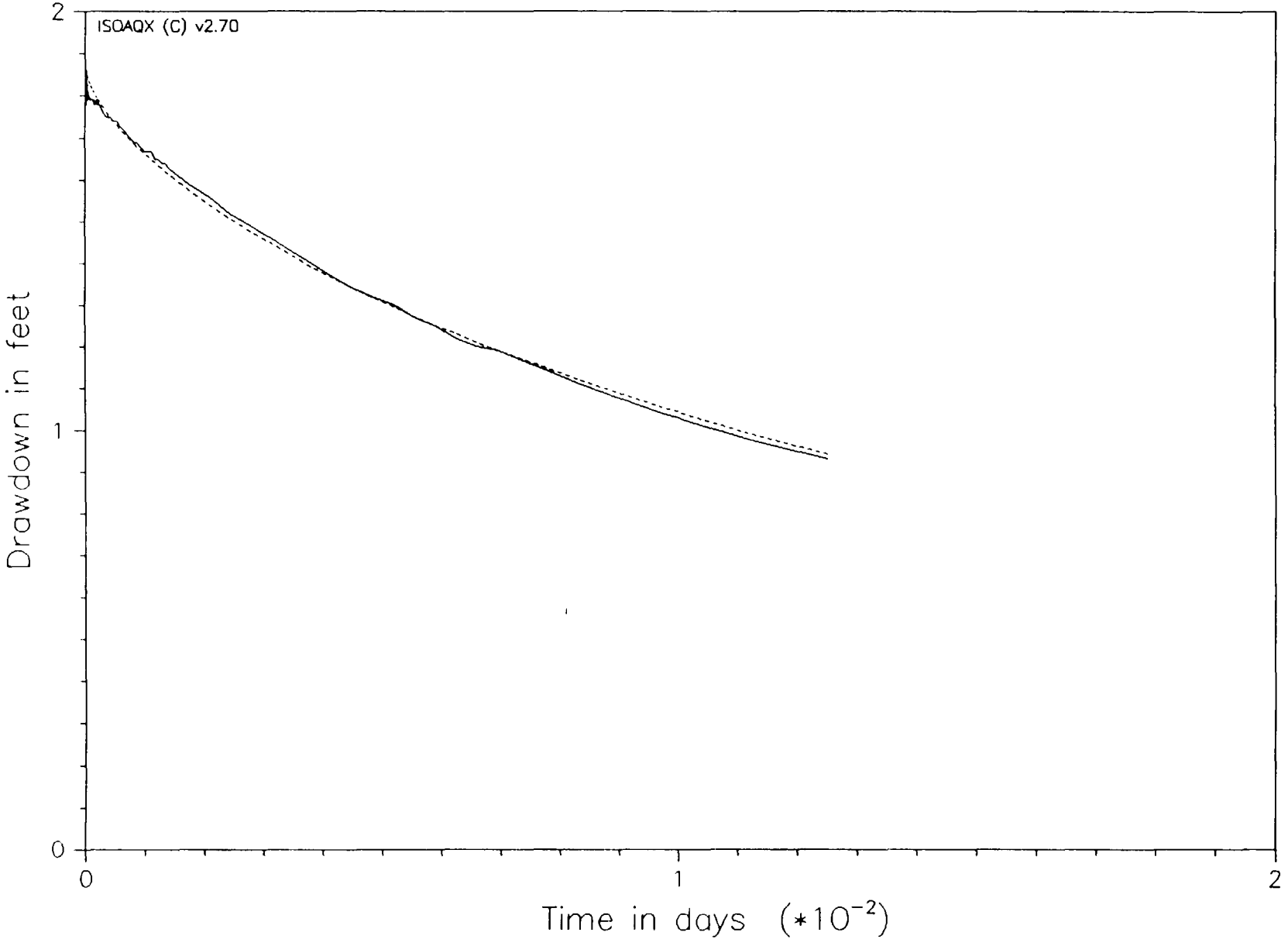
MW11-03 RISING HEAD TEST 1
SLUG TEST
ROSE HILL



STREAM BED HYDRAULIC CONDUCTIVITY MEASUREMENTS

ROUND: II D 10/02/91

MINI-PIEZOMETERS	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/MINUTE)	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/SEC)	L LENGTH OF SCREENED INTERVAL (CMS.)	D DIAMETER OF SCREEN (CMS.)	H HEAD DIFFERENCE BETWEEN MINI-PIEZOMETER AND SURFACE WATER (FT.)	H HEAD DIFFERENCE BETWEEN MINI-PIEZOMETER AND SURFACE WATER (CMS.)	K HYDRAULIC CONDUCTIVITY (CMS./SEC)	K HYDRAULIC CONDUCTIVITY (FT./DAY)
MP-01			4.267	0.48				
MP-03			4.267	0.48				
MP-07			4.267	0.48				
MP-08			4.267	0.48				
MP-09			4.267	0.48				
MP-10			4.267	0.48				
MP-11			4.267	0.48				
MP-12	-65.333	-1.089	4.267	0.48	-0.729	-22.220	5.27E-03	1.49E+01

SEEPAGE METERS	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/MINUTE)	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/SEC)	H 1* HEAD DIFFERENCE (FT.)	H 1* HEAD DIFFERENCE FT. * 30.48CMS/FT. (CMS.)	I HYDRAULIC GRADIENT = H/15.24CMS. (CMS./CMS.)	A CROSS-SECTIONAL AREA OF SEEPAGE METER 55 GALLON DRUM (CMS.^2)	K HYDRAULIC CONDUCTIVITY K=Q/IA (CMS./SEC)	K HYDRAULIC CONDUCTIVITY (FT./DAY)
SM-01								
SM-05	4.167	0.069	0.1875	5.715	0.375	336.50	5.50E-04	1.56E+00
SM-07								

NOTES: *1 DIFFERENCE IN HEAD WAS FOUND BY MEASURING THE HEIGHT OF WATER IN THE CLEAR TYGON TUBING, ATTACHED TO THE SEEPAGE METER, ABOVE (+) OR BELOW (-) THE SURFACE WATER-AIR INTERFACE IN FEET. THE HEAD DIFFERENCE IN FEET WAS THEN CONVERTED TO CENTIMETERS BY MULTIPLYING TIMES THE CONVERSION FACTOR 30.48.

STREAM BED HYDRAULIC CONDUCTIVITY MEASUREMENTS

ROUND: II DATE: 10/01/91

MINI-PIEZOMETERS	Q FLOW INTO (-Q) FLOW OUT (-Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/MINUTE)	Q FLOW INTO (-Q) FLOW OUT (-Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/SEC)	L LENGTH OF SCREENED INTERVAL (CMS.)	D DIAMETER OF SCREEN (CMS.)	H HEAD DIFFERENCE BETWEEN MINI-PIEZOMETER AND SURFACE WATER (FT.)	H HEAD DIFFERENCE BETWEEN MINI-PIEZOMETER AND SURFACE WATER (CMS.)	K HYDRAULIC CONDUCTIVITY (CMS./SEC)
MP-01			4.267	0.48			
MP-03			4.267	0.48			
MP-07			4.267	0.48			
MP-08			4.267	0.48			
MP-09			4.267	0.48			
MP-10			4.267	0.48			
MP-11			4.267	0.48			
MP-12	-7.305	-0.122	4.267	0.48	-0.703	-21.427	6.11E-04

SEEPAGE METERS	Q FLOW INTO (-Q) FLOW OUT (-Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/MINUTE)	Q FLOW INTO (-Q) FLOW OUT (-Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/SEC)	H 1* HEAD DIFFERENCE (FT.)	H 1* HEAD DIFFERENCE FT. * 30.48CMS/FT. (CMS.)	I HYDRAULIC GRADIENT = H/15.24CMS. (CMS./CMS.)	A CROSS-SECTIONAL AREA OF SEEPAGE METER 55 GALLON DRUM (CMS.^2)	K HYDRAULIC CONDUCTIVITY K=Q/IA (CMS./SEC)
SM-01							
SM-05	10.102	0.168	0.323 *2	9.84504	0.646	336.50	7.75E-04
SM-07							

NOTES: *1 DIFFERENCE IN HEAD WAS FOUND BY MEASURING THE HEIGHT OF WATER IN THE CLEAR TYGON TUBING, ATTACHED TO THE SEEPAGE METER, ABOVE (+) OR BELOW (-) THE SURFACE WATER-AIR INTERFACE IN FEET. THE HEAD DIFFERENCE IN FEET WAS THEN CONVERTED TO CENTIMETERS BY MULTIPLYING TIMES THE CONVERSION FACTOR 30.48.

*2 THE AVERAGE OF HEAD DIFFERENCES MEASURED BFORE AND IMMEDIATELY AFTER THE TEST

STREAM BED HYDRAULIC CONDUCTIVITY MEASUREMENTS

ROUND: II 10/01/91

MINI-PIEZOMETERS	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/MINUTE)	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/SEC)	L LENGTH OF SCREENED INTERVA (CMS.)	D DIAMETER OF SCREEN (CMS.)	H HEAD DIFFERENCE BETWEEN MINI-PIEZOMETER AND SURFACE WATER (FT.)	H HEAD DIFFERENCE BETWEEN MINI-PIEZOMETER AND SURFACE WATER (CMS.)	K HYDRAULIC CONDUCTIVITY (CMS./SEC)	K HYDRAULIC CONDUCTIVITY (FT./DAY)
MP-01			4.267	0.48				
MP-03			4.267	0.48				
MP-07			4.267	0.48				
MP-08			4.267	0.48				
MP-09			4.267	0.48				
MP-10			4.267	0.48				
MP-11			4.267	0.48				
MP-12	-7.305	-0.122	4.267	0.48	-0.703	-21.427	6.11E-04	1.73E+00

SEEPAGE METERS	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/MINUTE)	Q FLOW INTO (-Q) FLOW OUT (+Q) OF MINI-PIEZOMETERS OR SEEPAGE METERS (CM^3/SEC)	H 1* HEAD DIFFERENCE (FT.)	H 1* HEAD DIFFERENCE FT. * 30.48CMS/FT. (CMS.)	I HYDRAULIC GRADIENT = H/15.24CMS. (CMS./CMS.)	A CROSS-SECTIONAL AREA OF SEEPAGE METER 55 GALLON DRUM (CMS.^2)	K HYDRAULIC CONDUCTIVITY K=Q/IA (CMS./SEC)	K HYDRAULIC CONDUCTIVITY (FT./DAY)
SM-01								
SM-05	10.102	0.168	0.323	9.84504	0.646	336.50	7.75E-04	2.20E+00
SM-07								

NOTES: *1 DIFFERENCE IN HEAD WAS FOUND BY MEASURING THE HEIGHT OF WATER IN THE CLEAR TYGON TUBING, ATTACHED TO THE SEEPAGE METER, ABOVE (+) OR BELOW (-) THE SURFACE WATER-AIR INTERFACE IN FEET. THE HEAD DIFFERENCE IN FEET WAS THEN CONVERTED TO CENTIMETERS BY MULTIPLYING TIMES THE CONVERSION FACTOR 30.48.

*2 THE AVERAGE OF HEAD DIFFERENCES MEASURED BFORE AND IMMEDIATELY AFTER THE TEST

B-6 FINAL GEOPHYSICAL SURVEY RESULTS

Gartner Lee

Geophysical Survey Results
Rose Hill Regional Landfill
Superfund Site
South Kingstown, Rhode Island

Subcontract No. 90-004609-023

Prepared by:

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Project No. 91-804

January 22,1992

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Professional Services in Environmental Management

Gartner Lee, Inc.

January 22, 1992

Ms. Deborah Simone
Project Manager
Metcalf & Eddy
P.O. Box 4043
Woburn, MA 01888-4043

Dear Ms. Simone:

Re: Geophysical Survey Results, Rose Hill Regional Landfill Superfund Site, South Kingstown, Rhode Island

We are pleased to forward you this report for the above noted investigation. The report contains the methodologies, results and conclusions of the geophysical surveys performed May 21st through June 13th. The geophysical survey data, presented in profile format, are located at the end of the report and are referenced to your base map.

At the request of Metcalf & Eddy, the original seismic refraction data results were re-processed and re-calibrated based upon additional borehole information gathered during a recent Metcalf & Eddy drilling program. The results of the re-calibrated seismic data are discussed in detail in Sections 1.0, 2.3, 3.4 and 4.4. The seismic refraction data indicates that bedrock topography is variable throughout the study area and appears to deepen towards the Saugatucket River.

On November 4th through 6th, 1991 Lines 4 through 25 were voluntarily re-surveyed at a 20 meter intercoil spacing with a Geonics EM34-3. The site was revisited as a result of a mechanical problem with the equipment that occurred during the initial survey. A discussion of the methodologies, results and conclusions of the EM34-3 survey are in Sections 1.0, 2.1.1, 3.1 and 4.1.

The EM 34-3 survey identified 20 anomalies that may be due to the presence of contaminated fill, soils or ground water. The anomalies are discussed in detail in Sections 3.1 and 4.1. The background values of apparent conductivity for the site were very low, between 0 and 2 milliSiemens per meter (mS/m). When the values of apparent conductivity are very low, error

due to coil misalignment with the EM34-3 equipment can equal or exceed real changes in conductivities that may result from subsurface contaminants or stratigraphic/lithologic changes.

The VLF and near surface EM31-DL survey data are generally of good quality. VLF data were collected along three survey lines at the site and identified three anomalies that may be representative of north trending fracture zones or igneous intrusions (Section 4.3). The near surface EM31-DL survey was performed along two profile lines. The EM31-DL survey identified two anomalies that may represent contaminated soils, fill or ground water contamination (Section 4.2).

We trust this information is sufficient for your needs. We would like to take this opportunity to thank Metcalf & Eddy for involving us in this most interesting project. If there are any questions, please feel free to contact us.

Respectfully submitted,

GARTNER LEE, INC.

Thomas E. Judson FOR

David D. Slaine, M.S., C.G.W.P.
Principal
Hydrogeologist/Geophysicist

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1.0 Introduction

On May 21st through June 13th, 1991, a geophysical investigation was performed at the Rose Hill Regional Landfill Superfund Site in South Kingstown, Rhode Island. The geophysical surveys included electromagnetic profiling (EM34-3, EM31 and VLF) and a seismic refraction survey.

All geophysical methods utilize interpretative techniques which can be significantly impacted by varying site conditions. EM and VLF anomalies can only be identified if they show recognizable patterns against data representative of background or natural conditions. Seismic data relies upon borehole or testpit control to interpret bedrock topography and overburden stratigraphy.

Upon completion of the geophysical surveys, limited borehole information was available for use to calibrate the seismic refraction data and interpret the EM data. The drilling data that did exist was generally of poor quality and somewhat suspect as depth to bedrock was not confirmed by obtaining core samples.

Upon completion of the geophysical investigation, Metcalf & Eddy installed monitoring wells and completed test borings at the site. Metcalf and Eddy then compared the additional borehole information to the results of the seismic refraction survey. It was determined that the additional borehole information could be used to re-calibrate the seismic refraction data. Metcalf & Eddy requested that Gartner Lee re-interpret the seismic data with the additional borehole information to attempt to achieve a more accurate profile of subsurface conditions. Gartner Lee re-interpreted the seismic refraction data and the revised data are presented herein.

The additional borehole information raised suspicions as to the validity of the 20 meter intercoil EM34-3 data collected on the eastern portion of the site. The initial interpretation of the EM data appeared to show a lithologic or stratigraphic change occurring at or near the Mitchel Brook stream valley. The results of the Metcalf and Eddy drilling program did not reveal a significant lithologic or stratigraphic change at the site. As a result, Gartner Lee voluntarily remobilized the site with an EM34-3 on November 4th through 6th, 1991. The site was revisited by Gartner Lee to test a hypothesis of possible mechanical problems with the EM equipment during the initial survey. The second EM survey revealed that a mechanical problem had occurred during the initial survey with the 20 meter cable. The anomalous areas were resurveyed at a 20 meter intercoil spacing and tied into the initial survey data. The results of the revised survey data are presented herein.

The following report discusses the methodologies, results and the conclusions of these three geophysical surveys.

1.1 Background Information

According to on-site Metcalf and Eddy personnel, the Rose Hill Regional Landfill Site is 70 acres in area. The site was previously utilized as a gravel quarry prior to initiation of landfill operations. Three closed landfills currently exist on the 70 acre site. These landfills are a solid waste landfill, a bulky waste landfill and a sewage sludge landfill.

The solid waste landfill is approximately 28 acres in area and accepted wastes from 1967 though 1983. The solid waste landfill is located along the western site boundary.

The bulky waste disposal area is approximately 11 acres in size and operated from 1978 to 1983. The bulky waste landfill is located in the southern portion of the site.

The limits of the sewage sludge landfill are currently unknown. The sewage sludge landfill accepted sludges from 1977 to 1983. The sewage sludge landfill was located in the northeast portion of the site.

The southern portion of the site is currently owned by the Town of South Kingstown which constructed and operates a waste transfer station on-site. The remaining area of the site is owned by a private citizen which operates a trap and skeet shooting facility and a hunting dog training facility.

1.2 Purpose and Scope

The purpose of the geophysical surveys were to:

- map conductive zones around the periphery of the waste sites that may be attributed to ground water contamination;
- delineate areas of fill;
- map major bedrock features; and
- map bedrock topography and where possible, overburden stratigraphy.

2.0 Methodologies

To meet the objectives of the investigation, Metcalf & Eddy requested an EM34-3 survey, an EM31-DL survey, a VLF survey and a seismic refraction survey to be completed at the site. Data for each geophysical technique were collected and presented as two-dimensional profiles. Geophysical survey line locations were determined by Metcalf & Eddy personnel prior to Gartner Lee mobilizing to the site. Gartner Lee adopted Metcalf & Eddy's nomenclature for referencing the site survey lines for the purpose of this report.

2.1 Electromagnetic (EM) Surveys

2.1.1 EM34-3 Survey

The EM-34-3 survey was performed along 27 profile lines (Lines 1 through 26, and S3) from May 22nd to June 13th, 1991. The site was re-visited on November 4th through 6th, 1991 to re-survey Lines 4 through 26 and S3 at a 20 meter intercoil spacing. Survey lines were cleared, staked and labelled by Metcalf & Eddy personnel at 100 foot increments.

Data were collected at 25 foot increments along profile lines 1 through 26, and S3 with a Geonics EM34-3 Terrain Conductivity Meter and solid state data logger. The EM34-3 device is equipped with a transmitter coil and a receiver coil that can be separated by 10, 20 or 40 meters intercoil spacings. Data were collected at the site with the coil's dipole oriented horizontally and vertically and at 10 and 20 meter intercoil separations.

The EM34-3 was used to measure the quadrature component of the electromagnetic field at each station. The quadrature component data are a measurement of the apparent ground conductivity collected in units of millisiemens per meter (mS/m). The quadrature component data are representative of changes in the electrical conductivity of pore fluids, the presence of buried metals and fills, changes in saturated soil types, changes in bedrock lithology, and the presence of saturated bedrock fractures.

The depth of investigation of the EM34-3 is dependant upon the coil's dipole orientation and the intercoil spacing. The effective depth of investigation with the dipoles oriented horizontally is equal to approximately 0.75 the intercoil separation. The effective depth of exploration with the dipoles oriented vertically is equal to approximately 1.50 times the intercoil spacing. The effective depths of exploration for the site survey is as follows:

- 10 meter intercoil spacing, horizontal dipole mode: surface to 7.5 meters.
- 10 meter intercoil spacing, vertical dipole mode: near surface to 15 meters.
- 20 meter intercoil spacing, horizontal dipole mode: surface to 15 meters.
- 20 meter intercoil spacing, vertical dipole mode: near surface to 30 meters.

Apparent conductivity data collected in the horizontal dipole configuration are more representative of near surface conditions than apparent conductivity collected in the vertical dipole configuration. Data collected in the horizontal dipole configuration are less sensitive to the presence of buried metals, vertical fractures and data collection error due to coil misalignment relative to data collected in the vertical dipole orientation.

The data were digitally recorded with a solid state data logger. The data logger was interfaced daily to a portable laptop computer and the data were transferred to a floppy disk for subsequent processing an interpretation.

The EM34-3 was mechanically and electronically nulled daily following procedures specified in the operations manual, however, data collected in May and June on the east side Mitchel Brook were not tied into data collected on the west side of Mitchel Brook. This resulted in a failure to identify an electrical problem after it had occurred in the 20 meter cable. The damaged cable resulted in the 20 meter data collected on the east side of Mitchel Brook to appear 20 to 30 mS/m above the values recorded west of Mitchel Brook. The 20 to 30 mS/m offset was initially attributed to a lithologic or stratigraphic change suspected to occur at or near the Mitchel Brook stream valley. The data became suspect after results of the Metcalf & Eddy drilling program became available and after speaking with Geonics, the equipment manufacturer. To examine the validity of the 20 meter intercoil data collected at the site, Gartner Lee voluntarily remobilized to Rose Hill in November and collected data along Lines 4 through 26 and Line S3. The data recorded in November demonstrated that the 20 meter cable was damaged and that the 20 meter data are similar on both sides of Mitchel Brook.

2.1.2 EM31-DL Survey

Data were also collected along survey lines S7 and Mitchel Brook (revised line 3) with a Geonics EM31-DL and solid state data logger. The Geonics EM31-DL has a fixed intercoil spacing of 3.67 meters. Quadrature and in-phase data were simultaneously collected at approximately 2.5 foot intervals with the dipoles oriented vertically along the two survey lines. The quadrature component data, as mentioned above, are a

measurement of the apparent ground conductivity. Quadrature component data were collected in units of mS/m. The EM31-DL also records the in-phase component of the electromagnetic field measured in units of parts per thousand (ppt). The in-phase component data are susceptible to the presence of highly electrically conductive materials such as metals. All readings with the EM31-DL were taken with the instrument oriented parallel to the direction of travel, in the vertical dipole mode and with the instrument at waist height.

The EM31-DL was nulled prior to data collection following procedures specified in the operations manual. Readings were automatically stored in a solid state data logger during the survey. The data logger was interfaced to a portable computer and the data were transferred to a floppy disk for subsequent processing and interpretation.

Both EM34-3 and EM31-DL data were edited and analyzed utilizing the Geonics software package DAT34-3/DAT31Q and LOTUS 123. Data were then plotted and presented utilizing the Golden Software package GRAPHER. The EM34-3 data are presented as Figures 1 through 31. The EM31-DL data are presented as Figures 32 and 33.

2.2 Very Low Frequency (VLF) Survey

A VLF survey was performed along three survey lines designated VLF 1, 2 and 3 (EM survey Line 5, seismic Line 4 and EM Line 11). Data were collected at 12.5 foot station intervals with an ABEM Wadi VLF instrument. VLF surveying utilizes the magnetic components of the electromagnetic field generated by the VLF band (15 to 30 kHz) military navigation radio transmitters. Buried electrically conductive material locally affects the direction and strength of the VLF transmitter signal (primary field). A secondary field is generated around the buried conductor through electromagnetic induction.

The Wadi VLF meter measures and records the ratio (in percent) of the horizontal and vertical in-phase components of the total VLF field. This measurement is commonly referred to as the in-phase or real part data. The in-phase or real data is equivalent to tilt angle data which was measured by analog VLF meters. The device also measures and records the ratio (in percent) of the out-of-phase components of the total VLF field. This measurement is commonly referred to as the ellipticity, out-of-phase or imaginary data.

The depth of penetration with the Wadi VLF instrument is dependant upon the resistivity of the subsurface material and to a lesser extent the frequency of the VLF transmitter. As the resistivity of the subsurface increases (terrain conductivity

decrease) the depth of penetration increases. For the terrain conductivities observed at the Rose Hill Landfill Site (approximately 3 to 20 mS/m or 330 to 50 ohm-meters) the estimated depth of penetration was approximately 30 to 70 meters. Below this depth at this specific site, the transmitted VLF signal becomes too weak to induce a secondary field around a conductive body.

The Wadi VLF device also applies a Hjelt filter to the tilt angle and ellipticity data and stores the data separately in the solid state memory. A Hjelt filter is similar to the more familiar Fraser filter in that it was designed to be used with data that exhibits cross over type responses. The Hjelt filter differs in that the filter attempts to determine current flow and distribution responsible for producing the measured magnetic field. The error introduced by this filter is believed to be less than 8%. The filtered in-phase or tilt angle data is equivalent to the current density. Filtered tilt angle data always exhibits a positive anomaly over a buried conductor. Filtered tilt angle anomalies tend to deviate from zero dependant upon conductivity and depth of burial. The filtered imaginary or ellipticity data can exhibit both positive and negative anomalies over a conductor. Filtered and unfiltered imaginary data are less dependant upon conductivity, shape and depth of burial. As a result, all interpretations were made based upon the filtered and unfiltered tilt angle data.

For identifying buried bedrock fractures, the fractures should approximately trend towards the transmitting station. A bedrock outcrop was visited north of the site along Highway 138. This outcrop exhibited northerly tending fractures. As a result, the VLF transmitter used for the Rose Hill Landfill survey was located in Cutler, Maine which transmits at a frequency of 24.0 kHz. An attempt was made to use a transmitting station located in Seattle, Washington to examine the presence of east-west trending steeply dipping fractures This attempt was unsuccessful due to low signal strength from the Seattle, Washington transmitter.

2.3 Seismic Refraction Survey

A 24 channel EG&G 2401 Digital Instantaneous Floating Point (DIFP) seismograph was utilized to collect seismic refraction data at the Rose Hill landfill Site.

Available site information, concerning depth to bedrock and overburden materials, suggested that a refraction survey would be the most suitable seismic technique to employ at the Rose Hill Landfill Site. Seismic data are collected by generating a shock wave and recording the travel time and amplitude of the wave at nearby locations. The shock wave travels downward into the earth and reflects/refracts back to surface off geologic strata. The amplitude of the returning signal is measured as a function of time with ultra-sensitive motion detectors (geophones), and transmitted through a cable to a

digital recording device; a seismograph. After field acquisition of the data is completed, Gartner Lee utilized the General Reciprocal Method (GRM) of seismic refraction data analysis.

Seismic line locations were selected by Metcalf & Eddy to provide information on overburden stratigraphy and bedrock topography at the Rose Hill Landfill Site. A total of seven seismic lines were surveyed during the May/June work. These data were collected using a geophone spacing of 16 ft (5 meters). All data were collected using a single 14 Hz geophone per channel. A 10 pound sledge hammer and steel plate was used as the seismic source. For each shot, data were stacked from 1-5 times. "Stacking" of shots is used to improve the signal-to-noise ratio of the data. All shots were stacked until good "first breaks" were observed on the QA/QC printout of the seismograph. First breaks are the time of onset of the refracted wave arrival. The accurate measurement of these first break times is crucial for quality refraction analysis.

The data for the Rose Hill landfill were collected using 24 channels per seismic spread. Each spread was overlapped 4 geophones as the line progressed. For each spread, 9 shots were made at varying shot to geophone offsets. The far offset (typically 60 to 120 ft.) was chosen so that all first breaks measured for that shot were refractions off the bedrock interface. This was necessary to provide complete GRM coverage of the bedrock refractor. Data were collected and stored on a 24 channel engineering seismograph. Each evening, data were transferred to a lap top computer and backed up on floppy disks.

Due to the seismic noise caused by the transfer station located at the southern end of the site, long delays in seismic data collection were encountered waiting for noise levels to reduce such that data collection could commence. Twenty-four channel seismic data collection in the immediate vicinity of the transfer station was only possible during early morning hours and evening hours when the facility was closed.

At the completion of the survey, data were collected from shots along a "weathering spread". The weathering spreads were used to delineate the near surface velocity variations. The geophone spacing for the weathering spreads was approximately 3 feet (1 meter).

The first step in data interpretation involved selecting the "first break" arrival times from the seismic traces. These measurements represent the arrival times of the p-wave seismic energy refracted along layers exhibiting significant velocity contrast. From these data, the number and velocities of the subsurface layers are determined.

The GRM of analysis was used to convert the data from measurements of time to measurements of layer thickness. The GRM allows for the interpretation of data from a number of undulating refractors and was used to interpret the arrival times from each layer. The technique accepts variation in both the surface topography and the velocities of the upper layers.

Seismic data provides an estimation of layer thickness. The process of converting refraction arrivals in units of time (milliseconds) to depth (feet) has an approximate accuracy of $^{+}/-$ 15%. The lithologic interpretation is based upon seismic velocities correlated to geologic information obtained from borehole logs. Seismic profile data should be used as relative estimates to evaluate changes in overburden stratigraphy and bedrock topography between borehole locations.

Upon completion of the geophysical surveys, Metcalf and Eddy installed monitors and test borings at the site. The additional information obtained from the recent Metcalf and Eddy drilling program at the site was then used to re-calibrate the seismic data.

3.0 Results

3.1 EM34 Results

The EM34 survey was performed along 27 survey lines. The purpose of the EM34-3 survey was to identify areas of contaminated soils and fill materials and to identify the presence of groundwater contamination.

The EM results indicate that the soils and bedrock of the site are very resistive (low conductivities). Values of background apparent conductivity observed at the site were approximately between 0 and 2 mS/m. These values are indicative of coarse textured soils and/or granitic bedrock.

It should be noted that the vertical data for some of the profiles presented are erratic or "noisy" as a result of the presence of fill material or buried metals. Vertical dipole data can also appear noisy or erratic as this dipole orientation is more sensitive to coil misalignment.

The following is a discussion of pertinent physical features noted along each survey line and the annotated anomalies observed during the EM34 survey. It should be noted that anomalies annotated with a capital letter were observed when the dipoles were oriented horizontally and anomalies annotated with small case letters correspond to anomalies observed with the dipoles oriented vertically. An attempt was made to keep the vertical and horizontal scales equal for comparison purposes. Exceptions were made for lines

that contained erratic or noisy data such as Lines 3, 4 and 14 as well as along extremely long survey lines such as the cumulative presentation of Lines 15 through 26.

Line 1 Horizontal Dipole Data (Figure 1)

Line 1 was located on the west side of Rose Hill Road on the west side of the site. Data were collected in a south to north direction. Dead trees were noted at station locations 175 to 200, 425, and 875 North. Overhead power lines were noted at locations 650 and 800. The presence of the overhead power lines may have resulted in some signal interference at these locations.

A water table measurement taken at the completion of test boring X-2 was approximately 26 feet. If the water table was approximately the same depth during the survey, the 10 m horizontal dipole readings would have been performed in mostly unsaturated overburden. Anomalies observed during data collection in the 10 meter horizontal dipole mode are probably indicative of stratigraphic changes and possibly the presence of fill materials at this survey line location.

Background apparent conductivities were approximately 2 mS/m and were observed along the southern and northern extents of the line. The following anomalies were observed:

(A) An anomaly of approximately 3 mS/m above background was noted in the 20 meter horizontal dipole data. A slight increase in elevation was noted at this location. A dead tree was also noted at this location. This anomaly may be due to the presence of ground water contaminants or a stratigraphic change.

(B) An above background anomaly of approximately 2 to 3 mS/m above background was noted in the 10 and 20 meter horizontal dipole data. Overhead power lines were noted in the vicinity and may have contributed to the observed response. This anomaly may be due to the presence of overhead power lines, a stratigraphic change or the presence of subsurface contaminants.

(C) An anomaly of approximately 2 mS/m above background was noted in the 10 meter horizontal dipole data. An anomaly of approximately 2 mS/m below background was noted in the 20 meter horizontal dipole data. Dead oak trees were noted in the vicinity of this anomaly. This anomaly may represent an area of near surface fill or a stratigraphic change.

(D) A broad anomaly of approximately 3 mS/m above background was noted in the 10 and 20 meter horizontal dipole data. This anomaly may represent the presence of contaminated soils, contaminated ground water or a stratigraphic change.

Line 1 Vertical Dipole Data (Figure 2)

(a,b) Anomalies "a" and "b" were observed in the vicinity of overhead power lines. The presence of the power lines are probably responsible for the erratic response observed at these locations.

(c) A relatively high apparent conductivity anomaly, approximately 6 mS/m above background, was noted at this location in the 20 meter vertical dipole mode. This anomaly may be due to the presence of a buried conductor.

(d) Anomaly "d" was a low apparent conductivity anomaly approximately 2 to 5 mS/m above background that corresponds to the anomaly D of Figure 1.

(e) Anomaly "e" was observed as a apparent conductivity low. A house was noted in the vicinity of this anomaly as well as a mail box. This anomaly may represent a stratigraphic change or noise due to surface anthropogenic features.

Line 2 Horizontal Dipole Data (Figure 3)

Line 2 was located on the southwest side of the site, south of the transfer station access road. Data were collected in a hummocky and wooded area. During data collection, surface debris were noted along the survey line. During the planting of geophones for the seismic refraction survey, plastic and paper debris were unearthed. Data were collected west to east.

(A) Anomaly "A" was approximately 3 to 5 mS/m above background and was noted in the 10 and 20 meter horizontal dipole data. This anomaly corresponded with a decrease in surface elevation. This anomaly may represent a change in topography, stratigraphy or the presence of fill.

Line 2 Vertical Dipole Data (Figure 4)

(a,b) These apparent conductivity lows were observed in the vicinity of surface debris. The erratic responses observed at these locations are probably due to the presence of fill and metallic debris.

Line 3 Horizontal Dipole Data (Figure 5)

Data were collected at Line 3 along the northern toe of the solid waste landfill. An anomaly of approximately 20 to 50 mS/m above background was observed at this location that probably represents the presence of contaminated fill and buried metals. Prior to performing the EM survey, it was thought that survey Line 3 was not located on fill material.

As a result of Line 3 being located on conductive fill material, 20 meter dipole data were not collected. A topographic expression marking the apparent eastern extent of the landfill was noted at 475 east. Dead trees were noted north of Line 3 between 125 and 325 east. A crushed 55-gallon drum was noted at location 425 east. Near background values were noted at the end of the line.

(A) Anomaly "A" was located between location 0 east and 525 east and likely represents the presence of contaminated fill. The erratic response observed in the vertical dipole data suggests that the fill may contain buried metals.

Line 3 Vertical Dipole Data (Figure 6)

(a,c) Anomalies "a" and "c" are approximately 10 to 20 mS/m below background. These apparent conductivity lows probably represents contaminated fill materials with associated buried metals.

(b) Anomaly b, (approximately 50 mS/m below background) is an apparent conductivity low which represents buried metals or other highly conductive materials.

Line 4 Horizontal Dipole Data (Figure 7)

Line 4 was located near the north eastern corner of the solid waste landfill. Above background data was observed along Line 4 suggesting that it was located on or near the toe of the landfill.

(A) Anomaly "A", was a relatively high apparent conductivity anomaly in the 10 meter intercoil spacing and a conductivity low and 20 meter intercoil spacing, probably represents the presence of contaminated fill material buried within the toe of the solid waste landfill. The erratic noisy response observed in the vertical dipole mode (Figure 8) at this location supports the hypothesis of the presence of contaminated fill with associated buried metals.

(B) Anomaly "B", a broad 10 and 20 meter intercoil spacing apparent conductivity high, may represent an area of contaminated fill or ground water contamination. The erratic noisy response observed in the vertical dipole mode (Figure 8) at this location supports the hypothesis of the presence of contaminated fill with associated buried metals. The response may have also been affected by the presence of the landfill located to the west of the survey line.

Line 4 Vertical Dipole Data (Figure 8)

(a,b) Erratic, noisy responses were observed in both the 10 and 20 meter intercoil spacings. This response is often indicative of the presence of fill material with associated buried metals.

Line 5 Horizontal Dipole Data (Figure 9)

Line 5 data were collected in-between the solid waste landfill and the bulky waste landfill in what appears to be an eroded stream valley that now contains Mitchel Brook. A regional trend of decreasing apparent conductivity values was observed from south to north. This decreasing trend may represent increasing elevation. A swampy area was noted along the south of the survey line and Mitchel Brook was crossed twice during the Line 5 survey.

(A,B) Anomalies "A" and "B" were observed south and north of Mitchel Brook, respectively. Both anomalies were observed at a 10 meter intercoil spacing. Anomaly A was observed near a swampy area in the vicinity of Mitchel Brook and may represent the presence of porous near surface organic sediments. Anomaly B was observed along the north bank of Mitchel Brook and may represent the presence of near surface fill material.

(C) Anomaly "C" was a narrow high 20 meter intercoil spacing response. This anomaly was measured while the receiver was in a small ravine (approximately 8 feet deep). As this anomaly is defined by only one data point and only in the 20 meter intercoil spacing, it probably represents an error in coil alignment due to steep topography in the ravine.

(D) Anomaly "D" was observed in the 10 and 20 meter intercoil spacings. This nomaly was observed north of a paved access road in the vicinity of Mitchel Brook. This anomaly may represent the presence of fill or a change in topography.

(E) Anomaly "E" was observed as a narrow high response in the 10 meter intercoil spacing data. This anomaly was observed near the banks of Mitchel Brook. As this

anomaly is defined by only one data point and only in the 10 meter intercoil spacing, it probably represents an error in coil alignment due to steep topography.

Line 5 Vertical Dipole Data (Figure 10)

(a,b) Anomalies "a" and "b" were observed as conductivity lows in the 20 meter intercoil data. These anomalies were observed in the vicinity of the banks of Mitchel Brook and may represent topographic changes or coil misalignment due to steep topography.

Line 6 Horizontal and Vertical Dipole Data (Figures 11 and 12)

Line 6 was located on the west side of the bulky waste landfill. The survey line was located in a wooded area. A soil mound was observed at the southern extent of the survey line.

(A,a) Anomalies "A" and "a" were conductivity lows which were observed in the 10 meter horizontal and vertical intercoil data. These anomalies may represent buried metallic debris. A soil mound was noted in the vicinity of these anomalies.

Line 7 Horizontal and Vertical Dipole Data (Figures 13 and 14)

Line 7 was located on the northwest side of the bulky waste landfill. Line 7 was located in an area vegetated with grasses and brush. The following anomaly was observed.

(A,a) Anomalies "A" and "a" were narrow apparent conductivity lows observed in the 10 meter horizontal and vertical data. These anomalies may represent an area of fill that contains metallic debris.

Line 8 Horizontal and Vertical Dipole Data (Figures 15 and 16)

Line 8 was located on the west side of the sewage sludge landfill. The following anomalies were observed.

(A,a) Anomalies "A" and "a" were narrow apparent conductivity highs that may be representative of a pocket of fill material or coil misalignment.

Line 9 Horizontal and Vertical Data (Figures 17 and 18)

Line 9 was located on the north side of the sewage sludge landfill. A regional trend of increasing apparent condictivities was noted in the vertical data as the survey trended east. This regional trend may be representative of a decrease in elevation.

Line 10 Horizontal and Vertical Data (Figures 19 and 20)

Line 10 was located on the northeast corner of the sewage sludge landfill. A regional trend of increasing apparent conductivities was observed that may represent a decrease in elevation. The following anomaly was observed.

(A) A noisy response was observed in the 10 meter horizontal data. This response may represent the presence of near surface fill material.

Line 11 Horizontal Dipole Data (Figure 21)

Line 11 was located on the east side of the sewage sludge landfill in a wooded area. The following anomalies were observed.

(A) Anomaly "A" was a broad, low frequency anomaly that may represent a stratigraphic change or the possible presence of fill, or the presence of contaminated ground water. This anomaly is observed in both the 20 meter horizontal and 10 meter vertical intercoil spacing data.

(B) Anomaly "B" was a high frequency apparent conductivity low observed in the 10 meter data. This anomaly may represent the presence of near surface fill containing metals or represents coil misalignment.

Line 11 Vertical Dipole Data (Figure 22)

(a) Anomaly "a" was observed in the 10 meter data as a narrow apparent conductivity high. This anomaly may be the result of poor alignment of the transmitter and receiver coils due to topography or the presence of fill material.

(b) Anomaly "B" was associated with anomaly "A" (Figure 21). This anomaly may represent a stratigraphic change, the presence of fill or the presence of contaminated ground water.

Line 12 Horizontal and Vertical Data (Figures 23 and 24)

Line 12 was located along the eastern side of the bulky waste landfill. Due to the close proximity of the eastern toe of the landfill to the survey line, some signal interference

may have occurred especially as the intercoil spacings were increased to 20 meters. The following anomalies were observed.

(A,B,a) Anomalies "A", "B" and "a" were observed along Line 12. These anomalies may represent the survey lines close proximity to the bulky waste landfill or the presence of contaminated soils or ground water. A gradual decrease in apparent conductivity was also observed as the line proceeded north and may represent an increase in elevation.

Line 13 Horizontal and Vertical Data (Figures 25 and 26)

Line 13 was located on or near the southern toe of the bulky waste landfill. The presence of the landfill may have caused signal interference. The following anomalies were observed.

(A,B,a) Anomalies "A", "B" and "a" may represent an area of fill, contaminated soils and/or contaminated ground water. The erratic, noisy response noted in the vertical dipole mode suggests the presence of fill at or near the survey line with associated buried metals.

Line 14 Horizontal Data (Figure 27)

Line 14 was located on and near the southern toe of the bulky waste landfill. The toe of the landfill appeared to topographically end at, or near station 250 east. The following anomalies were observed.

(A) Anomaly "A" is a broad conductivity high that may represent an area of contaminated soils and fill. The erratic response observed in the vertical data suggests the presence of fill with buried metals.

Line 14 Vertical Data (Figure 28)

(a, b) Anomalies "a" and "b" are believed to be representative of fill with associated buried metals.

Lines 15 though 26 Horizontal Data (Figure 29)

Lines 15 through 26 were located in fields and wooded areas on the east side of the Saugatucket River.

(A) Anomaly "A" was observed in the vicinity of a wire fence. This anomaly may have been caused by a the presence of metal in a wire fence.

Lines 15 through 26 Vertical Data (Figure 30)

(a) Anomaly "a" was a conductivity low probably due to the presence of a power line observed south of this location.

Line S3 Horizontal Data (Figure 31)

Line S3 trended east from the eastern toe of the solid waste landfill to the western toe of the bulky waste landfill. The following anomalies were observed.

(A, B) Anomalies "A" and "B" represent the approximate extent of contaminated fill at the solid waste and bulky waste landfills respectively.

Line S3 Vertical Data (Figure 32)

(a,b) Anomalies "a" and "b" represent the approximate extent of fill at the solid waste and bulky waste landfills, respectively.

3.2 EM31-DL Results

Stream Survey, Mitchel Brook (Figure 33)

Due to the presence of fill materials along EM Line 3, a secondary line was chosen north of the solid waste landfill that followed the stream bottom of Mitchel Brook. Iron stained soils were observed in the vicinity of Mitchel Brook that were thought to represent leachate seeps or the presence of near surface contamination. In order to map these possible near surface contaminants, an EM31-DL survey was requested. Background values of apparent conductivity were approximately 1 to 2 mS/m at this location. The following anomalies were observed.

(A) Anomaly "A", a broad apparent conductivity high that was 1 to 3 mS/m above background readings, may represent an area of soil or ground water contamination. This anomaly may also represent a near surface stratigraphic change.

(B) Anomaly "B", a negative apparent conductivity, probably represents the presence of metallic debris. An above background in-phase response was also observed at this location.

(C) Anomaly "C", a negative apparent conductivity and in-phase response is probably due to the presence of metals in a bridge located at the end of the survey line.

Line S7 (Figure 34)

It was noted during the seismic survey that iron stained soils, possibly due to leachate seeps, were present along the swampy, northern extent of the survey line. While the EM31-DL equipment was available on-site, Gartner Lee volunteered to perform a survey along seismic survey line S7. The EM31-DL survey was performed to further define the presence of possible near surface contaminants. The following anomalies were observed.

(A) Anomaly "A" was located along the northern area of the survey line in a swampy topographic low area. This anomaly may correspond to a decrease in elevation and the presence of near surface ground water contamination.

3.3 VLF Results

The VLF survey was performed along three survey lines designated VLF 1, VLF 2 and VLF 3. The purpose of the VLF survey was to identify the presence of steeply dipping bedrock fractures that may act as preferential pathways for contaminant migration. Two plots were constructed for each profile line. These plots consist of (1) unfiltered tilt angle and unfiltered ellipticity data; and (2) filtered tilt angle and filtered ellipticity data. All data are presented in units of percent. The following are the results of the survey.

Line VLF 1 (Figures 35 and 36)

Survey Line VLF 1 was located in the Mitchel Brook stream valley that separates the sanitary landfill and the bulky landfill. The following anomalies were observed:

(A, B, C) Anomalies "A", "B" and "C" may represent steeply dipping fractures or dipping conductive intrusions that trend northwards. Anomaly B appears to correlate to the EM34-3 anomaly "D" of Figure 9.

Line VLF 2 (Figure 37 and 38)

Survey line VLF 2 was a west-east trending survey line that was located along seismic Line S4. This survey line was located north of the bulky waste area. The following anomaly was observed.

(A) Anomaly "A", represented as a strong positive peak in the filtered data, may represent a steeply dipping bedrock fracture or conductive igneous intrusion.

Line VLF 3 (Figures 39 and 40)

There were not any VLF anomalies observed at this line location.

3.4 Seismic Refraction Results

Results are presented in the form of depth profiles denoting velocity contrasts in the subsurface. These have been corrected for near surface variations in velocity and variations in surface elevations. Surface elevations are referenced to a surveyed elevation of 64.27 feet above sea level at the 0+00 stake of Seismic Line 2. A total of seven seismic lines were surveyed at the Rose Hill Landfill Site. The locations of these lines are shown on Plate 1. The seismic depth sections are presented in Figures 41 through 48. Our interpretations indicate that bedrock topography, depicted with arcs on Figures 41 through 48, is variable across the study area. In general, bedrock appears to deepen to the east of the site towards the Saugatucket River.

Initial interpretation of the seismic data indicated three refracting layers, interpretted as unsaturated overburden, saturated overburden, and bedrock. The unsaturated overburden layer was initially interpretted as being a uniformly thin (5 to 10 ft.) low velocity layer. Subsequent borehole data provided by Metcalf & Eddy,Inc. indicated discrepancies in the depth to bedrock determined through analysis of the seismic data. This difference was most notable in the northeast portion of the study area. As a result of this discrepency, the seismic data were re-interpretted utilizing the borehole data. The re-interpretation indicated that in the northeast portion of the site, four refracting layers could be distinguished: (1) a near surface, loose, unsaturated, low velocity layer: (2) an unsaturated overburden layer: (3) a saturated overburden layer; and (4) bedrock. The initial interpretation grouped layers (1) and (2) together, which resulted in an underestimation of the depth to the water table and bedrock. Since the water table in the northeast portion of the site is relatively deep (> 20 ft.) a careful review identified refractions from the unsaturated sands and silts of layer (2) on several geophone channels. Where the water table was shallow it was not possible to identify and separate layers (1) and (2). The geophone spacing was not short enough to record arrivals from these shallow, thin layers. Data from the "short spreads" (1 meter geophone spacing) were utilized to determine an average velocity for these near surface layers and this velocity was used for depth calculations along Seismic Lines S1, S2, S3, and S7.

Figures 41 through 48 present the results of the seismic survey. Three layers were interpretted on Lines S1, S2, S3, and S7. On Lines S4, S5, and S6 it was possible to distinguish four layers. Boreholes, in the vicinity of the seismic lines, as well as seismic

tie locations, are plotted on the figures where appropriate. For the four layer case, the following approximate velocities observed were:

Layer 1	150 - 300 m/s	loose, slow, unsaturated overburden;
Layer 2	450 - 750 m/s	unsaturated overburden;
Layer 3	1300 - 1700 m/s	saturated overburden;
Layer 4	3800 - 4500 m/s	bedrock.

For the three layer case, the following approximate velocities observed were:

Layer 1	250 - 500 m/s	unsaturated overburden;
Layer 2	1300 - 1700 m/s	saturated overburden;
Layer 3	3800 - 4500 m/s	bedrock.

It is likely that if a weathered bedrock zone exists above competent bedrock, the depths interpreted from a seismic refraction survey would represent the competent bedrock.

It should be noted that irregular surface topography at the Rose Hill Landfill Site adversely affected the definition of the bedrock refractor. Surface layers have low velocities relative to the bedrock velocity. Variations in the thicknesses or velocities in these shallow layers produce time anomalies which are much greater than anomalies produced by similar variations in bedrock topography. For unsaturated overburden and bedrock velocities of 300 m/s and 4200 m/sec respectively, a change in thickness/elevation of the overburden of 1 meter corresponds to a 6.6 millisecond time anomaly. This same time anomaly, if interpreted as a change in bedrock topography, would correspond to a 13.9 meter apparent change in bedrock topography. However, for this survey, this possible source of error was minimized as follows:

- by collecting data from weathering spreads along lines to identify near surface velocity variations;
- by surveying the elevations of seismic lines; and
- and thorough interpretation and comparison of multiple forward and reverse shots using the Generalized Reciprocal Method (GRM) of seismic refraction interpretation.

4.0 Conclusions

4.1 EM34-3 Data

Values of apparent conductivity at the Rose Hill Site were very low (very resistive). When the values of apparent conductivity are low, error due to coil misalignment can equal or exceed small changes in apparent conductivity values, which could possibly be representative of the presence of low levels of contaminants or stratigraphic/lithologic change. Geophysical equipment other than that requested in the work plan may have been better suited for mapping the resistive subsurface conditions observed at the Rose Hill Site. This equipment includes, VLF resistivity and/or Ground Penetrating Radar (GPR) profiling. The extremely resistive soils and bedrock at the site would have been conducive for a GPR survey. A GPR survey may have helped identify the presence of boulders, the water table, fill and possibly provided supplimental data of the bedrock topography.

A general regional trend of decreasing apparent conductivities was observed as survey lines trended north. This trend is believed to be due to the northward increase in elevation at the site. No attempt was made to remove this regional trend from the data by applying a low cut filter as the trend was felt to be of minor importance.

Several areas of broad, above background anomalies were identified at the site that can be representative of stratigraphic change, topographic change or the presence of contaminated ground water or soils were observed at the site. The following anomalous areas were identified in the 10 and 20 meter horizontal dipole data that may represent areas of contaminated fill, soils and/or ground water.

Line 1, Anomalies A & D (Figure 1)
Line 2, Anomaly A (Figure 3)
Line 3, Anomaly A (Figure 3)
Line 4, Anomalies A & B, (Figure 7)
Line 5, Anomaly D (Figure 9)
Line 6, Anomaly A (Figure 11)
Line 7, Anomaly A (Figure 13)
Line 8, Anomalies A & B (Figure 15)
Line 10, Anomaly A (Figure 19)
Line 11, Anomaly A (Figure 21)
Line 12, Anomalies A & B (Figure 23)
Line 13, Anomalies A & B (Figure 25)
Line 14, Anomaly A (Figure 27)
Line S3, Anomalies A & B (Figure 31)

4.2 EM31-DL Data

The EM31-DL survey identified two areas of broad, above background quadrature component anomalies. These anomalies are inferred to represent areas of near surface soil and/or ground water contamination. These areas were located north of the solid waste landfill and south of the bulky waste landfill. The following anomalies were observed.

Stream Survey, Mitchel Brook, Anomaly A (Figure 33)

Line S7, Anomaly A (Figure 34)

4.3 VLF Data

The VLF data identified several conductive anomalies that may represent large fracture zones or conductive intrusions in the bedrock. The following anomalies were observed:

Line VLF 1, Anomalies A and B (Figures 35 and 36)

Line VLF 2, Anomaly A (Figures 37 and 38)

4.4 Seismic Refraction Data

The seismic refraction surveys at the Rose Hill Landfill Site appear to have been successful at delineated relative changes in bedrock topography along the profile lines.

Our interpretations indicate that bedrock topography is variable beneath the seismic lines. Bedrock appears to deepen to the east of the site towards the Saugatucket River.

Relative changes in bedrock topography interpreted along profile lines is believed to be representative of true, competent bedrock topography.

We would like to thank Metcalf & Eddy, Inc. for involving our firm in this most interesting study. If you have any questions, please do not hesitate to contact our office at (716) 285-5448.

Respectfully submitted,

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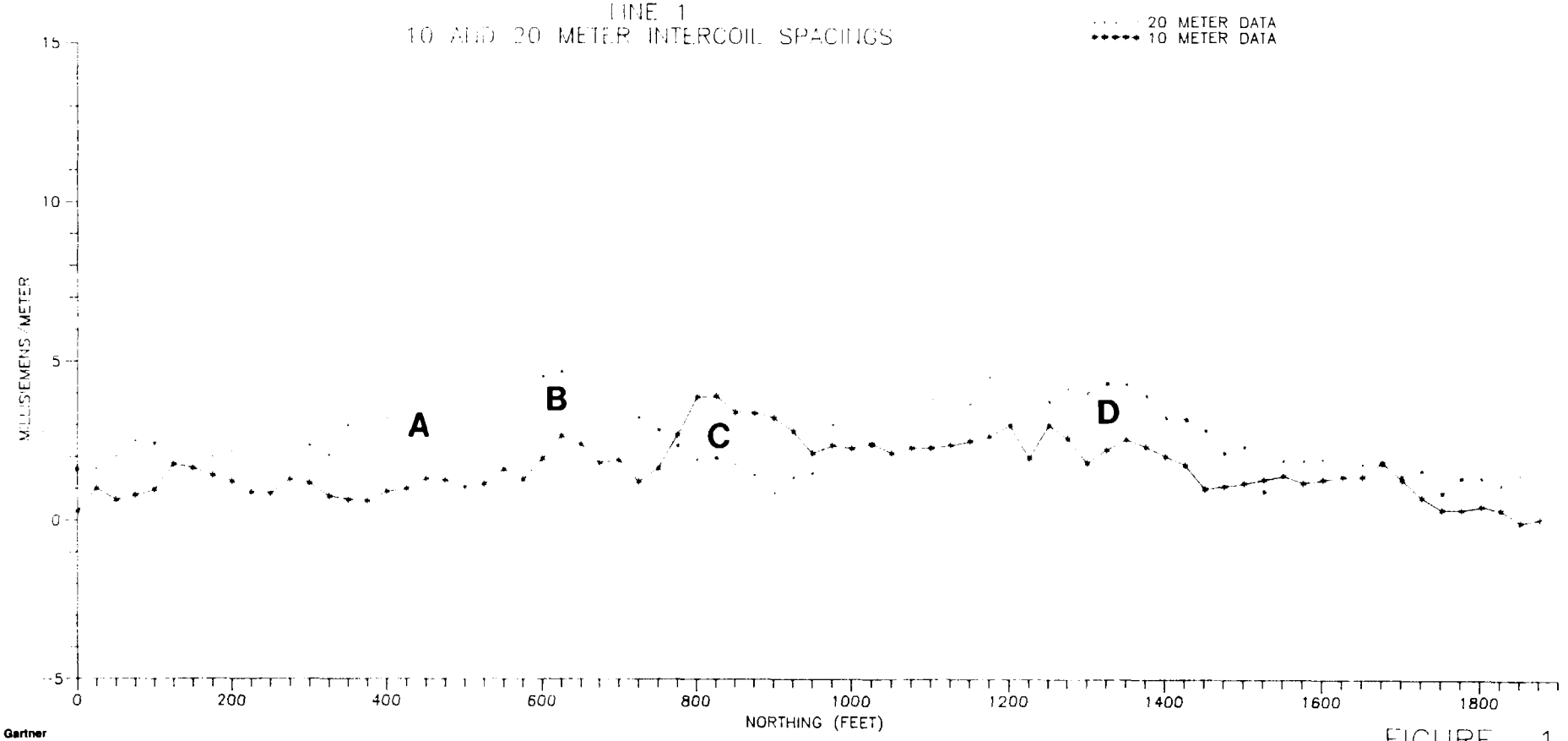
FIGURES

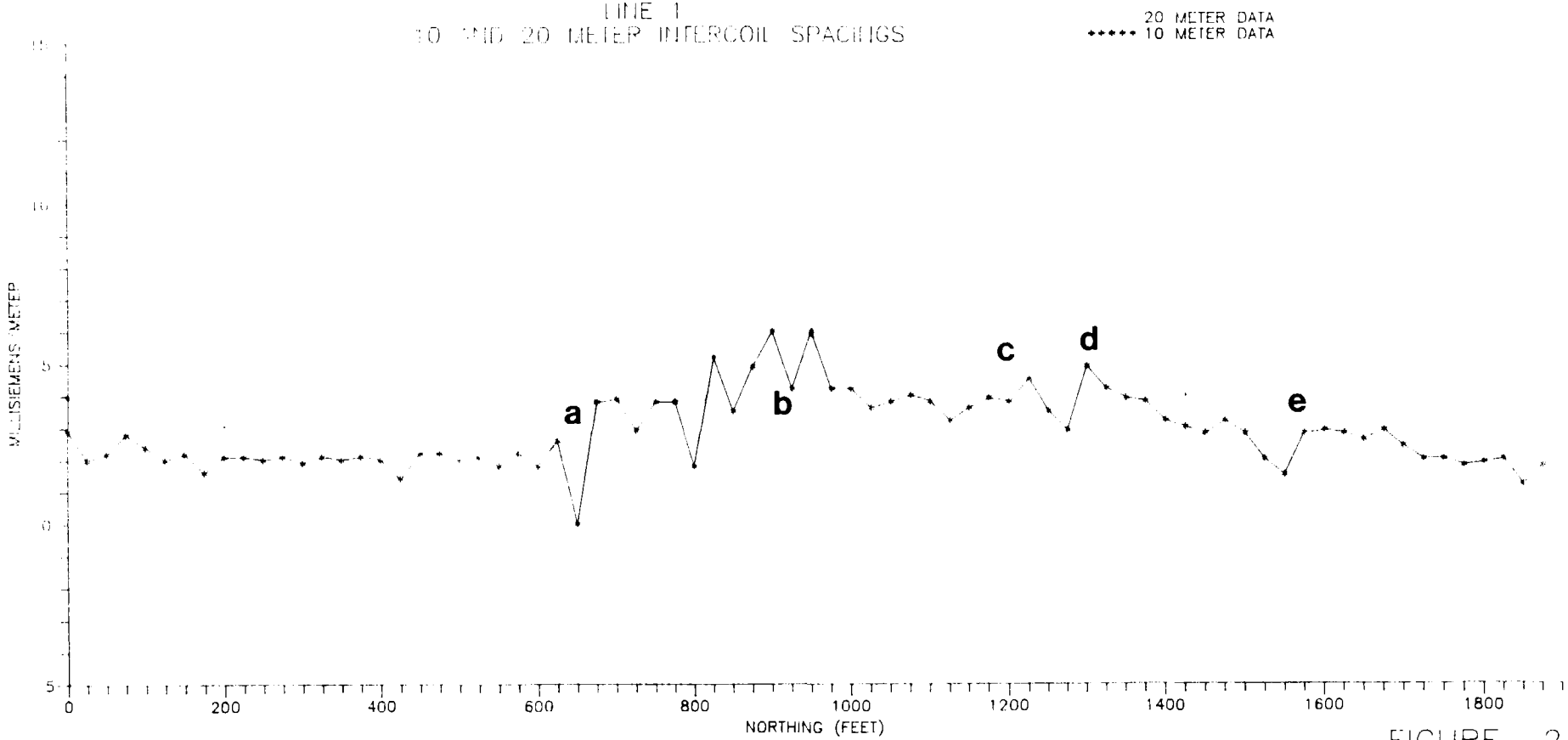
ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 1
10 AND 20 METER INTERCOIL SPACINGS



Gartner Lee

FIGURE 1

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 1
10 AND 20 METER INTERCOIL SPACINGS



Gartner Lee

FIGURE 2

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 2
10 AND 20 METER INTERCOIL SPACINGS

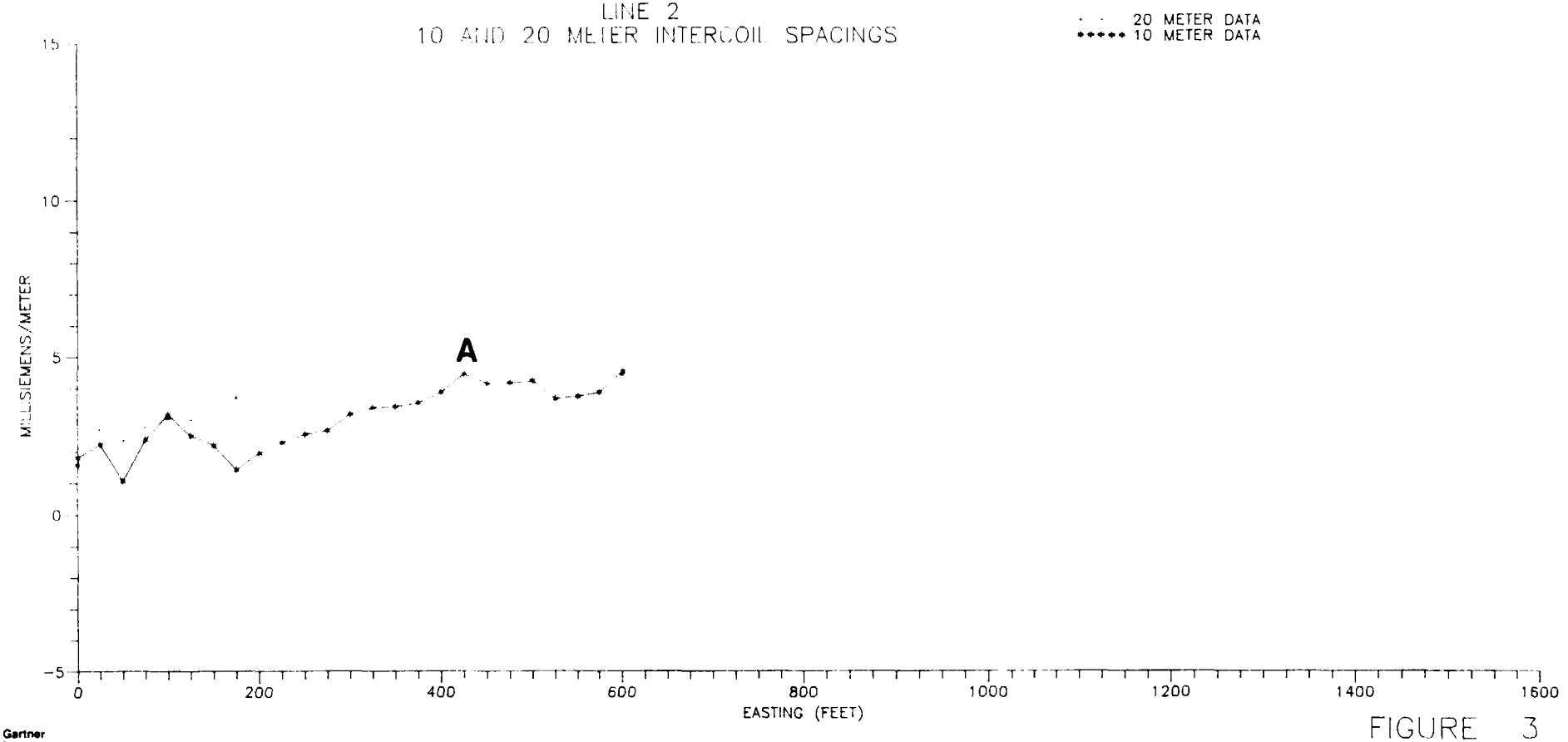


FIGURE 3

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ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34 3 VERTICAL DIPOLE RESULTS
LINE 2
10 AND 20 METER INTERCOIL SPACINGS

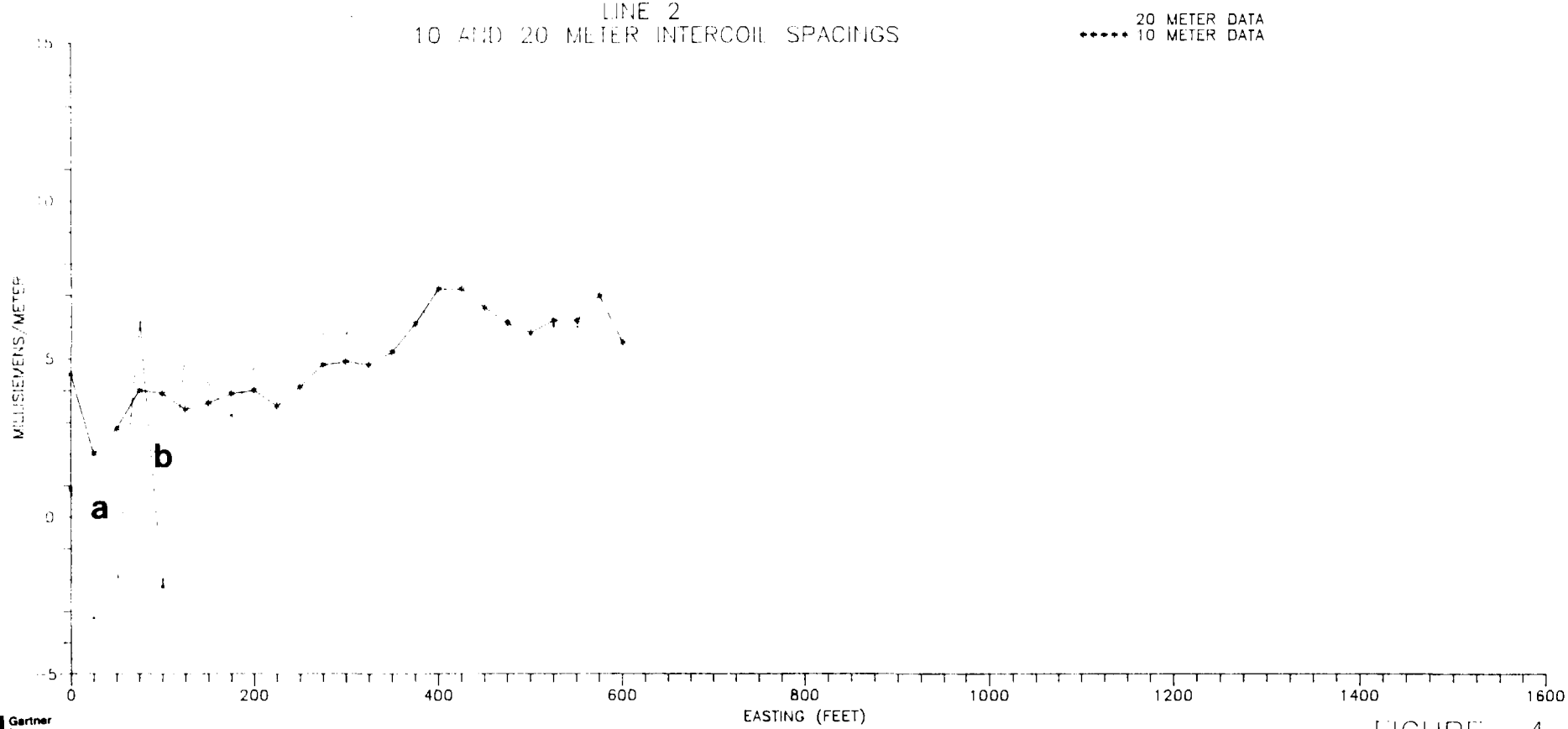

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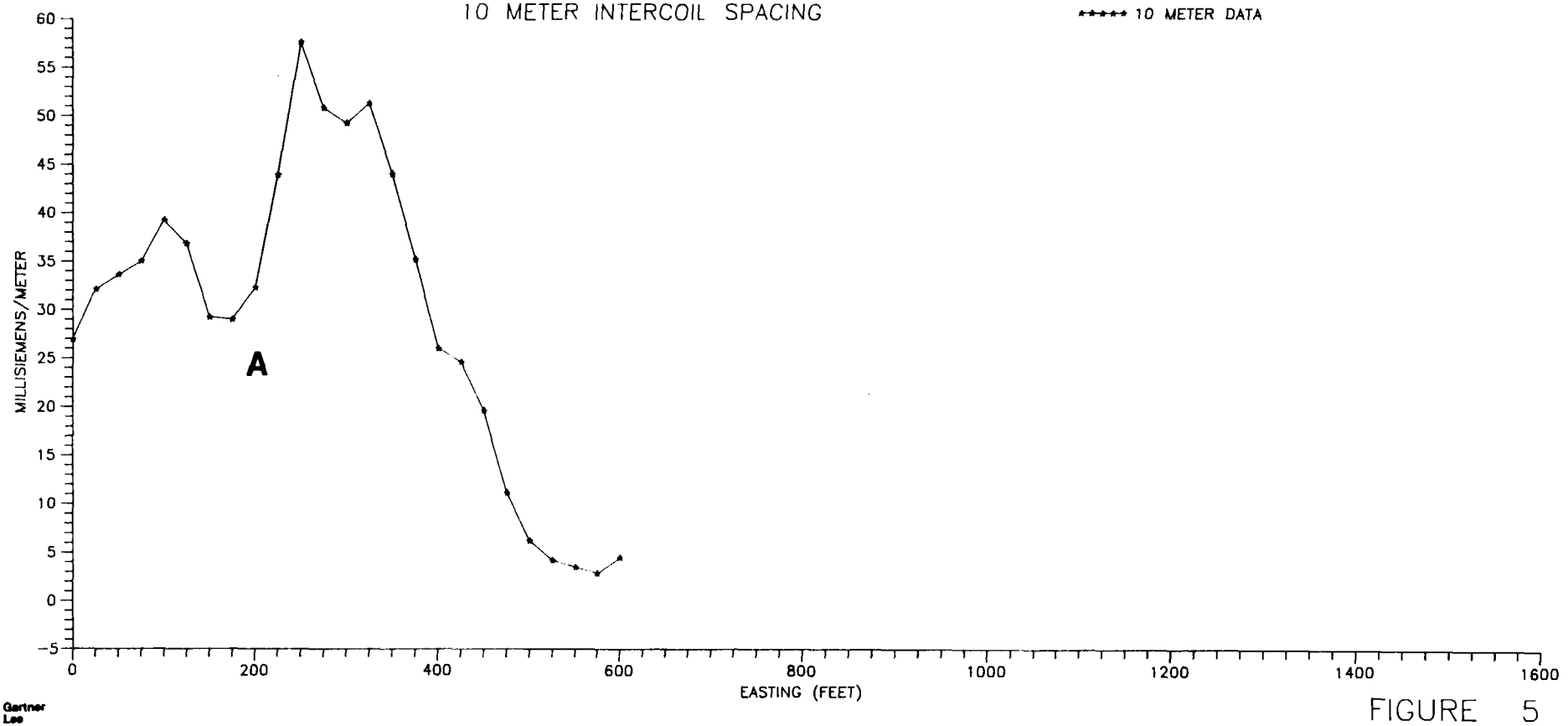
FIGURE 4

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 3
10 METER INTERCOIL SPACING



Gartner Lee

FIGURE 5

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 3
10 METER INTERCOIL SPACING

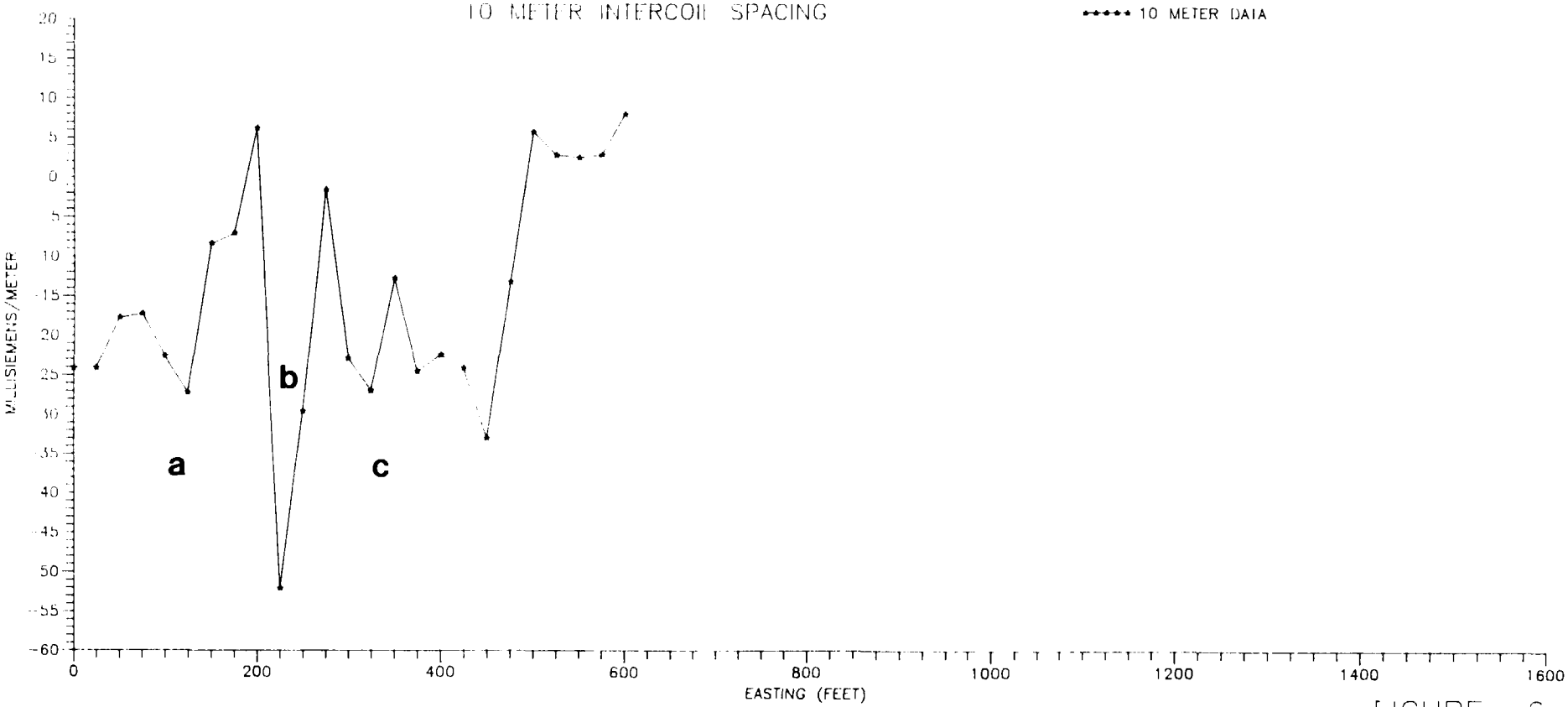


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FIGURE 6

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 4
10 AND 20 METER INTERCOIL SPACINGS

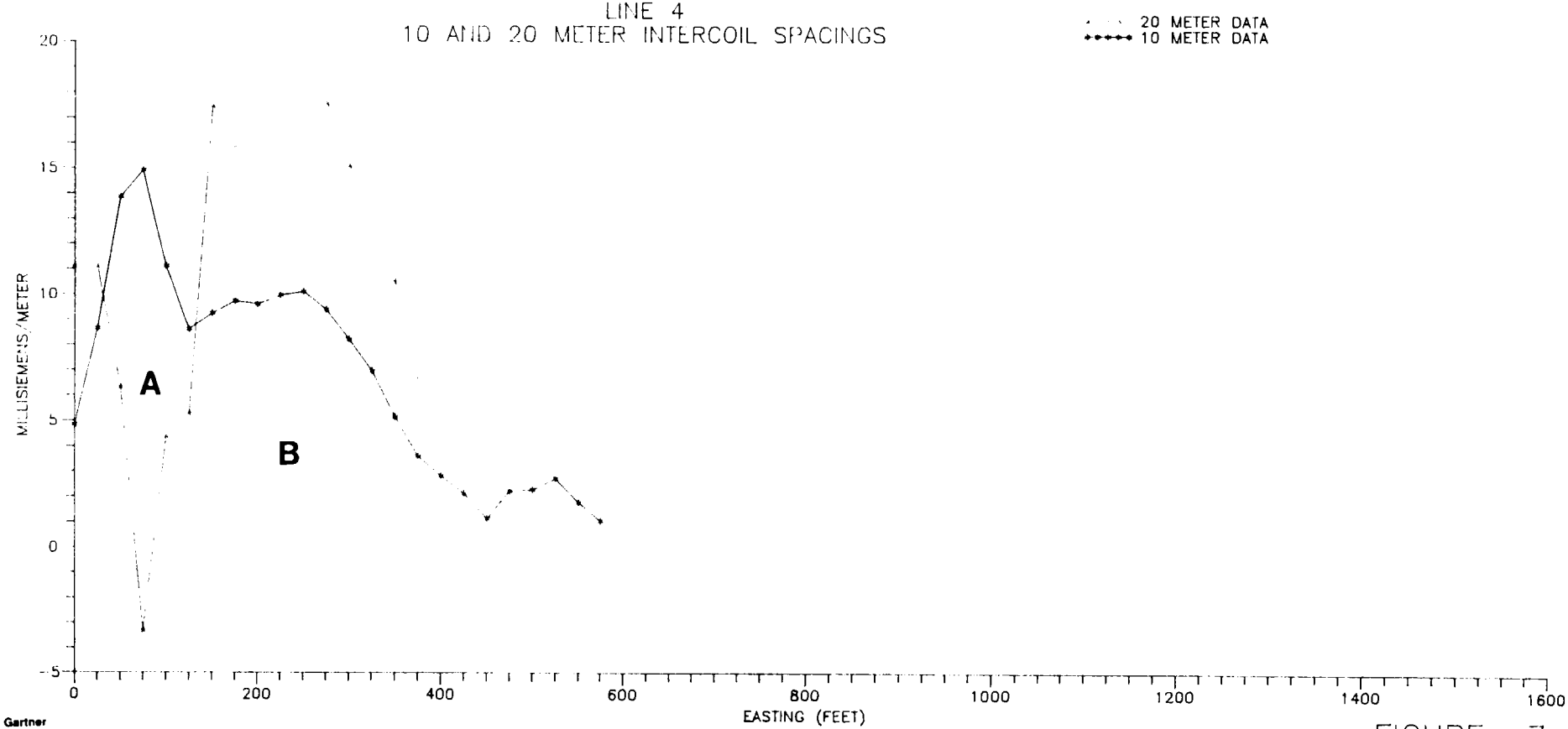

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FIGURE 7

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34 3 VERTICAL DIPOLE RESULTS
LINE 4
10 AND 20 METER INTERCOIL SPACINGS

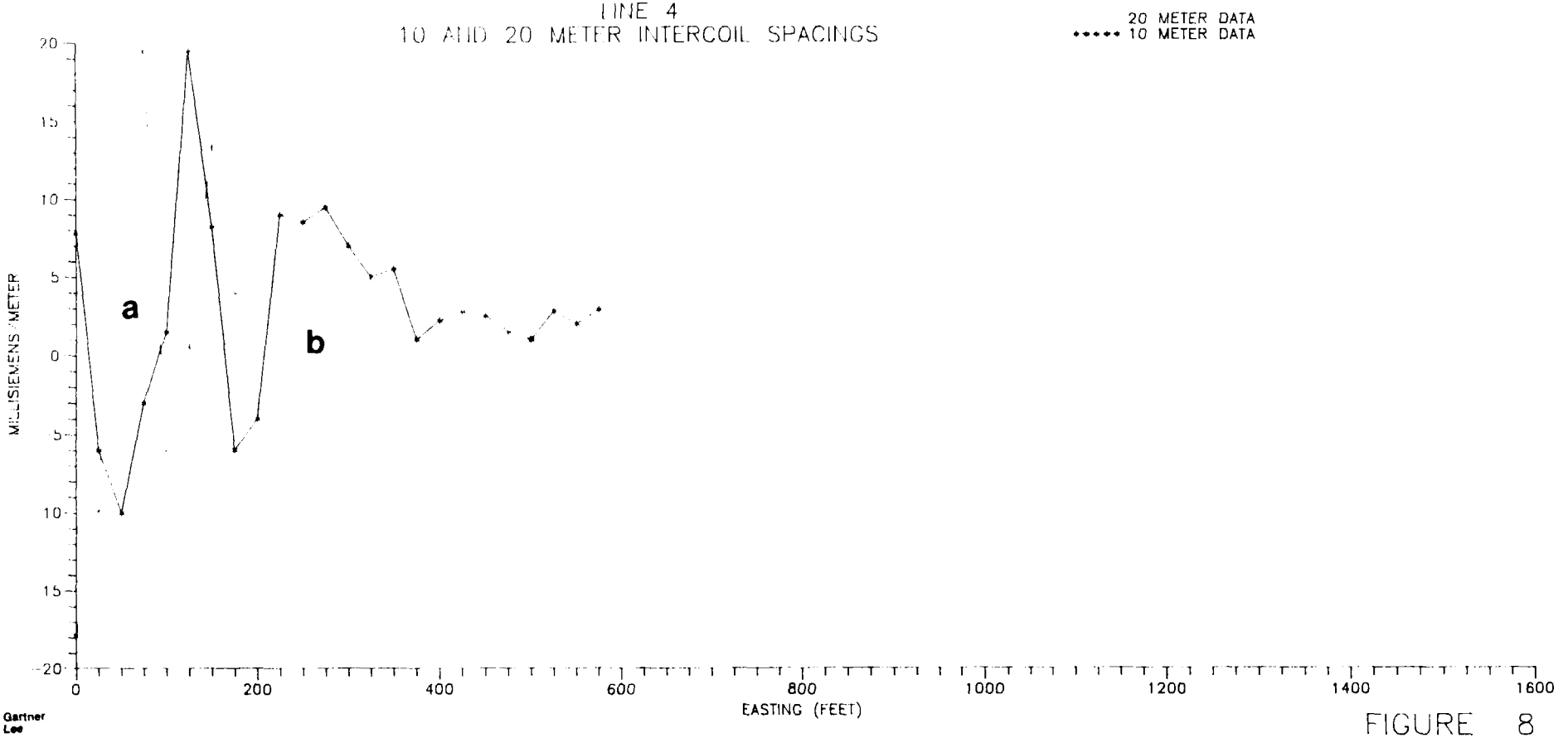

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FIGURE 8

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 5
10 AND 20 METER INTERCOIL SPACINGS

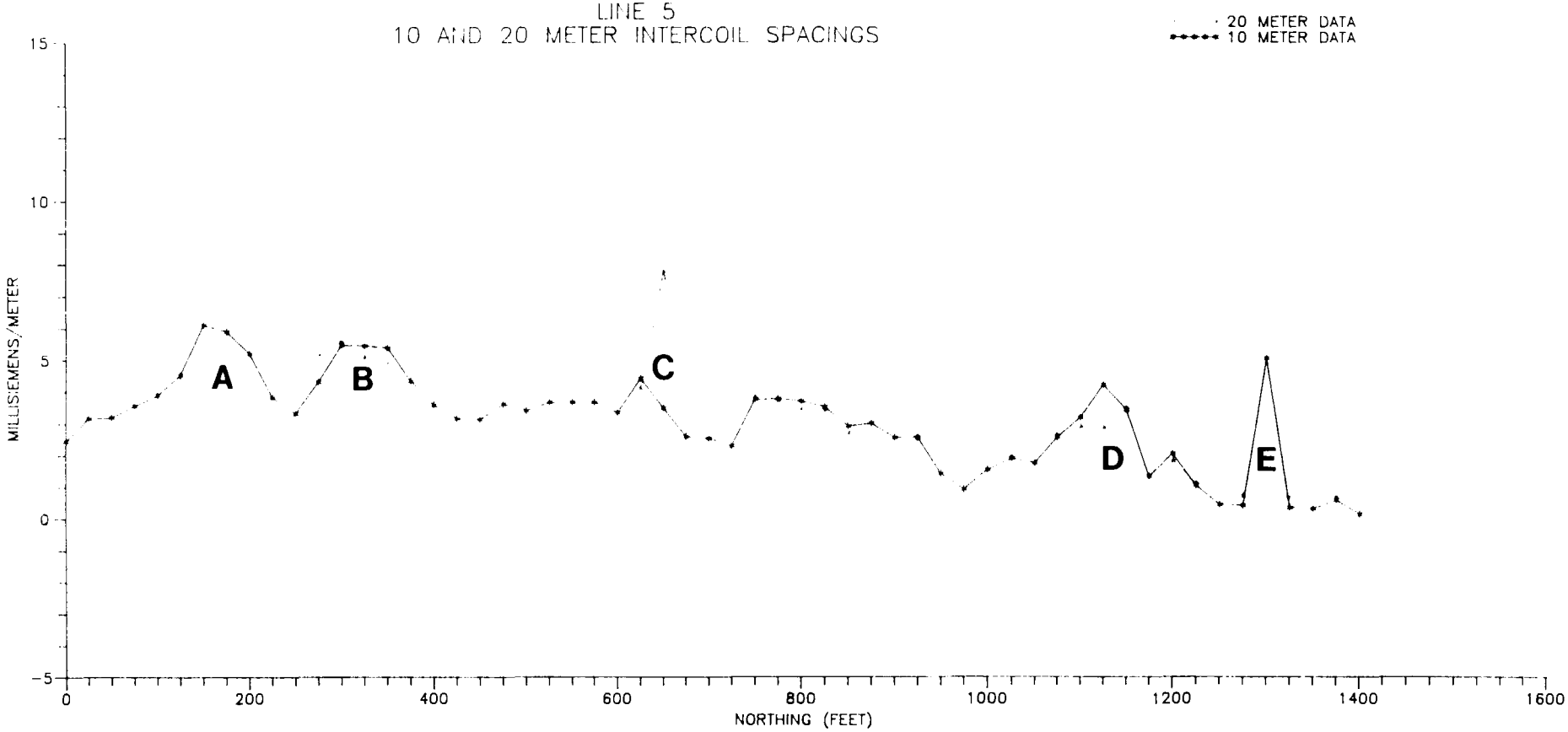

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FIGURE 9

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 5
10 AND 20 METER INTERCOIL SPACINGS

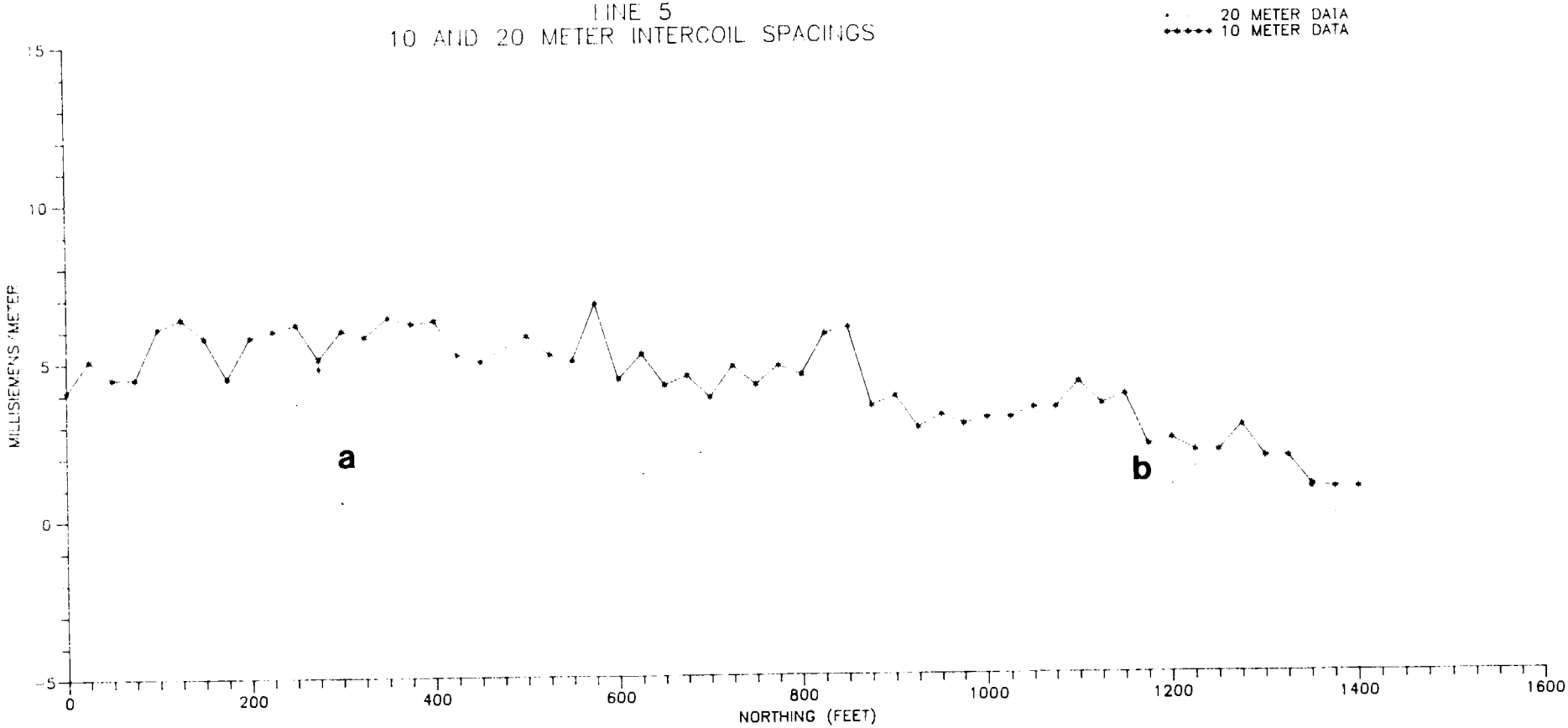

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FIGURE 10

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 6
10 AND 20 METER INTERCOIL SPACINGS

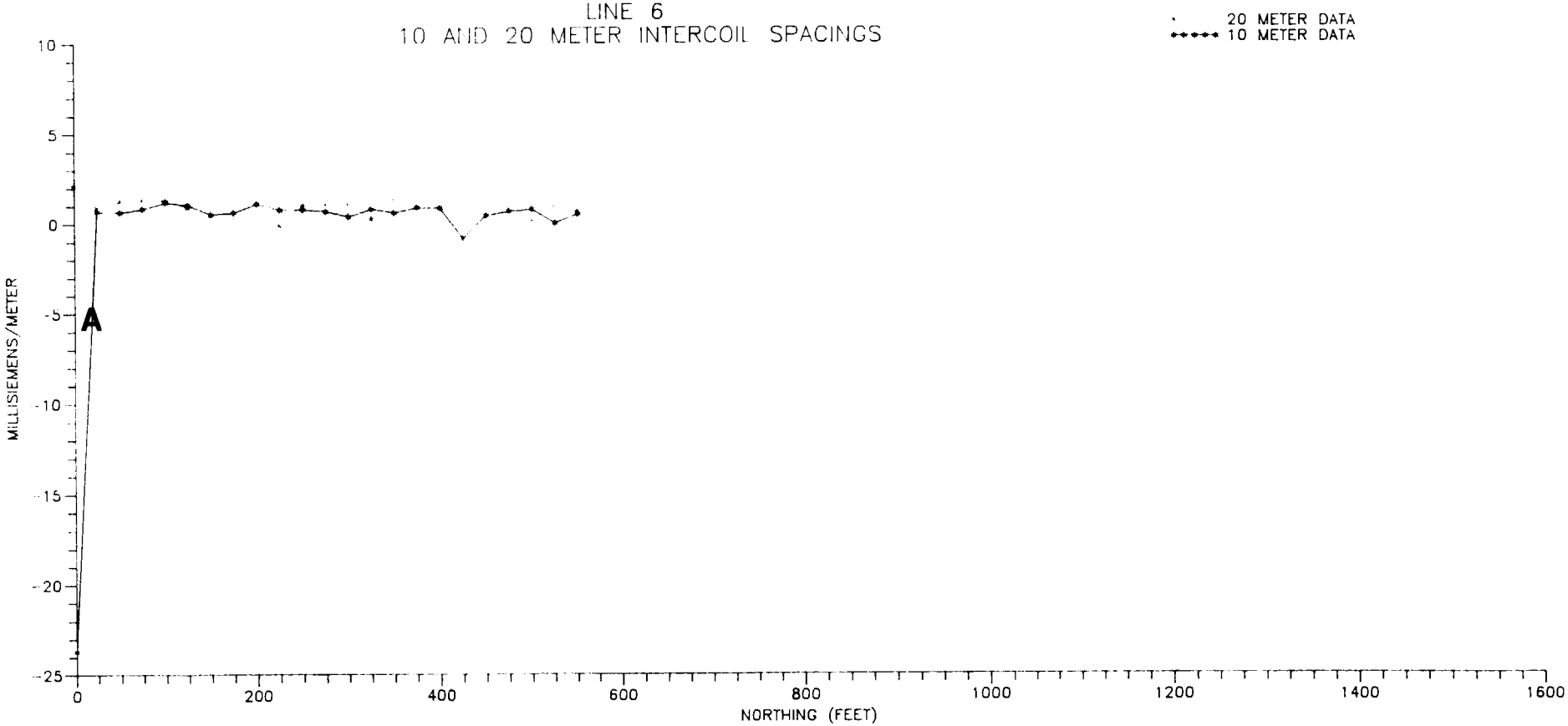

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FIGURE 11

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 6
10 AND 20 METER INTERCOIL SPACINGS

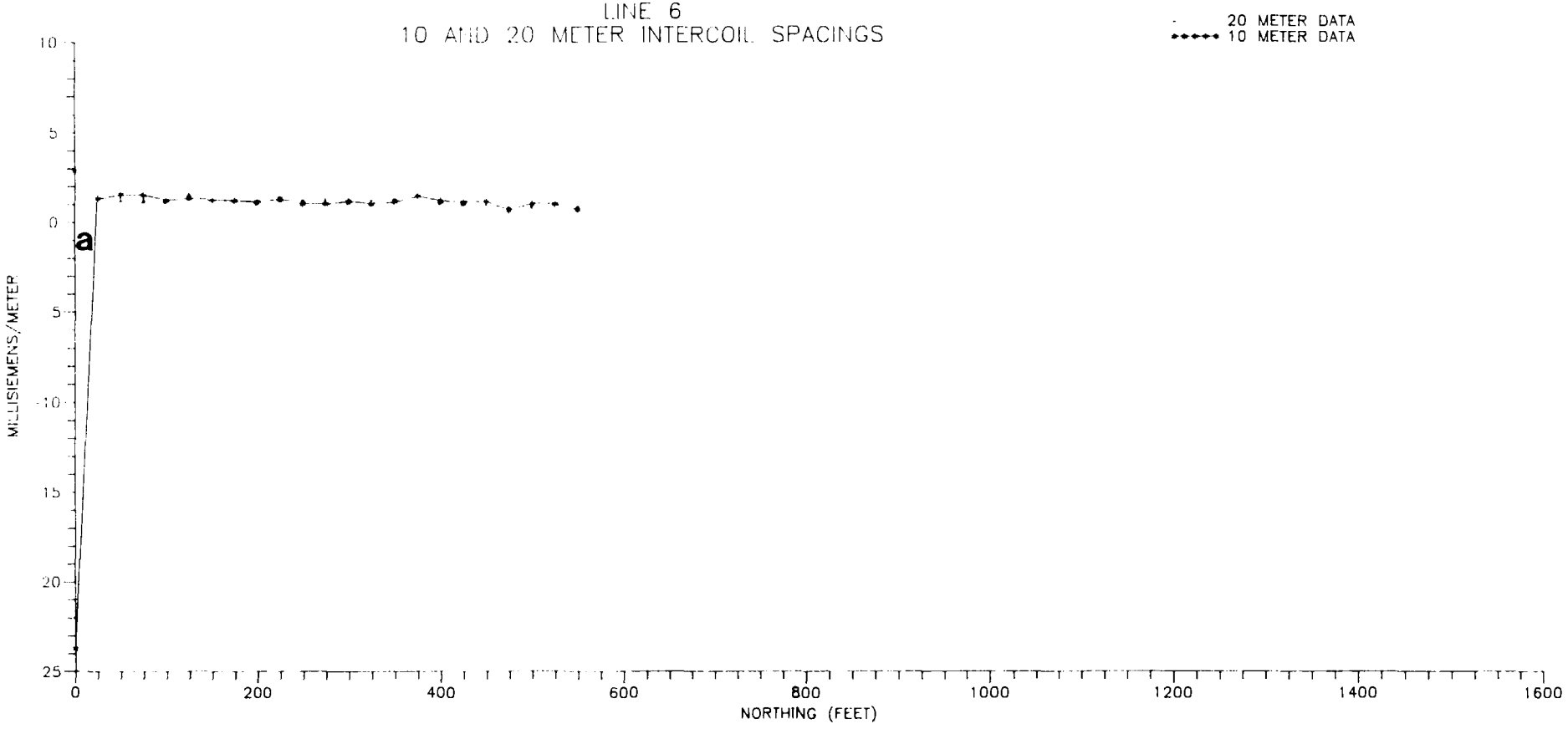

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FIGURE 12

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 7
10 AND 20 METER INTERCOIL SPACINGS

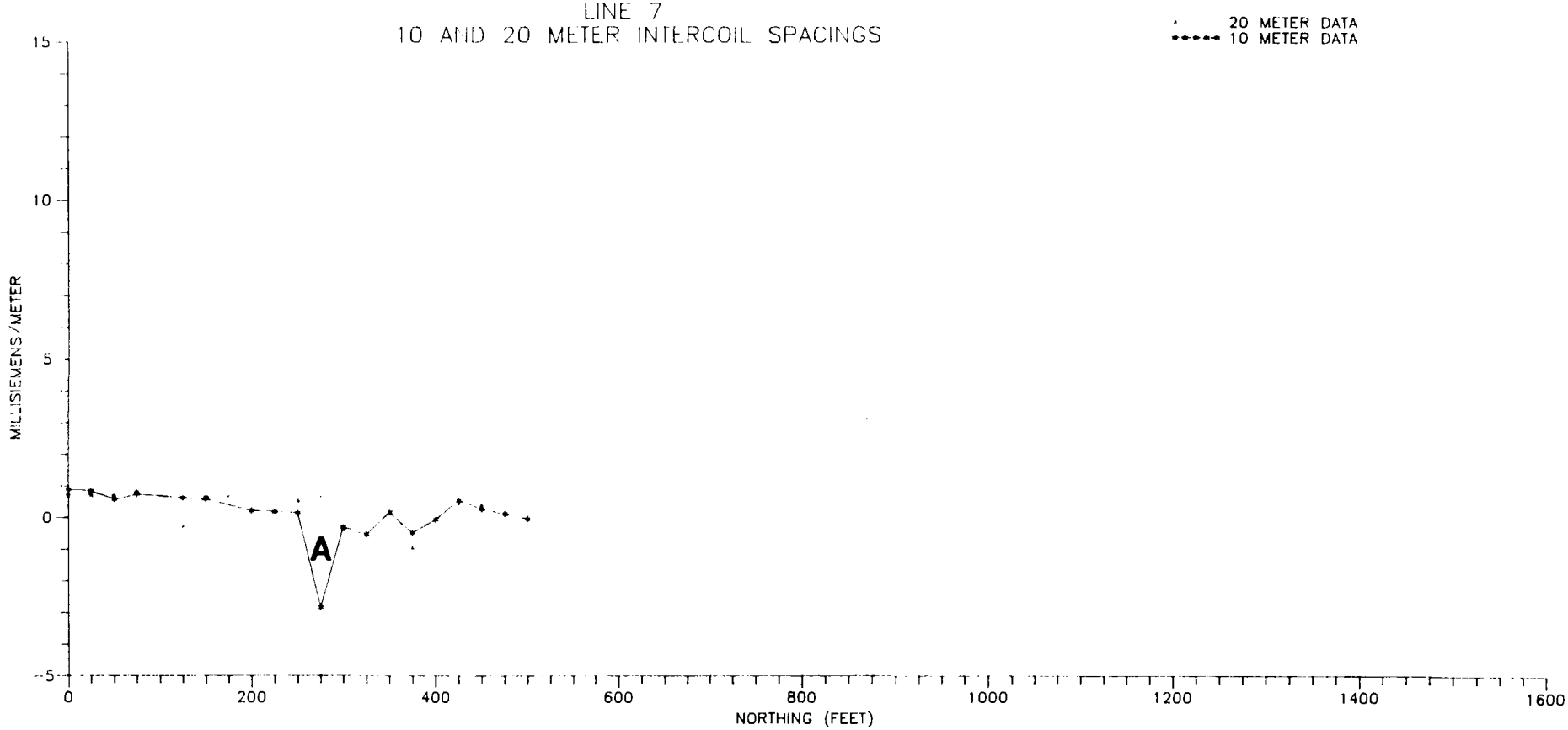

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FIGURE 13

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 7
10 AND 20 METER INTERCOIL SPACINGS

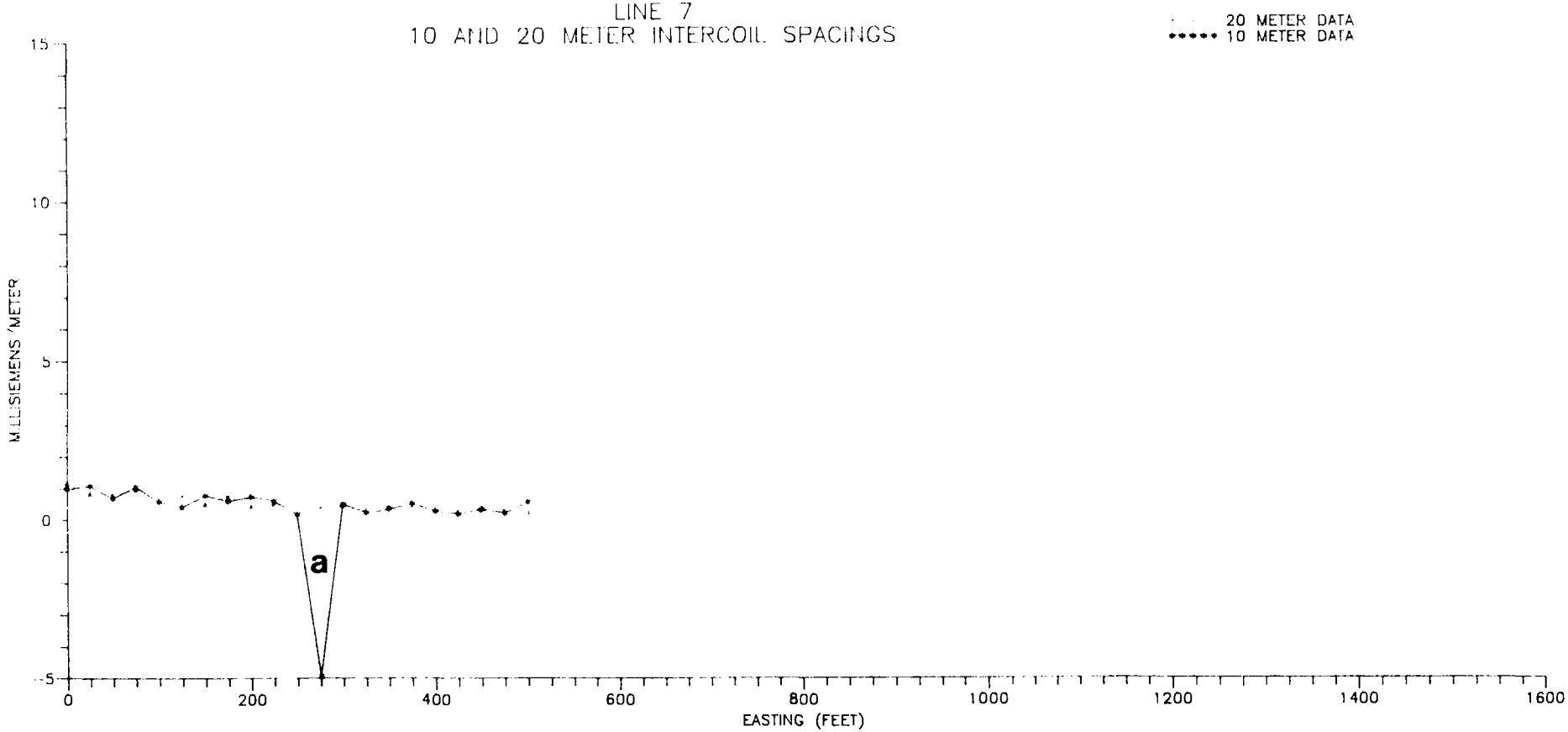

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FIGURE 14

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 8
10 AND 20 METER INTERCOIL SPACINGS

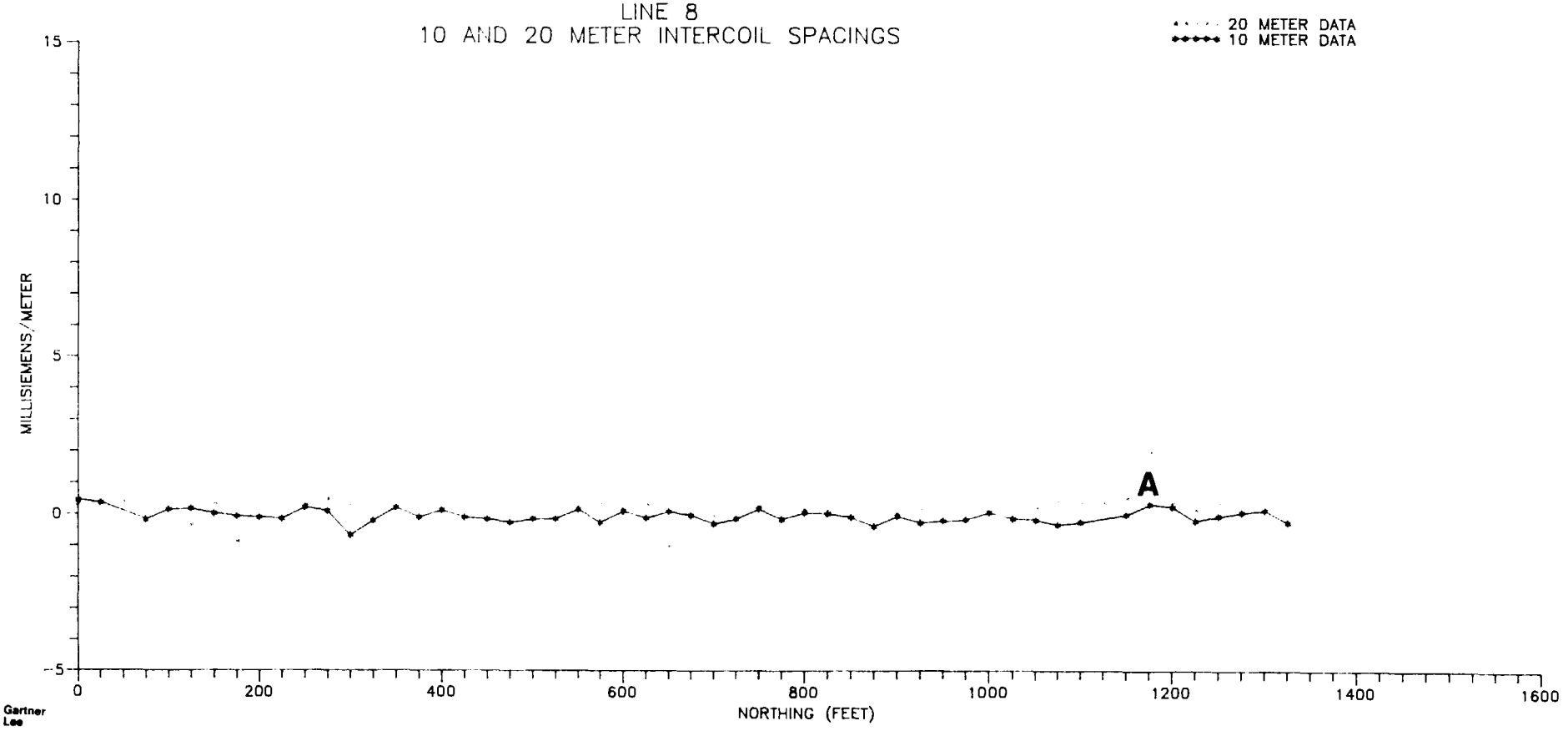

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FIGURE 15

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 8
10 AND 20 METER INTERCOIL SPACINGS

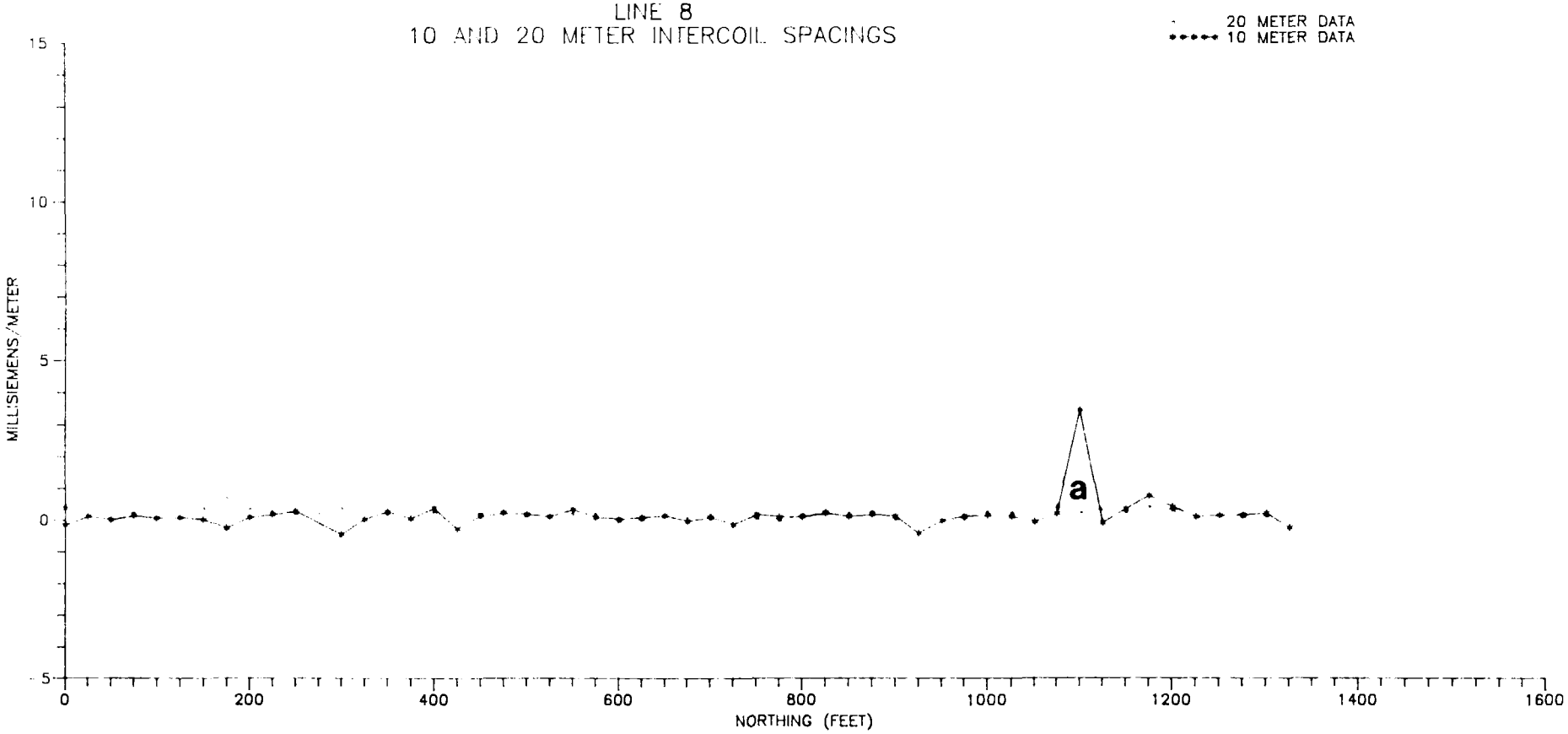

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FIGURE 16

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 9
10 AND 20 METER INTERCOIL SPACINGS

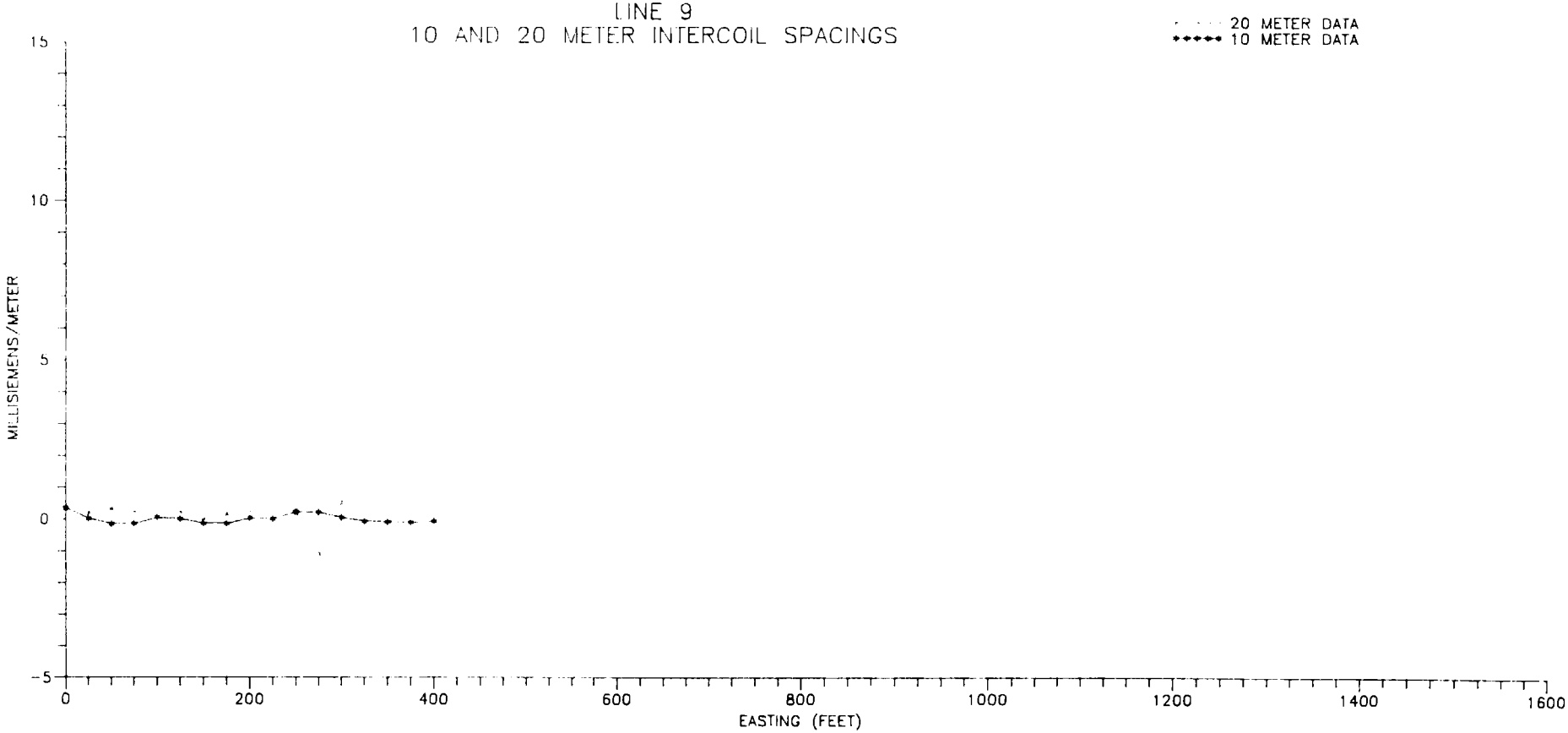

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FIGURE 17

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
FM34 3 VERTICAL DIPOLE RESULTS
LINE 9
10 AND 20 METER INTERCOIL SPACINGS

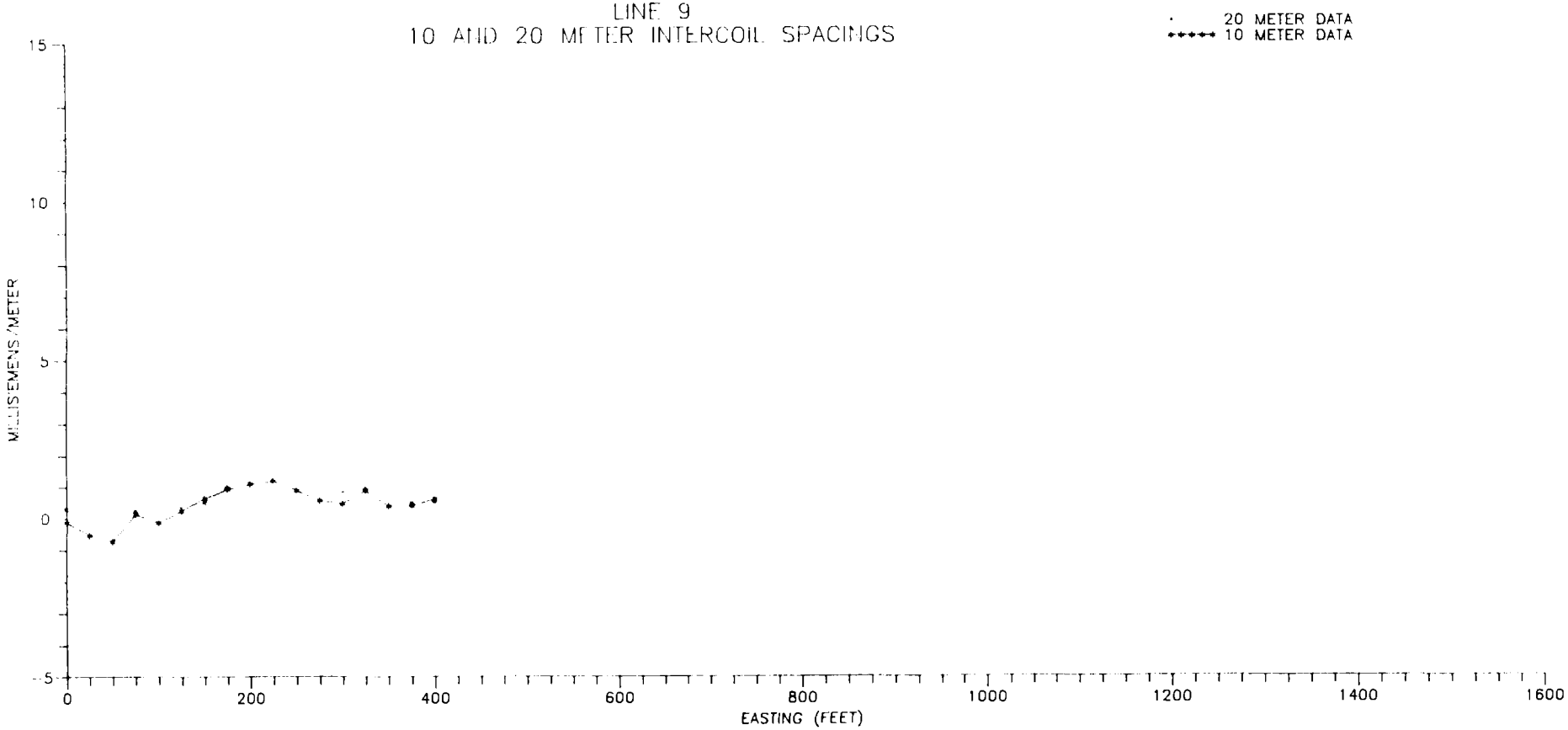

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FIGURE 18

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 10
10 AND 20 METER INTERCOIL SPACINGS

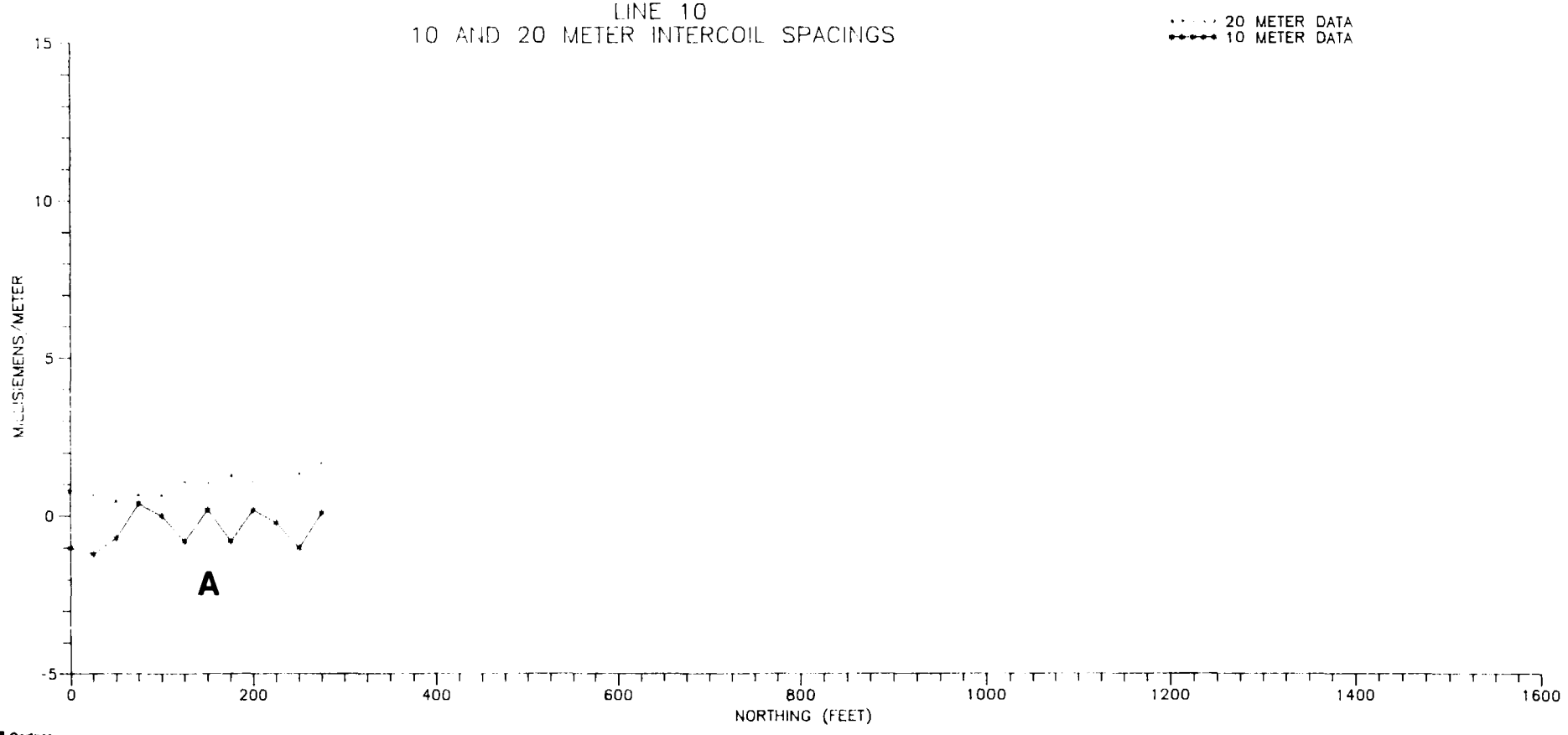

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FIGURE 19

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 10
10 AND 20 METER INTERCOIL SPACINGS

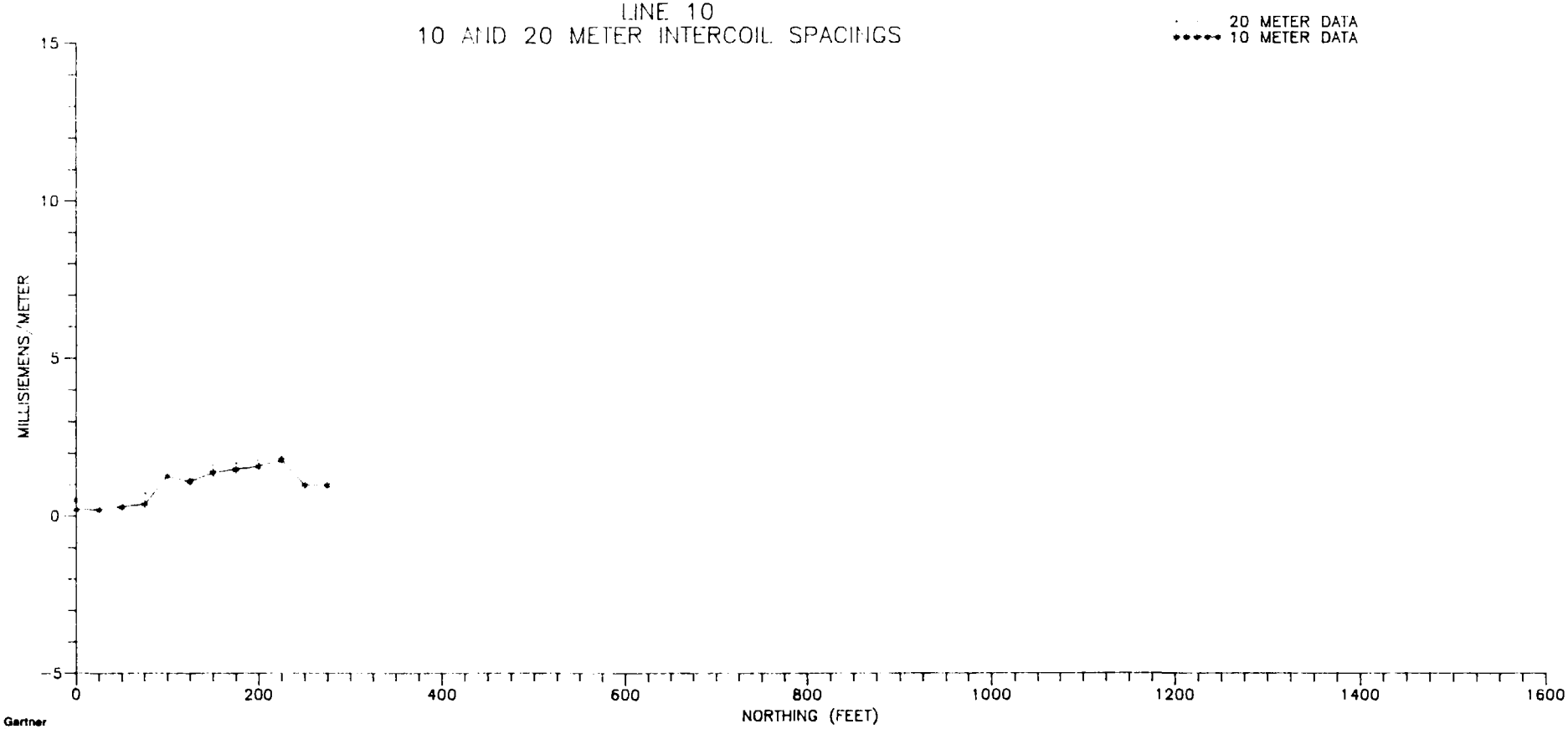

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FIGURE 20

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 11
10 AND 20 METER INTERCOIL SPACINGS

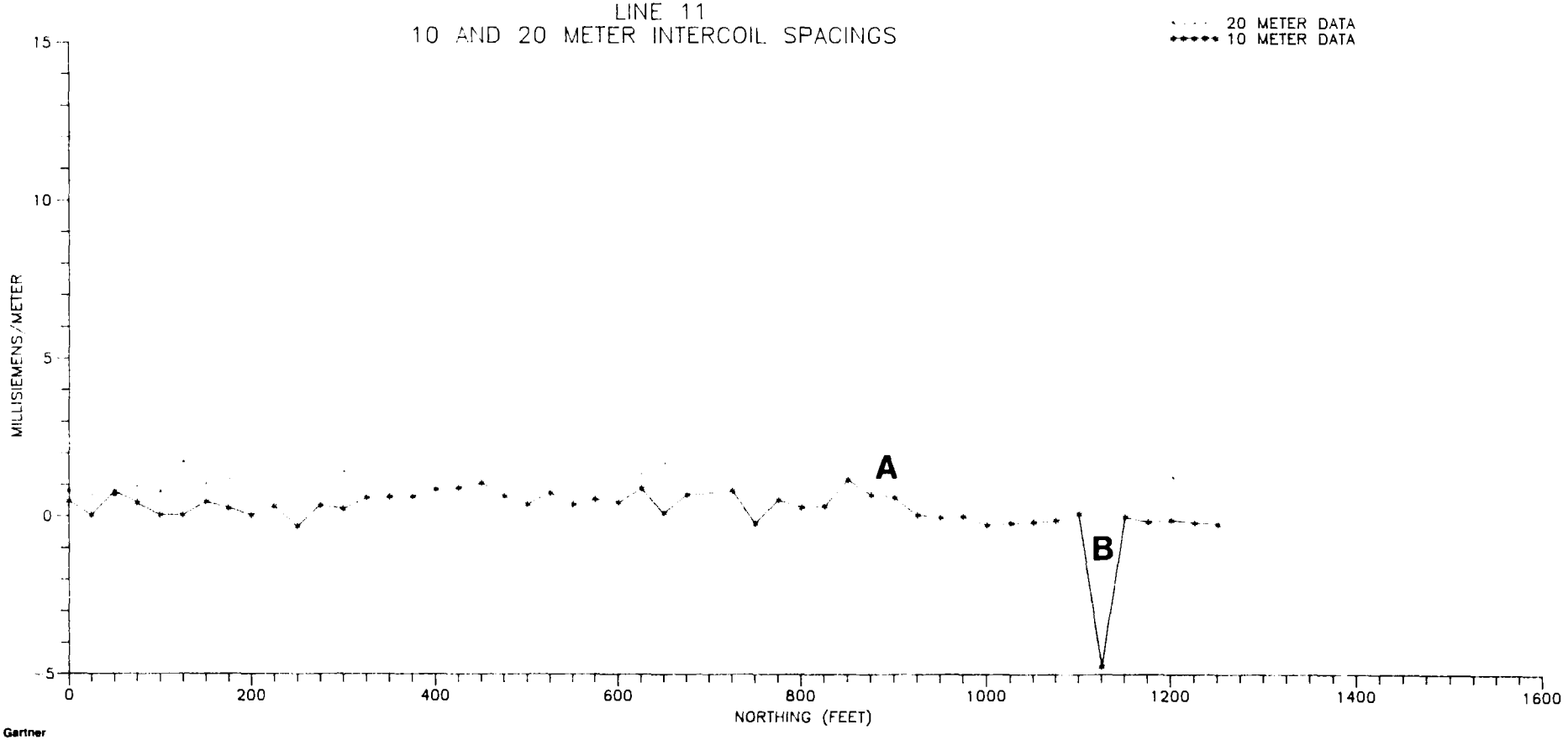

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FIGURE 21

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 11
10 AND 20 METER INTERCOIL SPACINGS

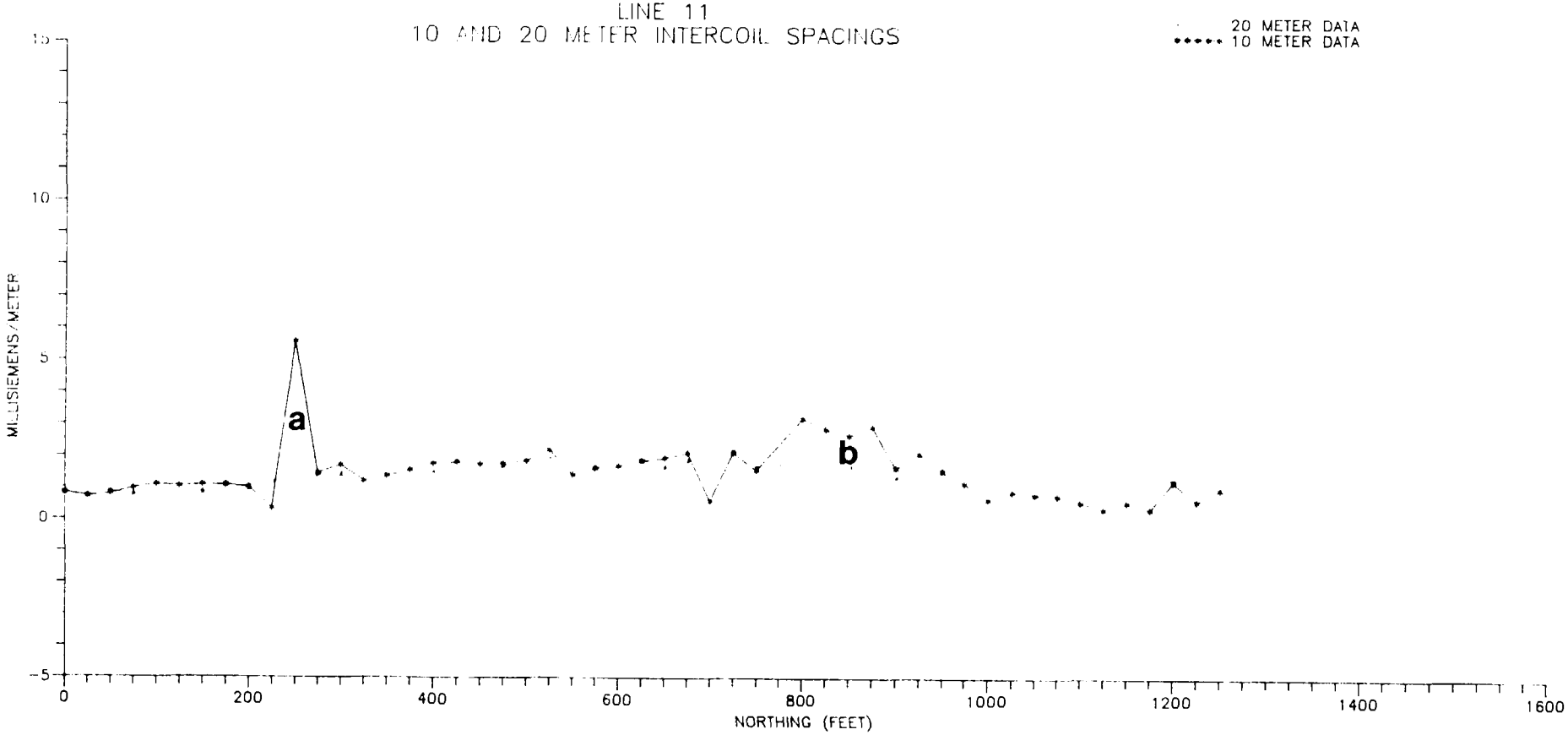

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FIGURE 22

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 12
10 AND 20 METER INTERCOIL SPACINGS

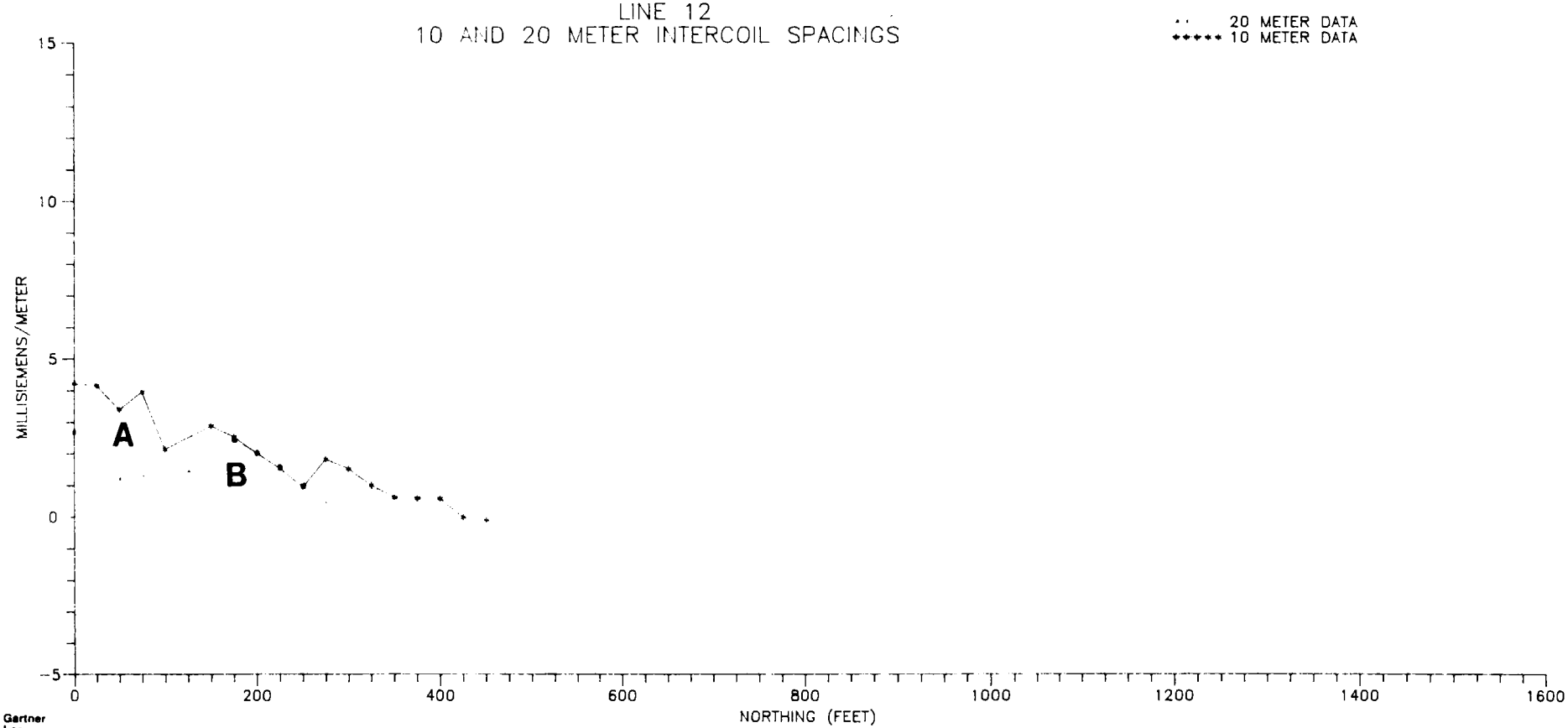

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FIGURE 23

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34 3 VERTICAL DIPOLE RESULTS
LINE 12
10 AND 20 METER INTERCOIL SPACINGS

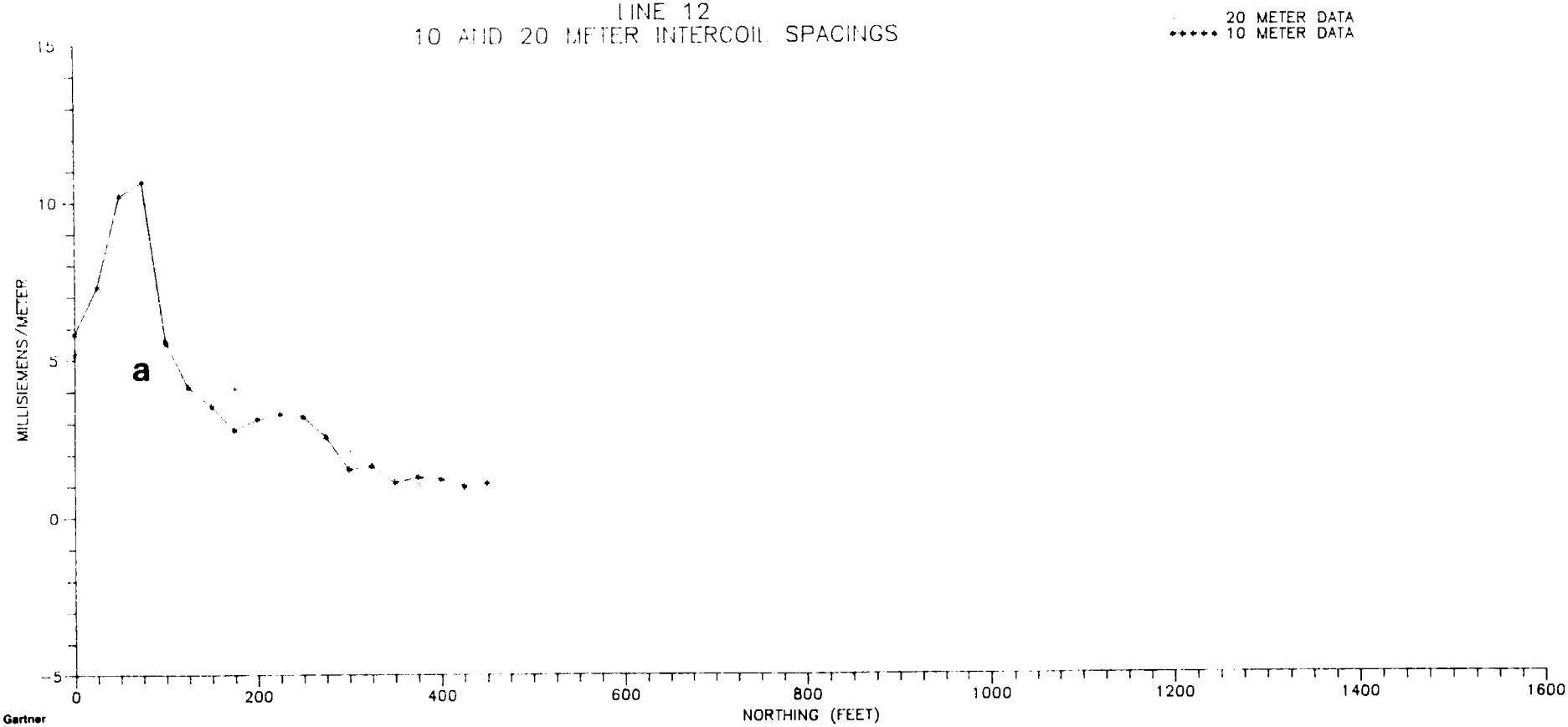

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FIGURE 24

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 13
10 AND 20 METER INTERCOIL SPACINGS

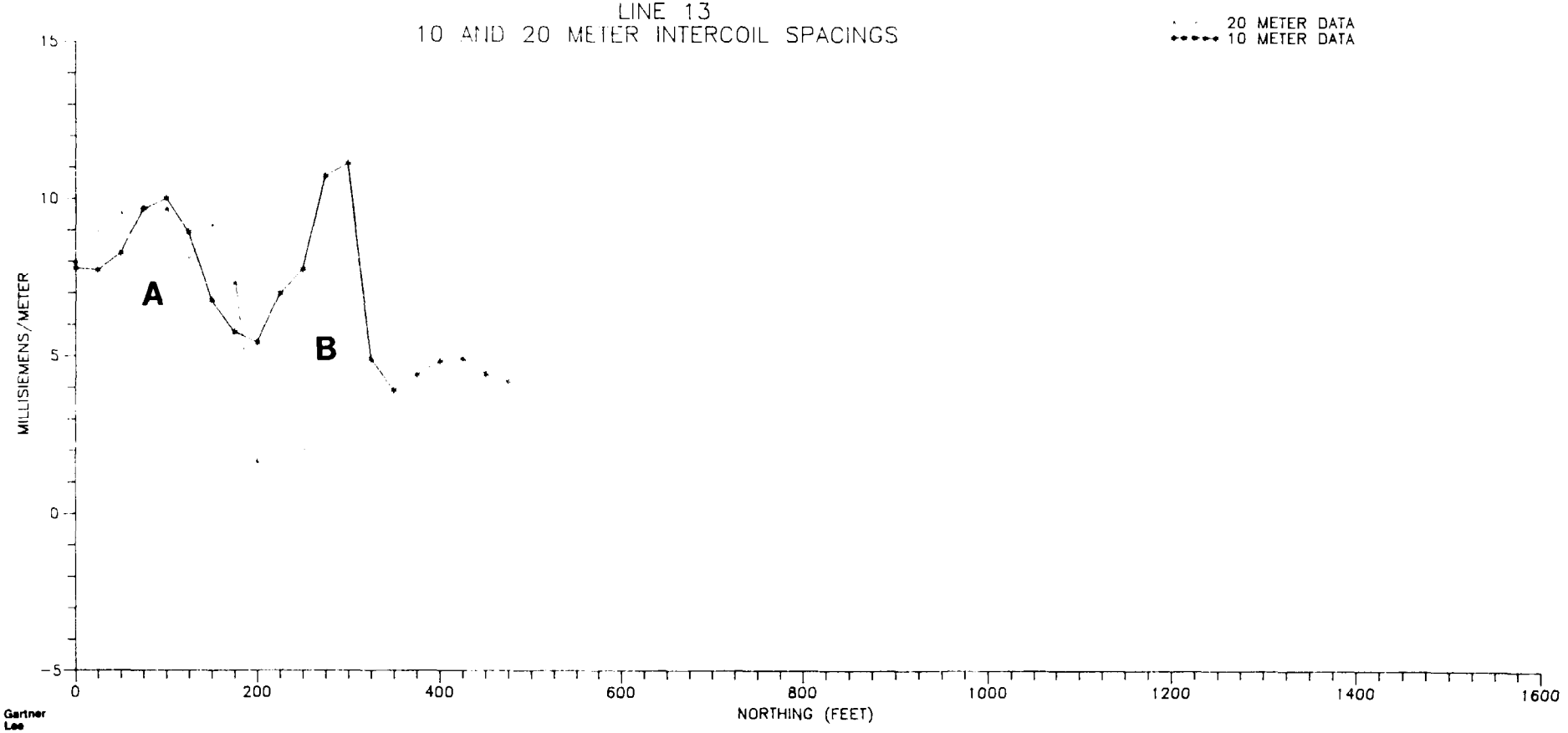

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FIGURE 25

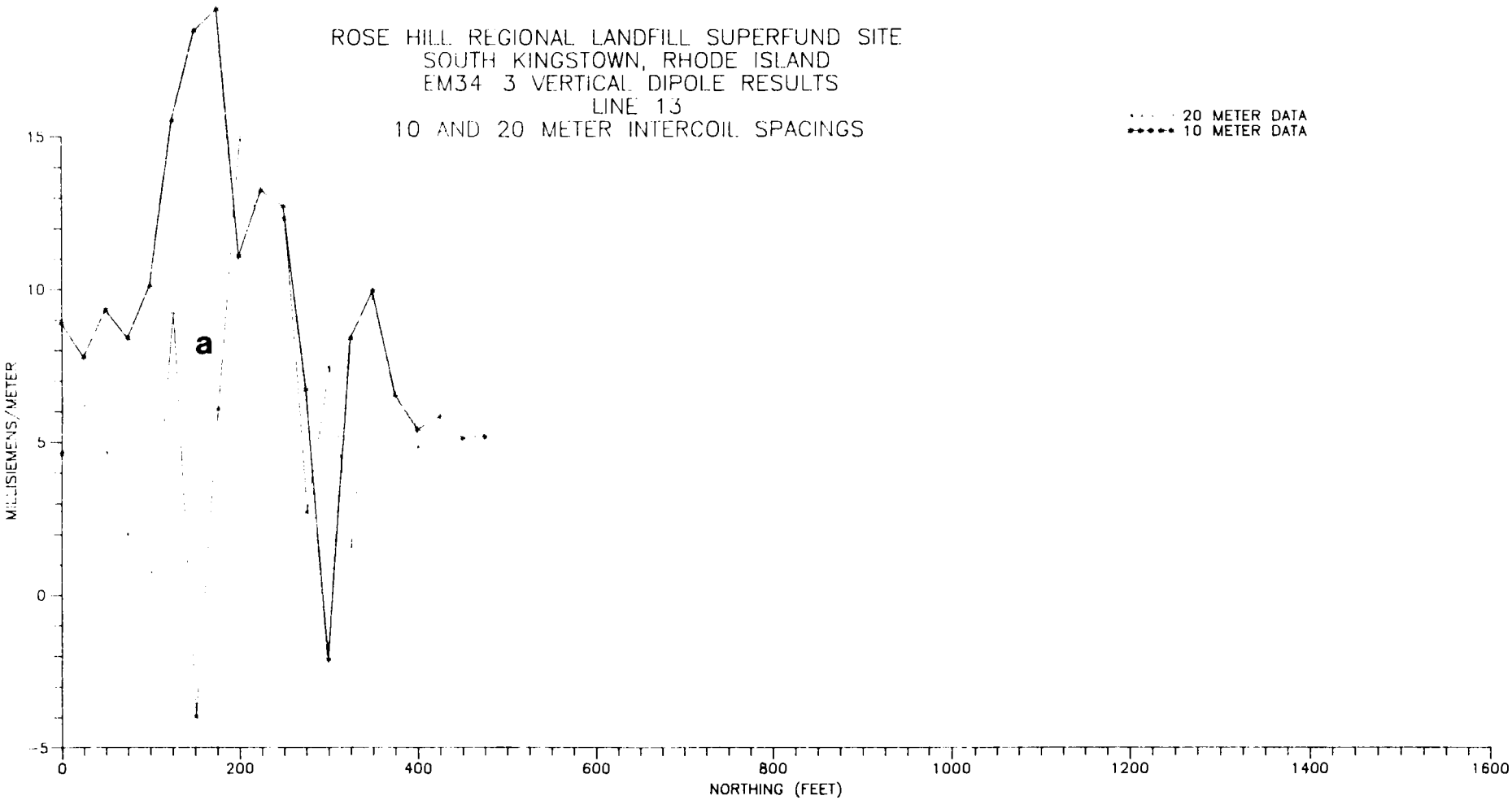

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FIGURE 26

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE 14
10 AND 20 METER INTERCOIL SPACINGS

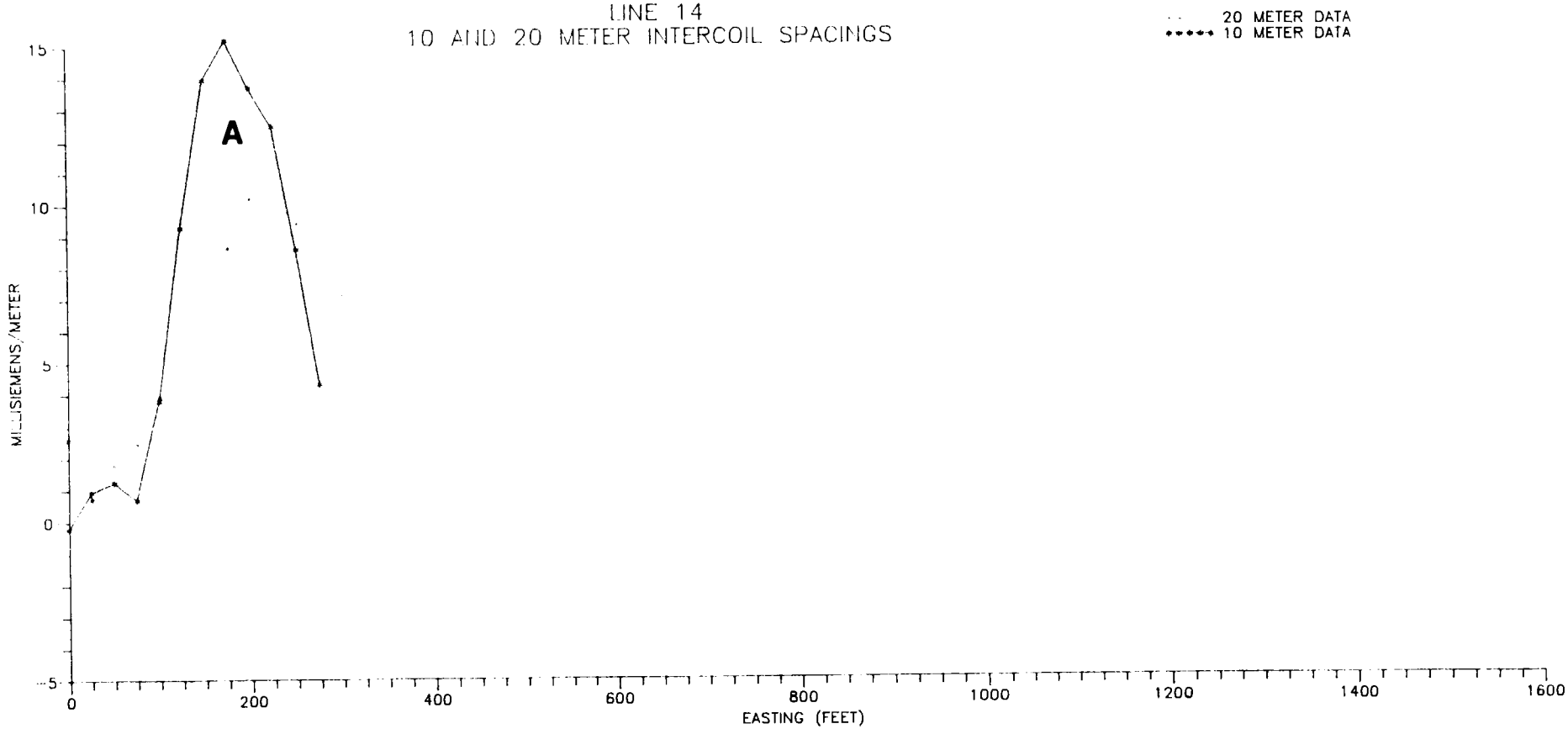

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FIGURE 27

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE 14
10 AND 20 METER INTERCOIL SPACINGS

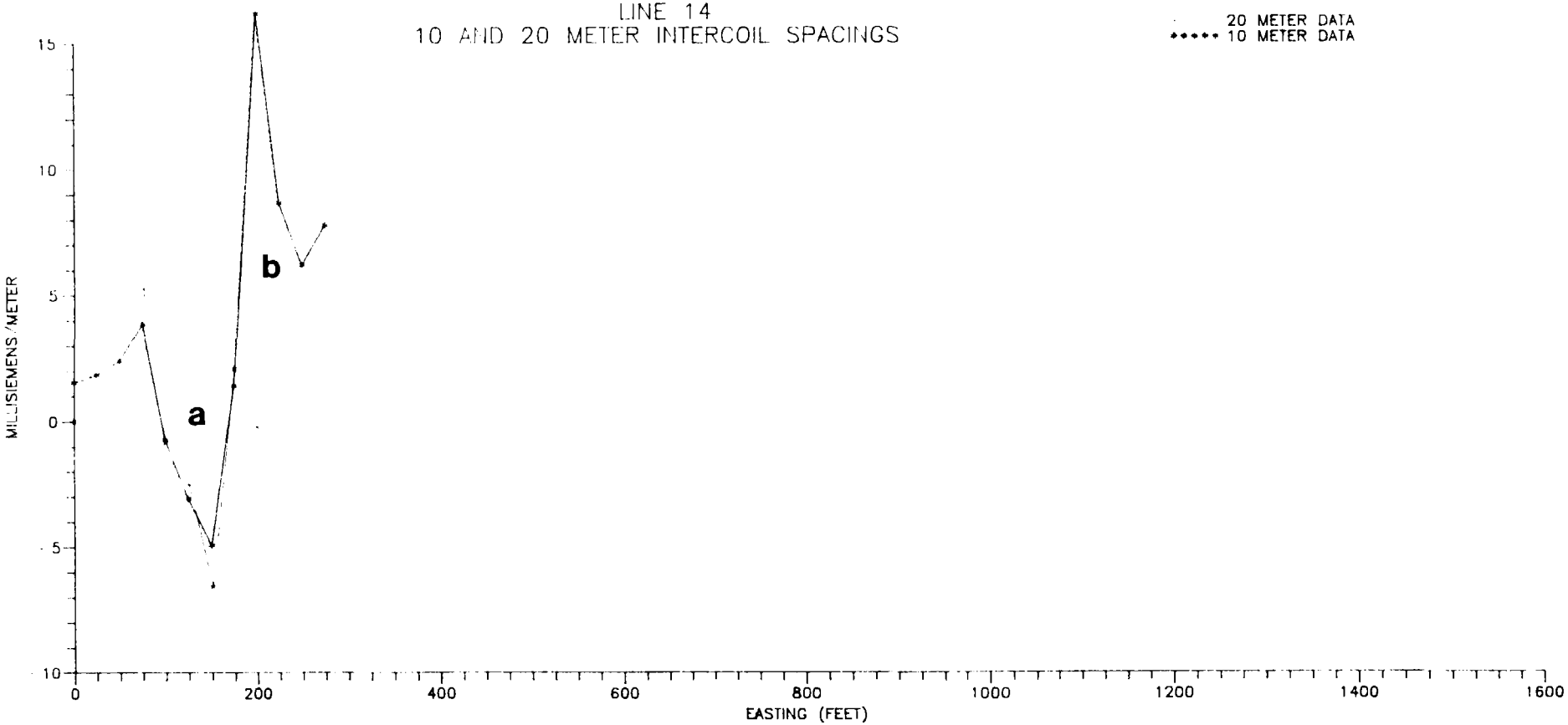

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FIGURE 28

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINES 15 - 26
10 AND 20 METER INTERCOIL SPACINGS

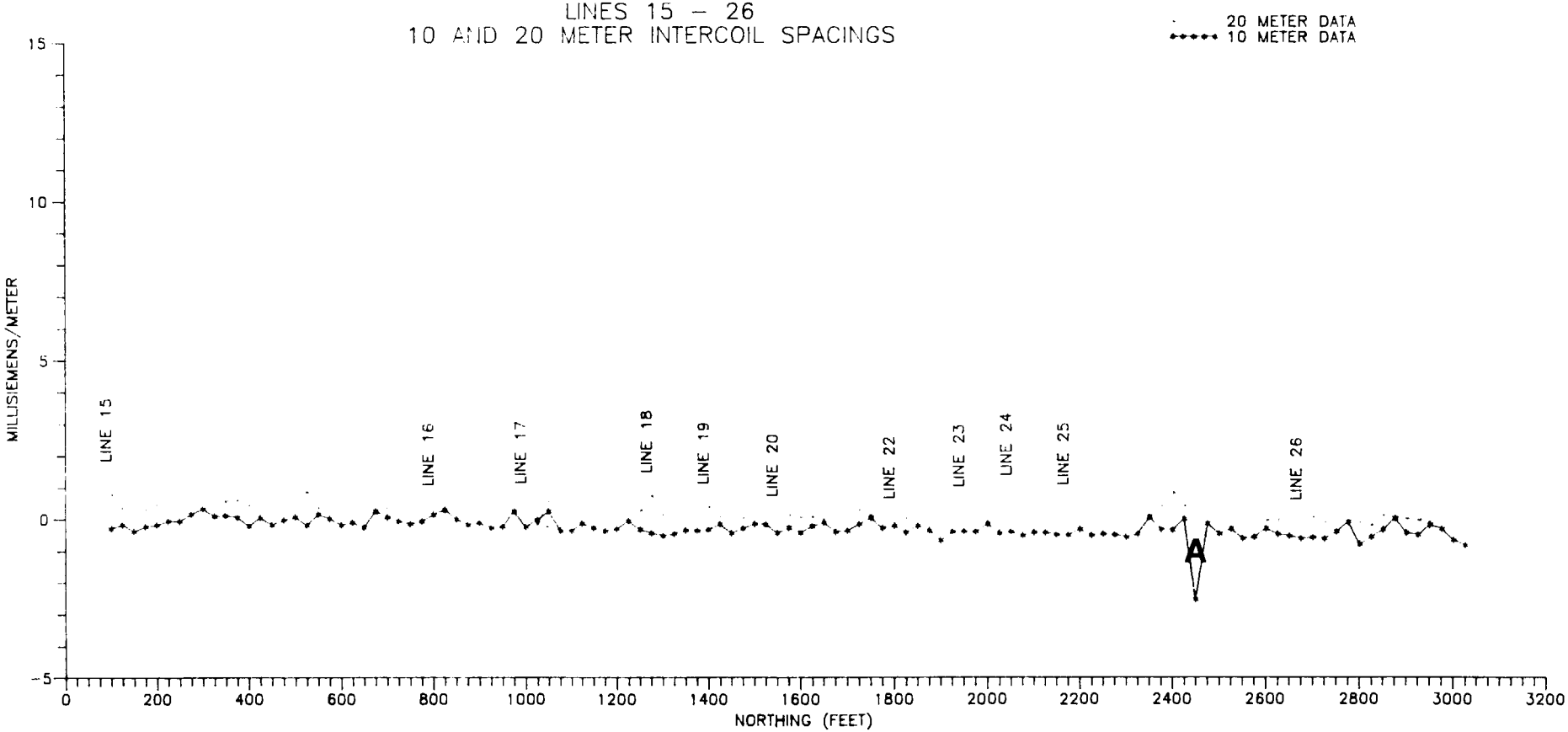

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FIGURE 29

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINES 15 - 26
10 AND 20 METER INTERCOIL SPACINGS

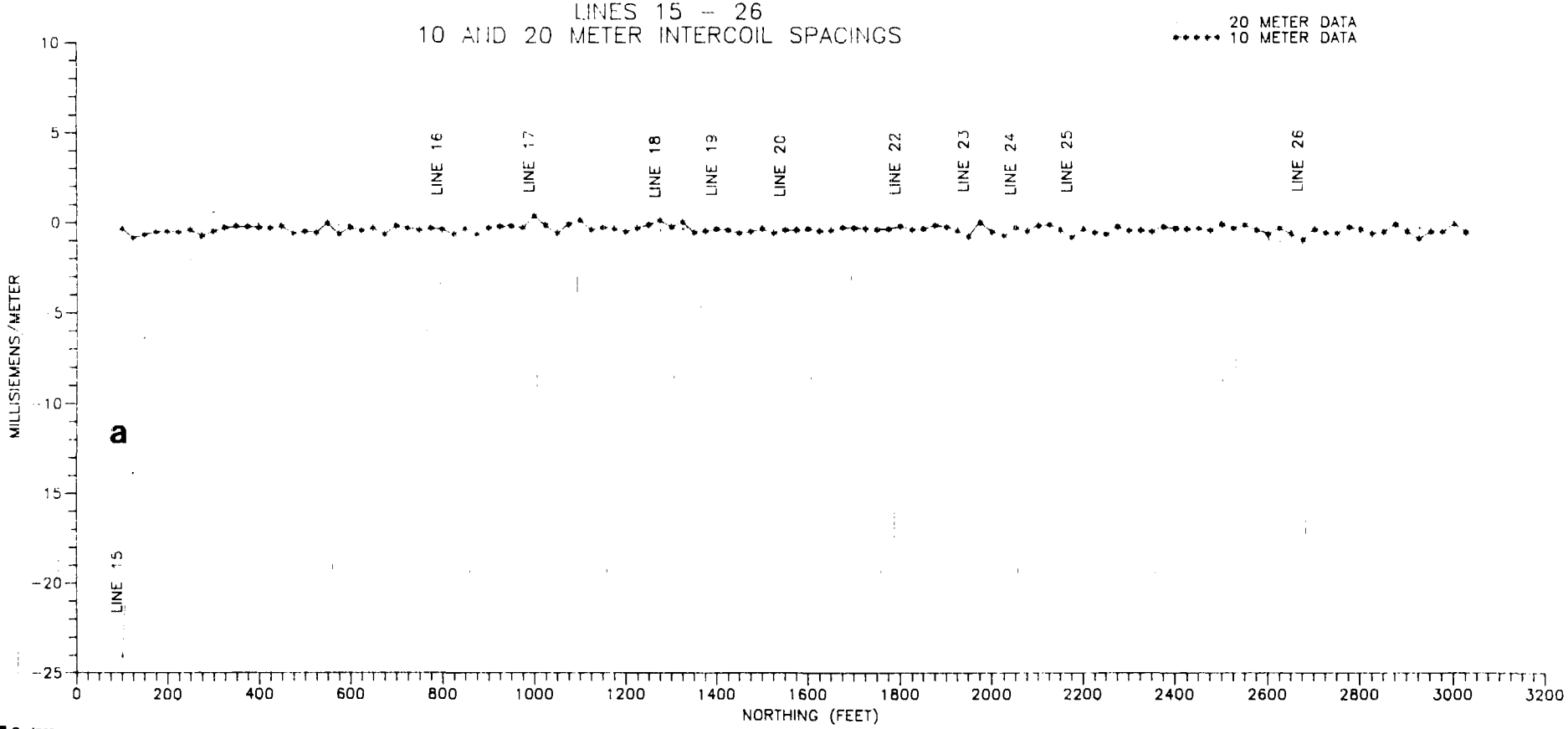

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FIGURE 30

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 HORIZONTAL DIPOLE RESULTS
LINE S3
10 AND 20 METER INTERCOIL SPACINGS

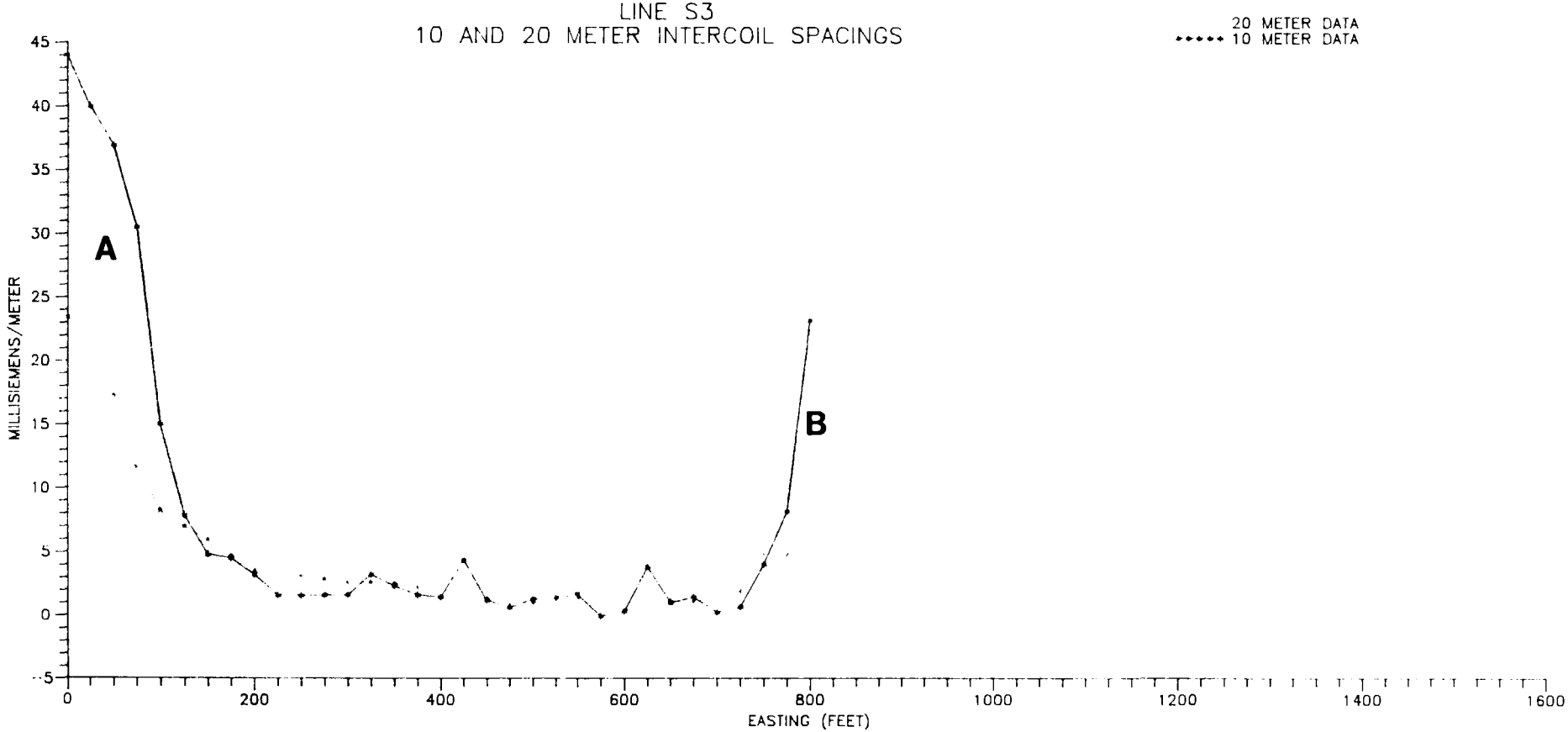

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FIGURE 31

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM34-3 VERTICAL DIPOLE RESULTS
LINE S3
10 AND 20 METER INTERCOIL SPACINGS

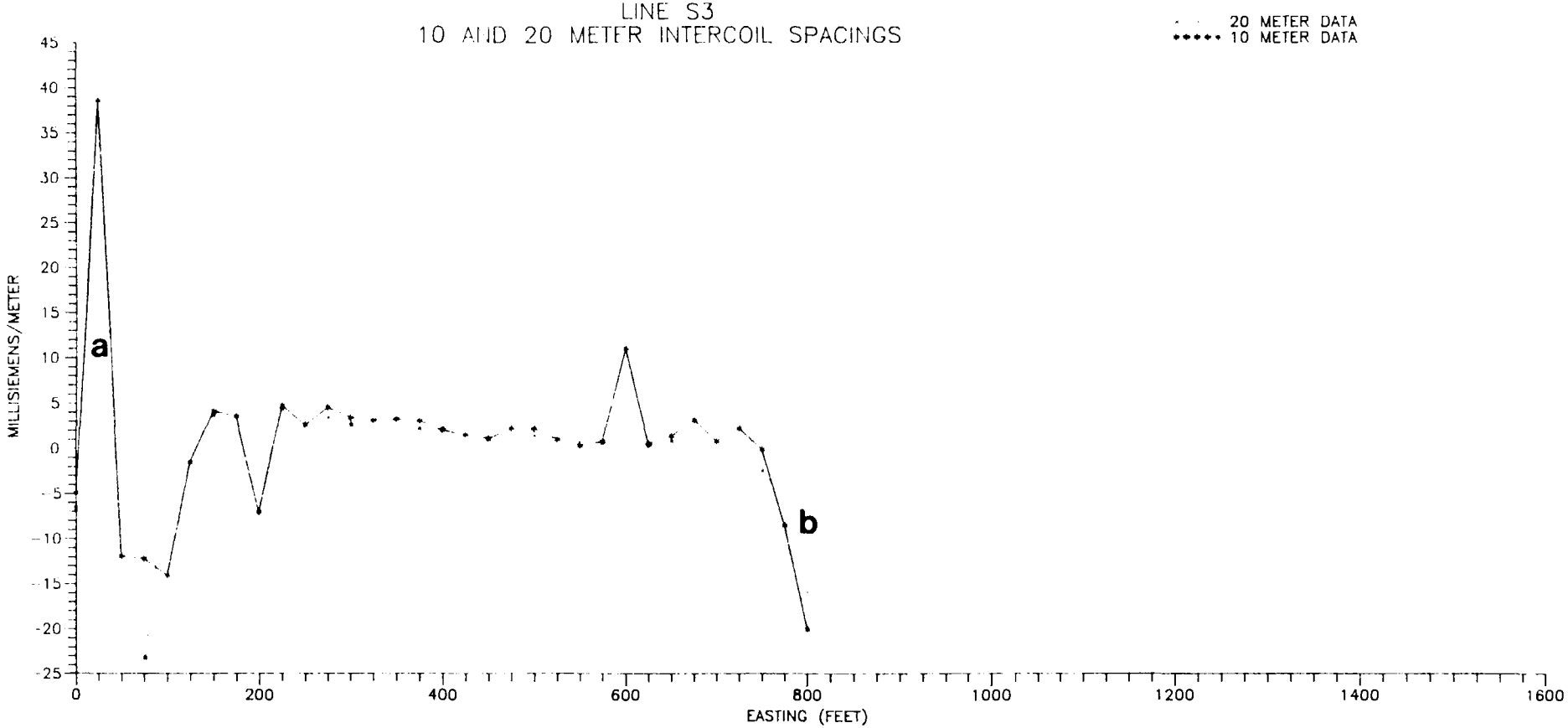

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FIGURE 32

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM31-DL RESULTS
STREAM SURVEY (MITCHEL BROOK)
QUADRATURE AND IN-PHASE COMPONENT DATA

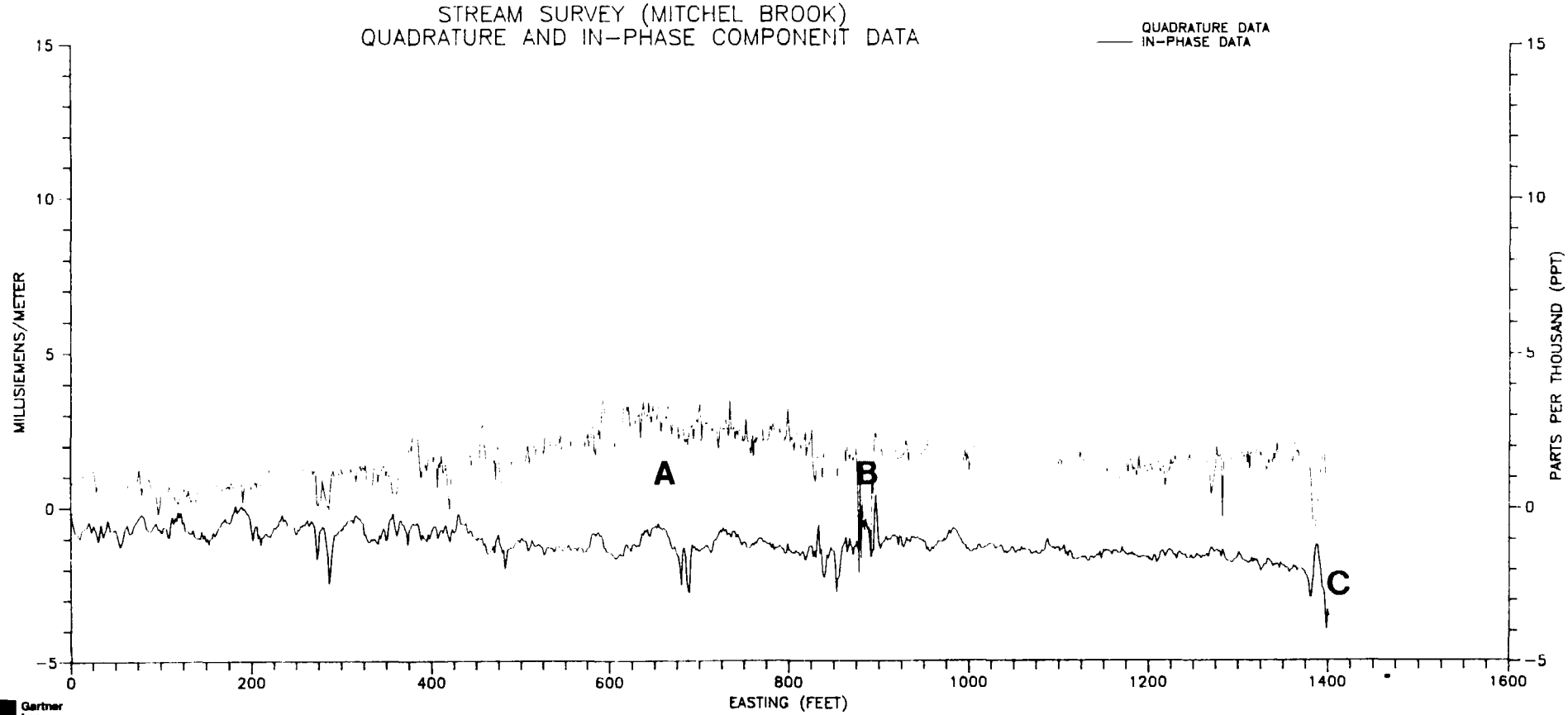

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FIGURE 33

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
EM31-DL RESULTS
LINE S7
QUADRATURE AND IN-PHASE COMPONENT DATA

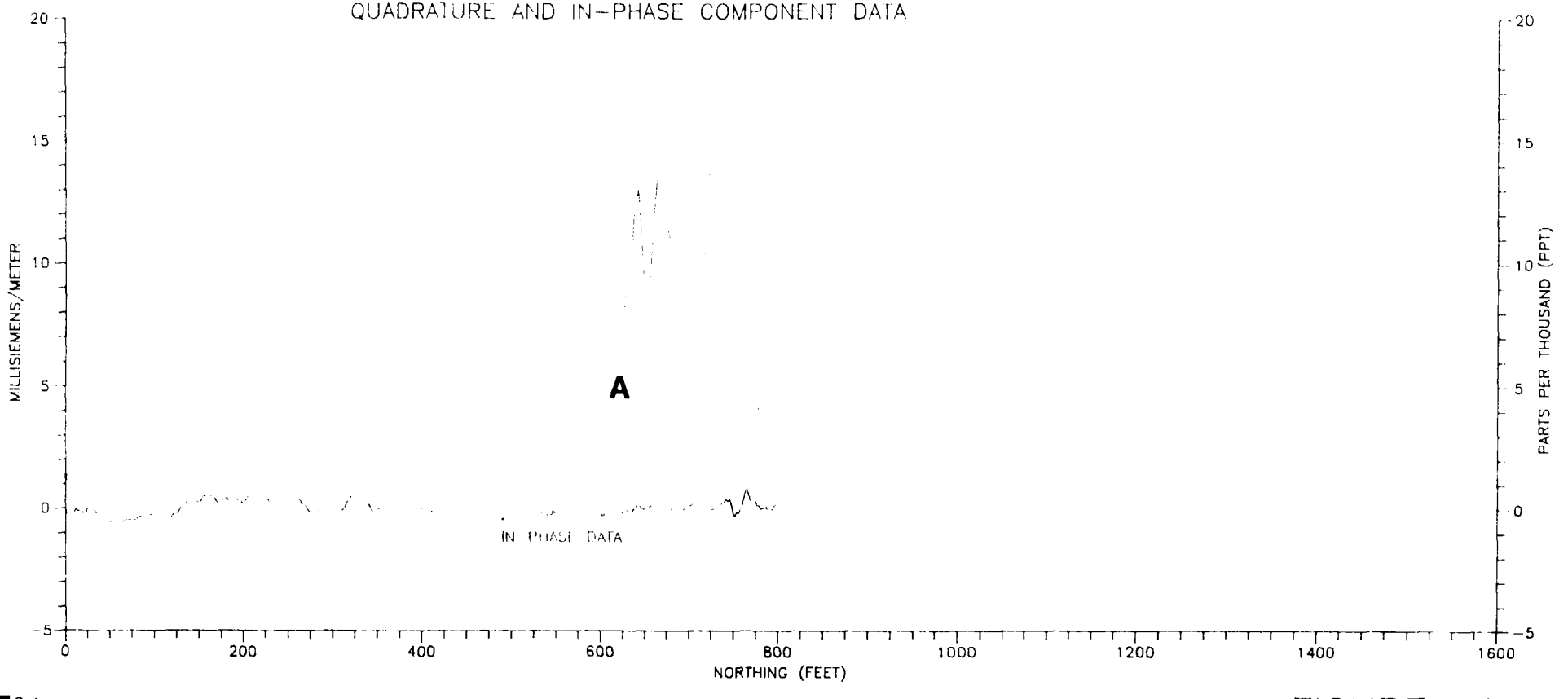

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FIGURE 34

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
ABEM WADI VLF RESULTS
LINE VLF 1
TILT ANGLE (IN-PHASE) DATA AND ELLIPTICITY (IMAGINARY) DATA

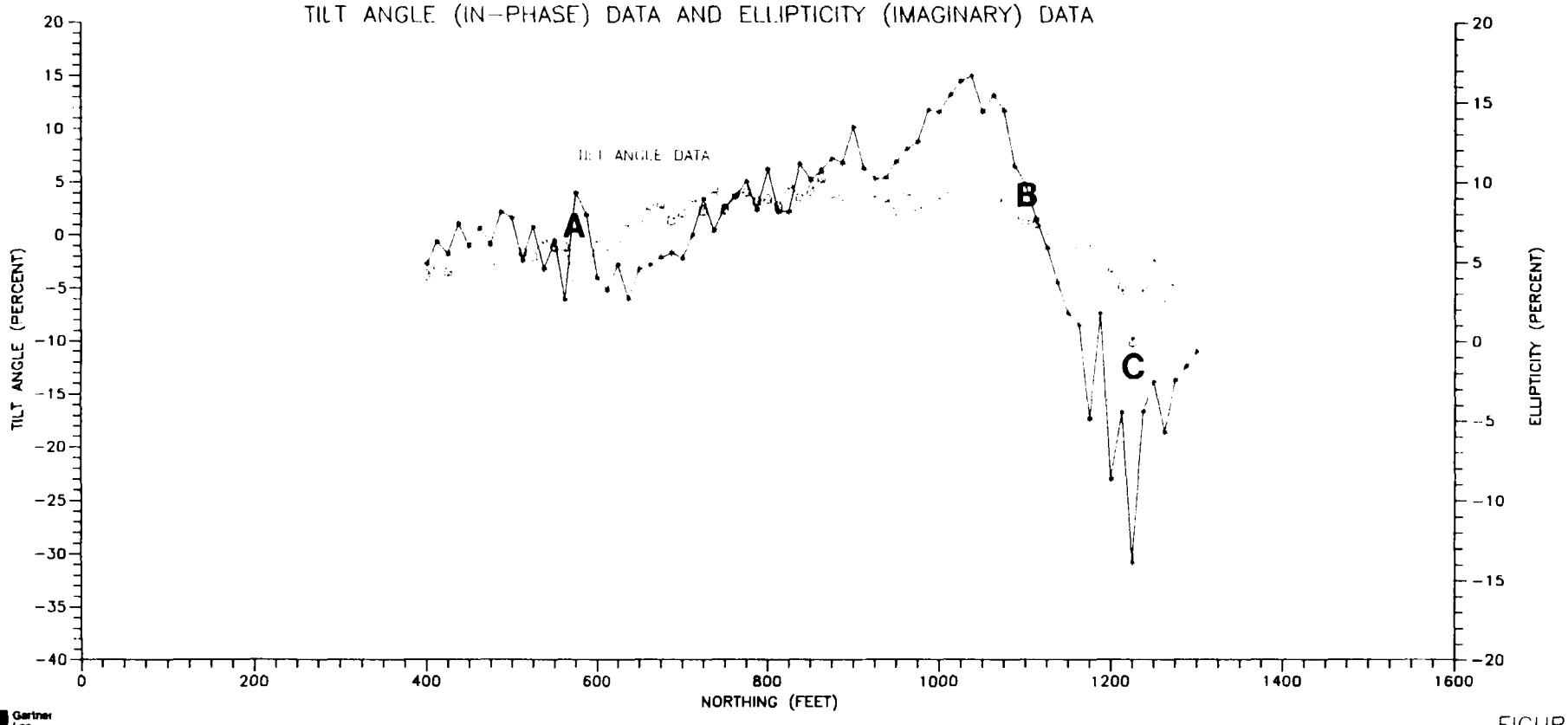

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FIGURE 35

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
ABEM WADI VLF RESULTS
LINE VLF 1
FILTERED TILT ANGLE (CURRENT DENSITY) AND FILTERED ELLIPTICITY DATA

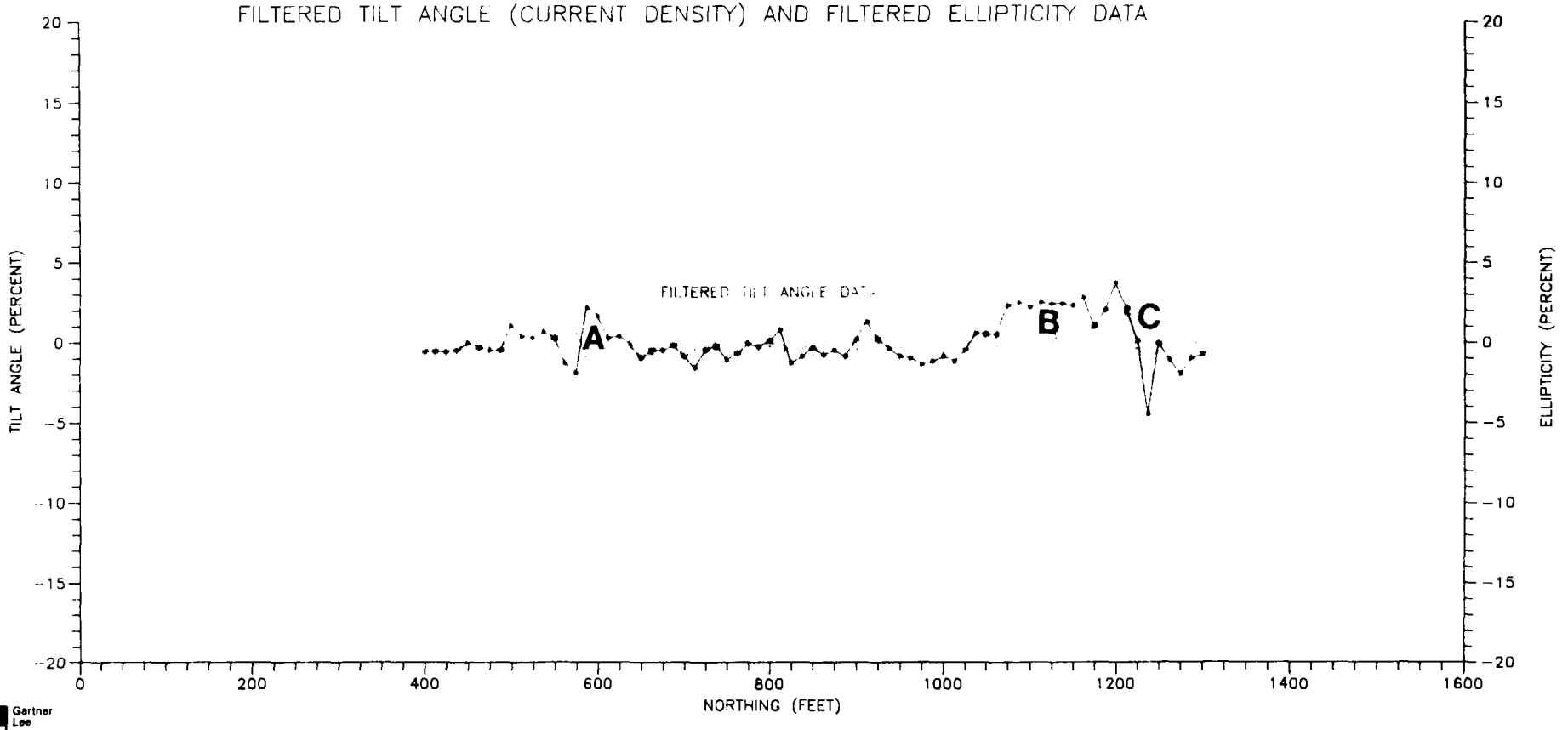

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FIGURE 36

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
ABEM WADI VLF RESULTS
LINE VLF 2
TILT ANGLE (IN-PHASE) DATA AND ELLIPTICITY (IMAGINARY) DATA

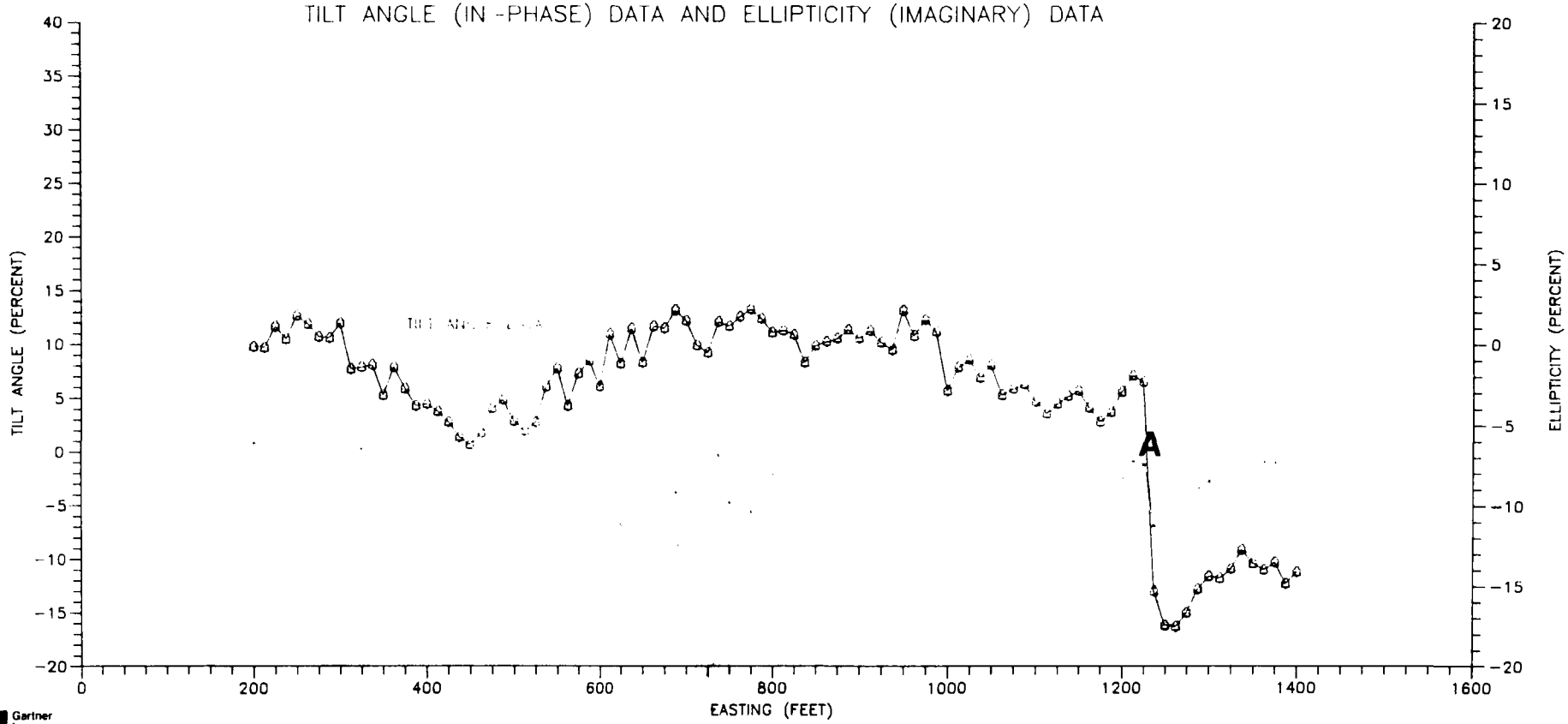

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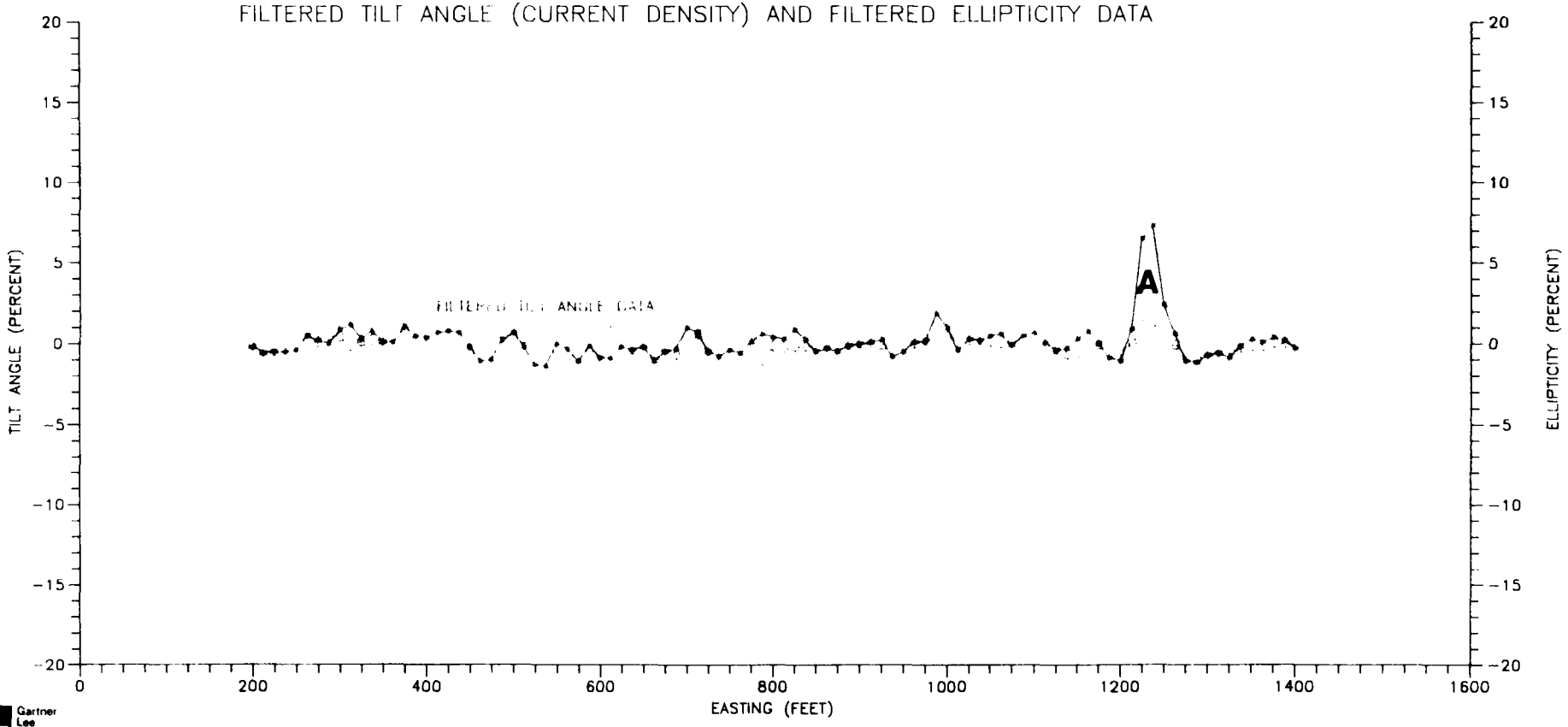
FIGURE 37

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
ABEM WADI VLF RESULTS
LINE VLF 2
FILTERED TILT ANGLE (CURRENT DENSITY) AND FILTERED ELLIPTICITY DATA



Gartner Lee

FIGURE 38

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
ABEM WADI VLF RESULTS
LINE VLF 3
TILT ANGLE (IN-PHASE) DATA AND ELLIPTICITY (IMAGINARY) DATA

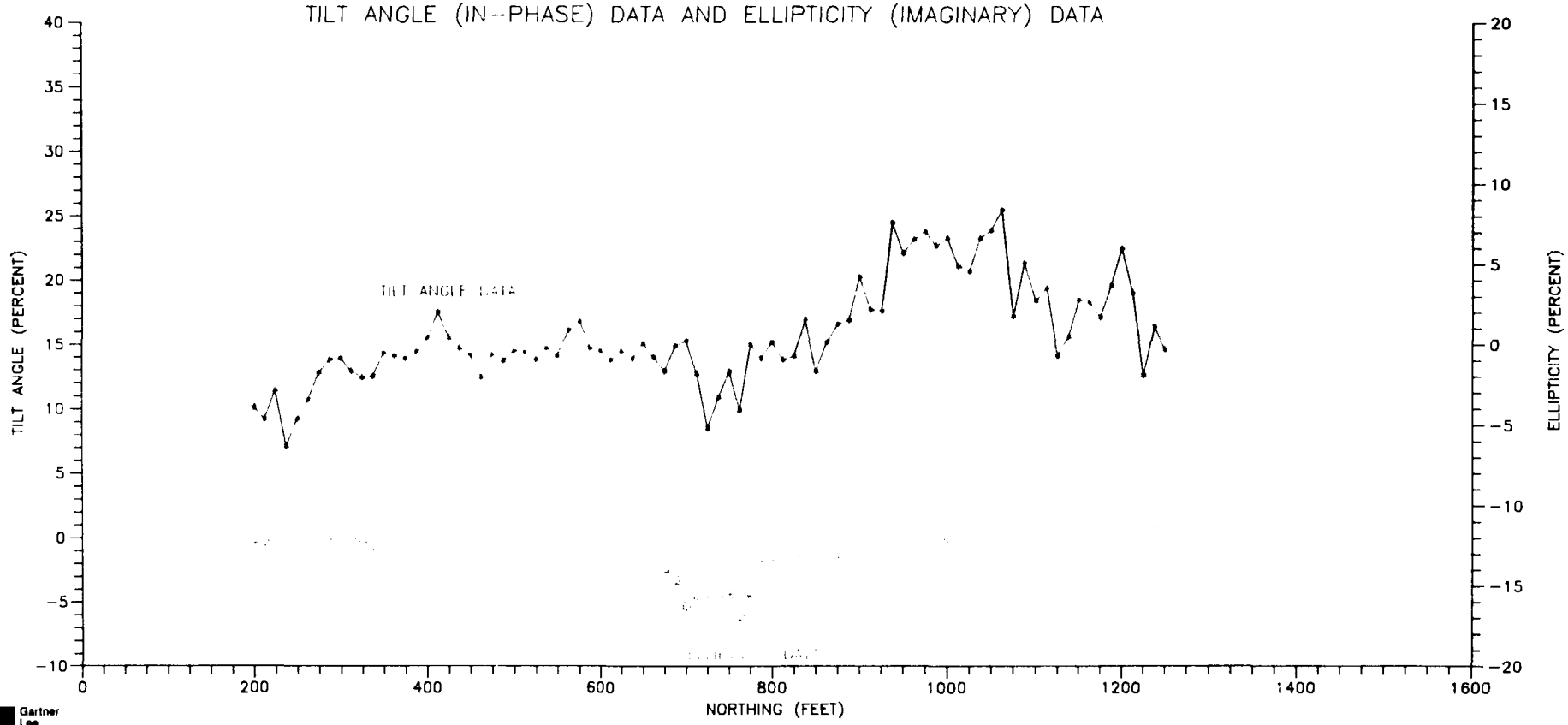


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FIGURE 39

ROSE HILL REGIONAL LANDFILL SUPERFUND SITE
SOUTH KINGSTOWN, RHODE ISLAND
ABEM WADI VLF RESULTS
LINE VLF 3
FILTERED TILT ANGLE (CURRENT DENSITY) AND FILTERED ELLIPTICITY DATA

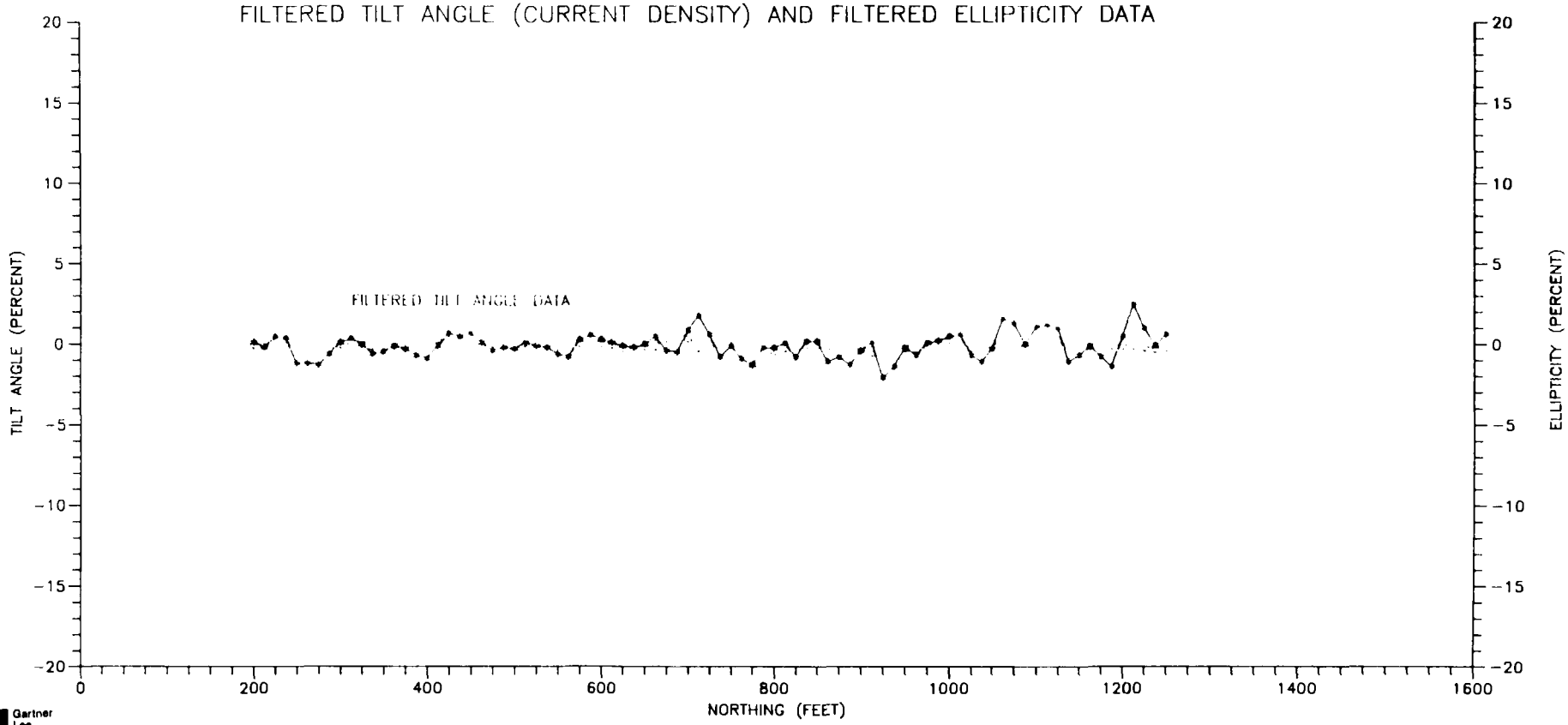

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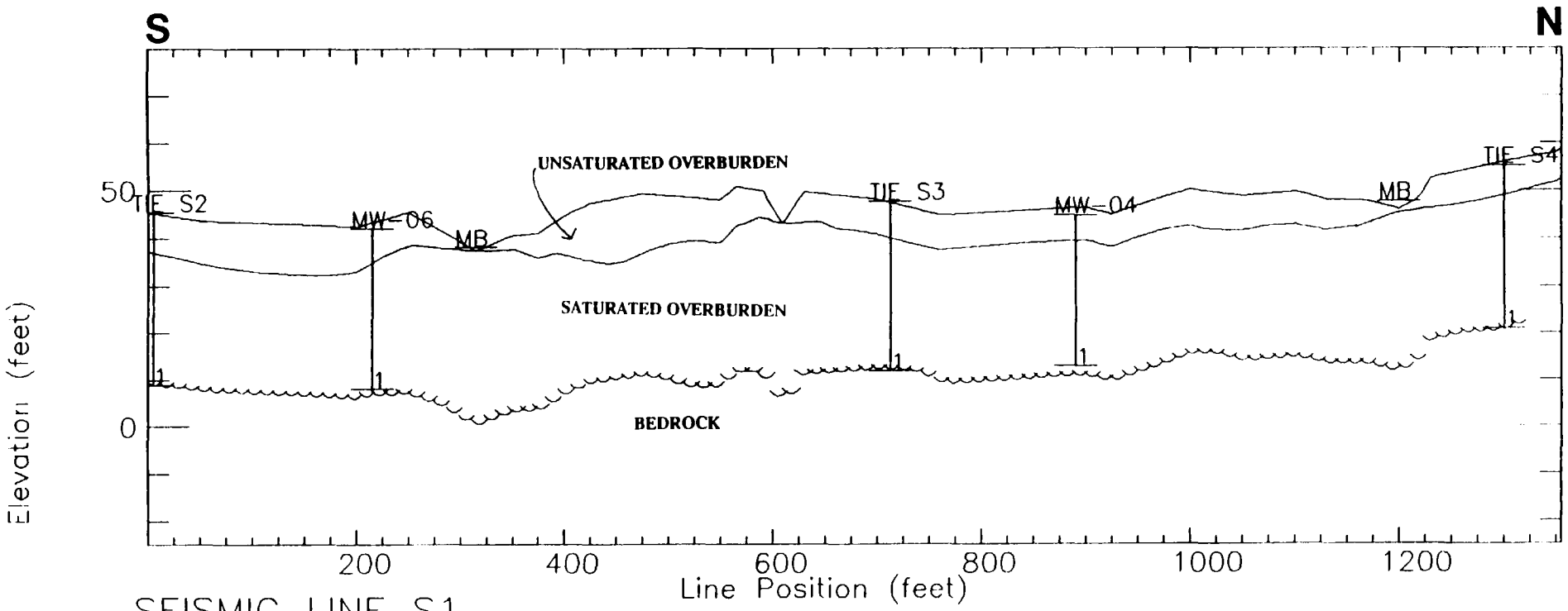
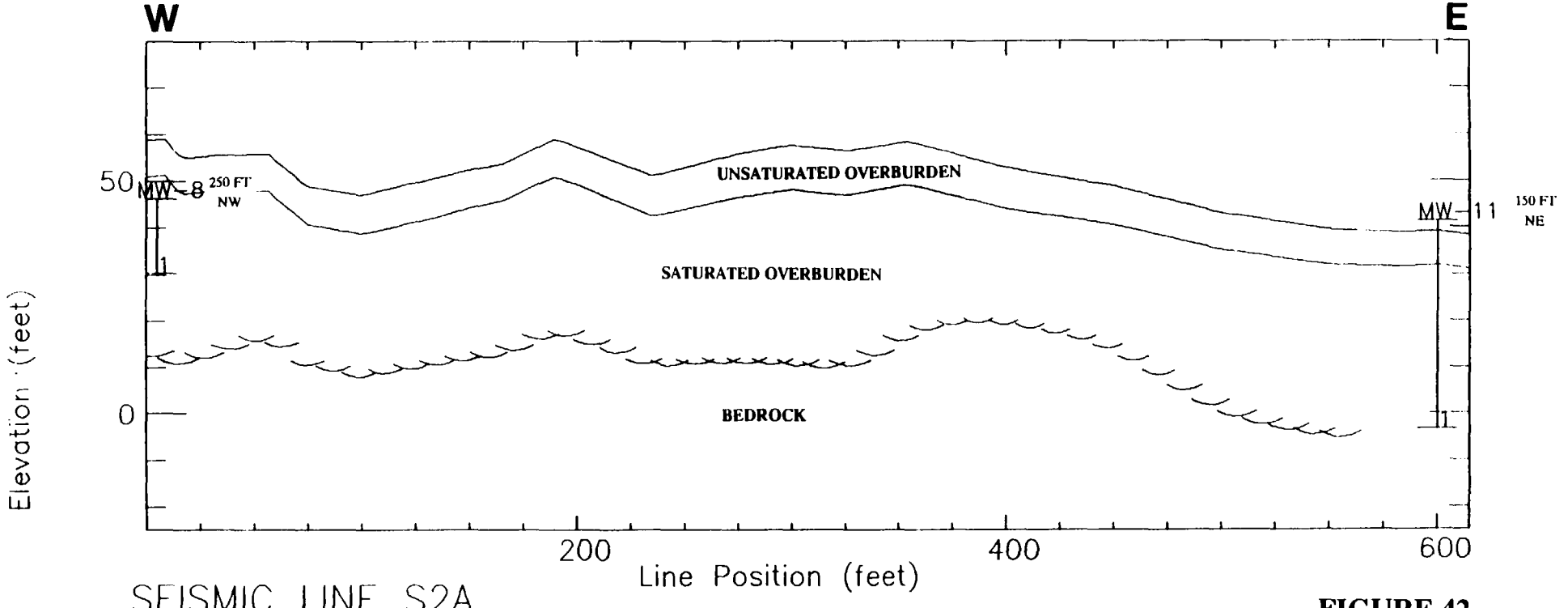
FIGURE 40



SEISMIC LINE S1
ROSE HILL LANDFILL
GARTNER LEE, INC., JUNE 1991

FIGURE 41

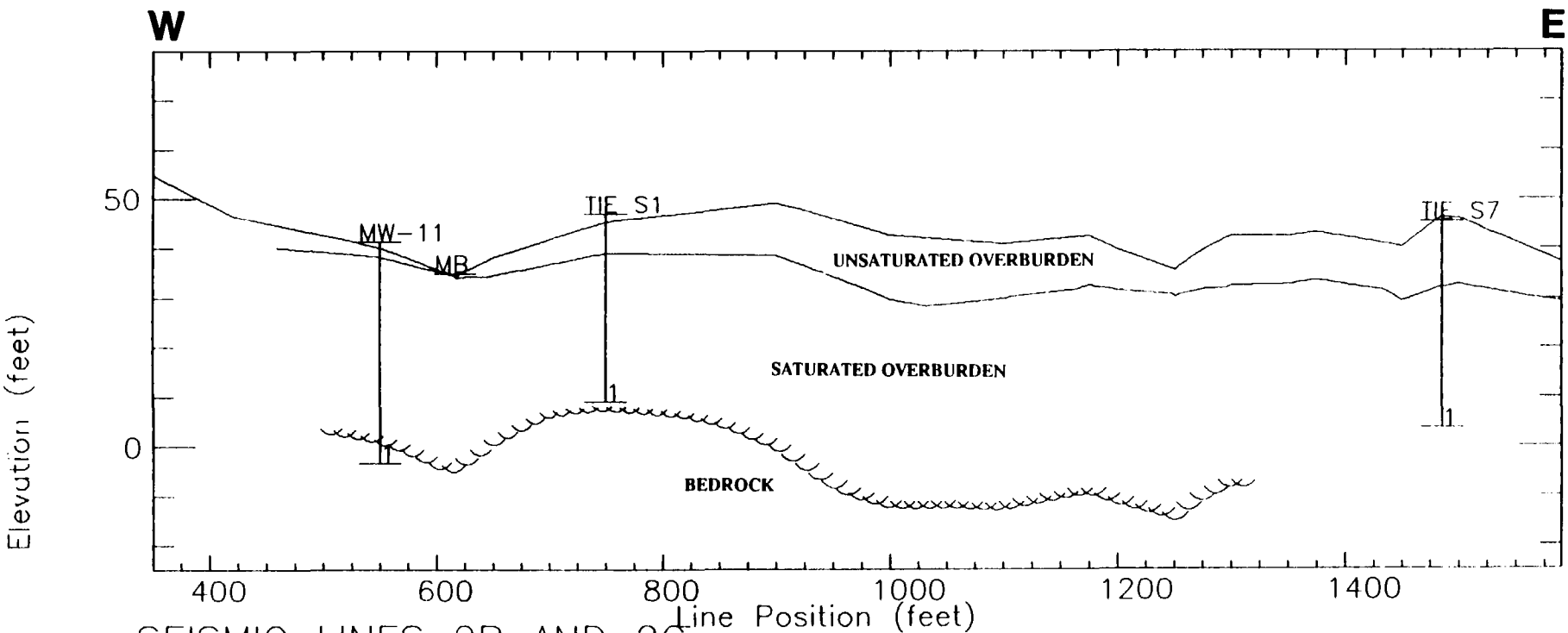
Gartner Lee



SEISMIC LINE S2A
ROSE HILL LANDFILL
GARTNER LEE, INC., JUNE 1981

FIGURE 42

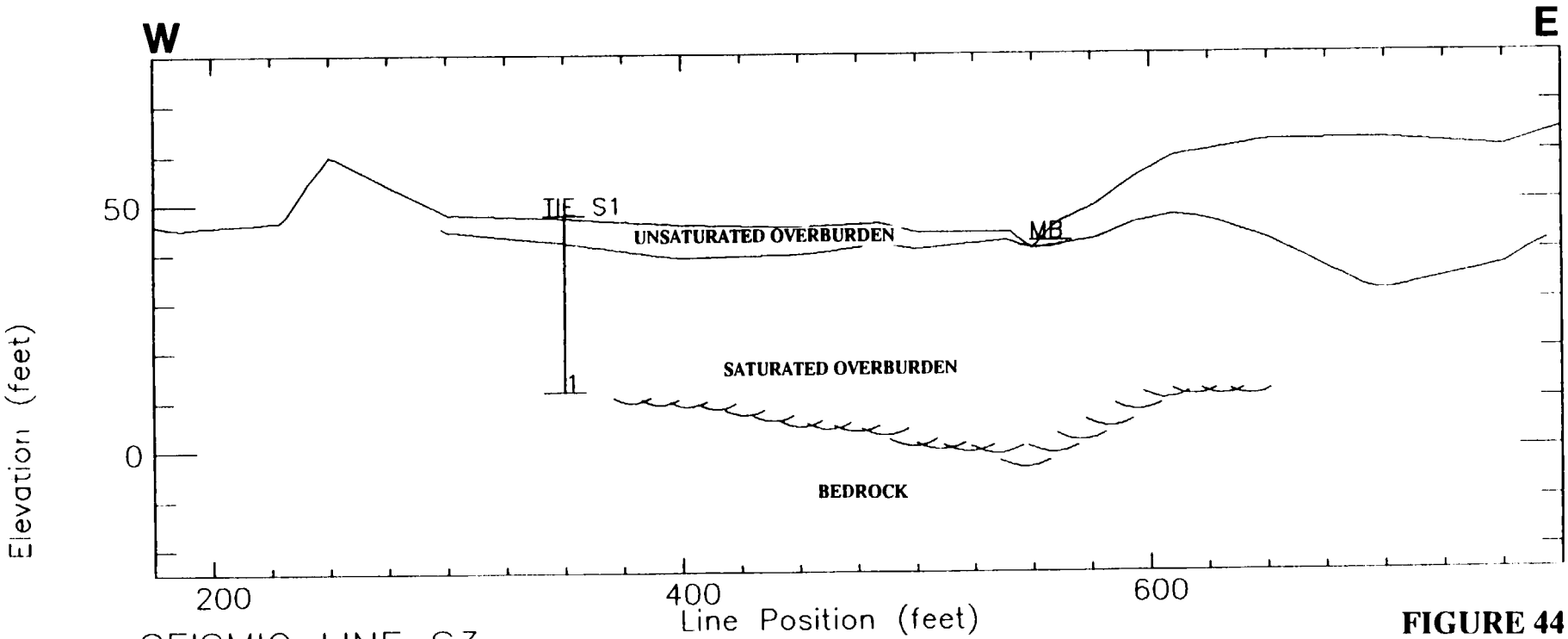
Gartner Lee



SEISMIC LINES 2B AND 2C
ROSE HILL LANDFILL
GARTNER LEE, INC., JUNE 1991

FIGURE 43

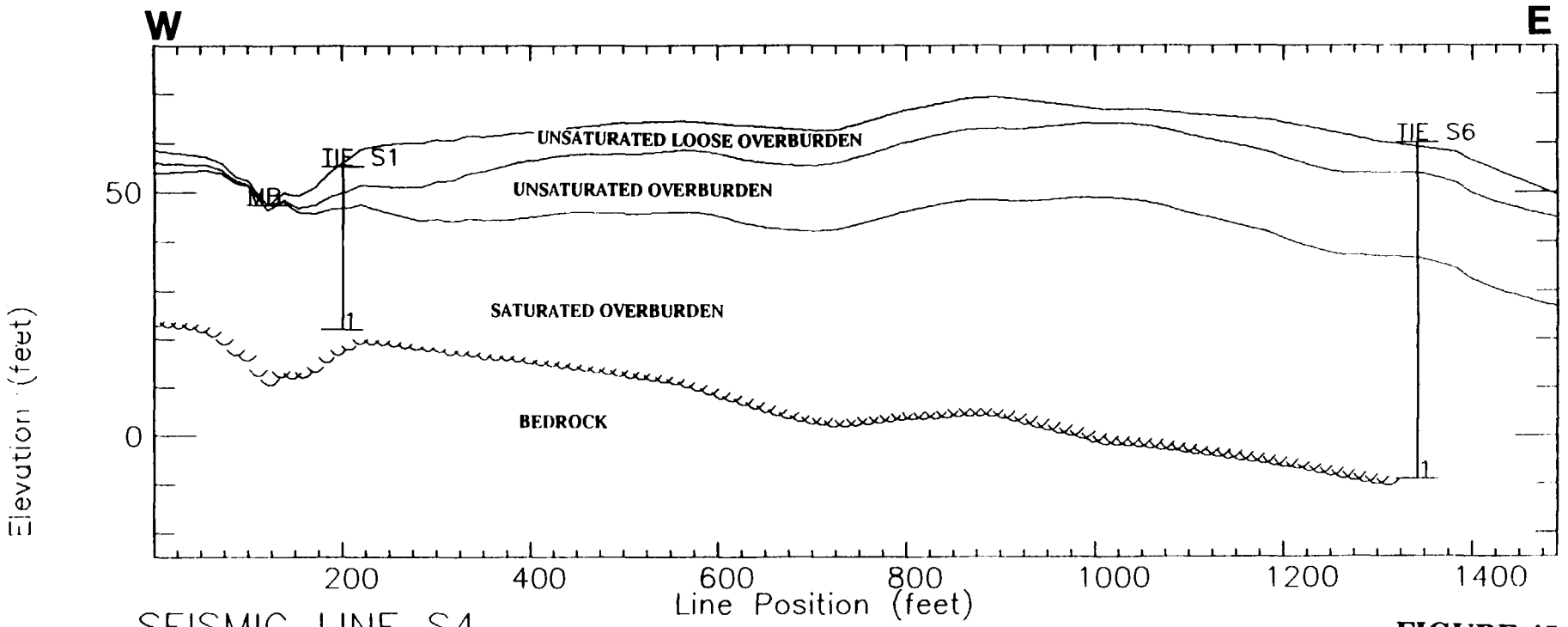
Gartner Lee



SEISMIC LINE S3
ROSE HILL LANDFILL
GARTNER LEE, INC., 1991

FIGURE 44

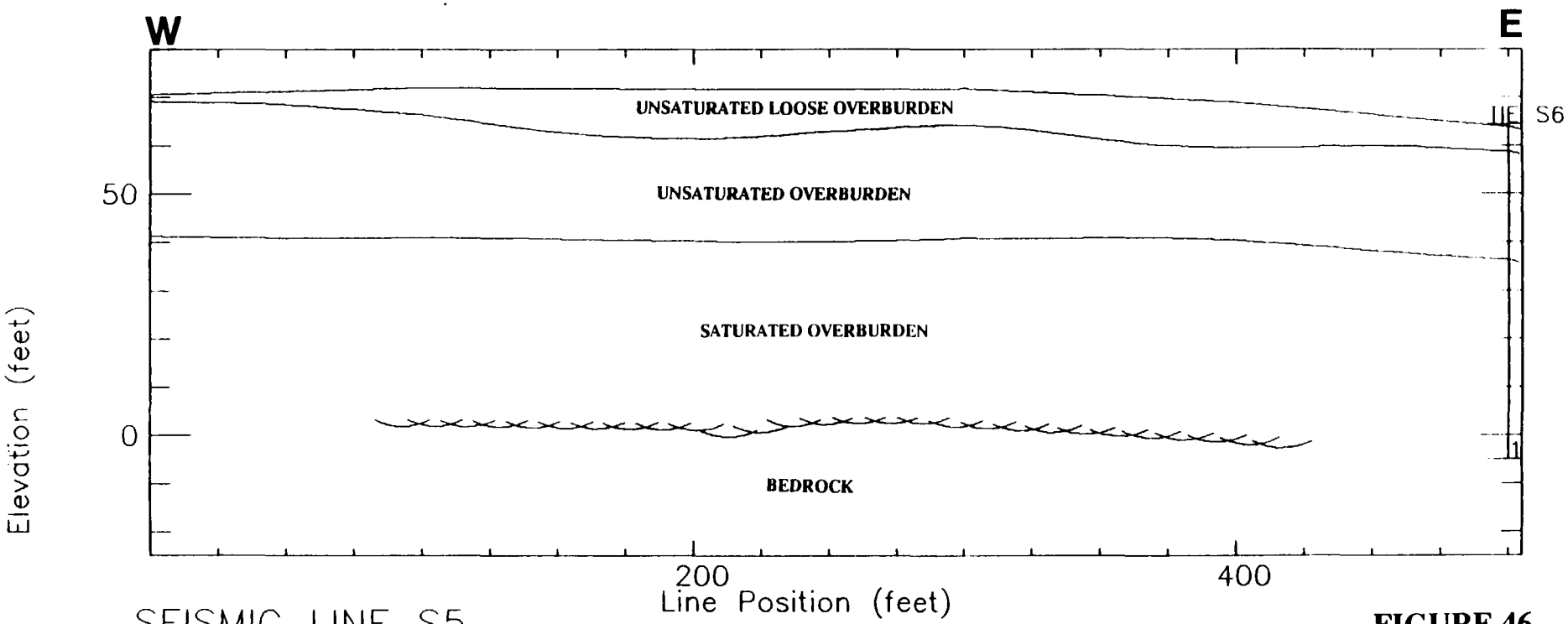
Gartner Lee



SEISMIC LINE S4
ROSE HILL LANDFILL
GARTNER LEE, INC., JUNE 1991

FIGURE 45

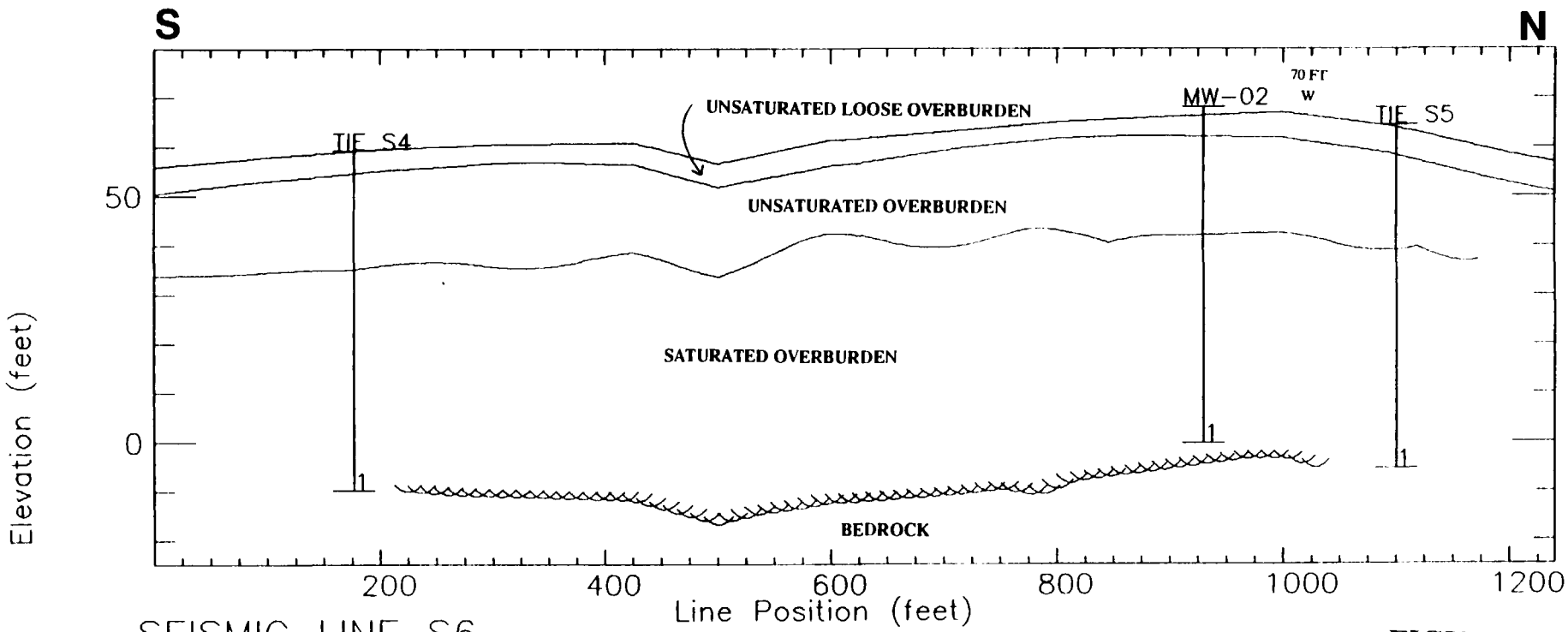
Gartner Lee



SEISMIC LINE S5
ROSE HILL LANDFILL SITE
GARTNER LEE, INC., JUNE 1991

FIGURE 46

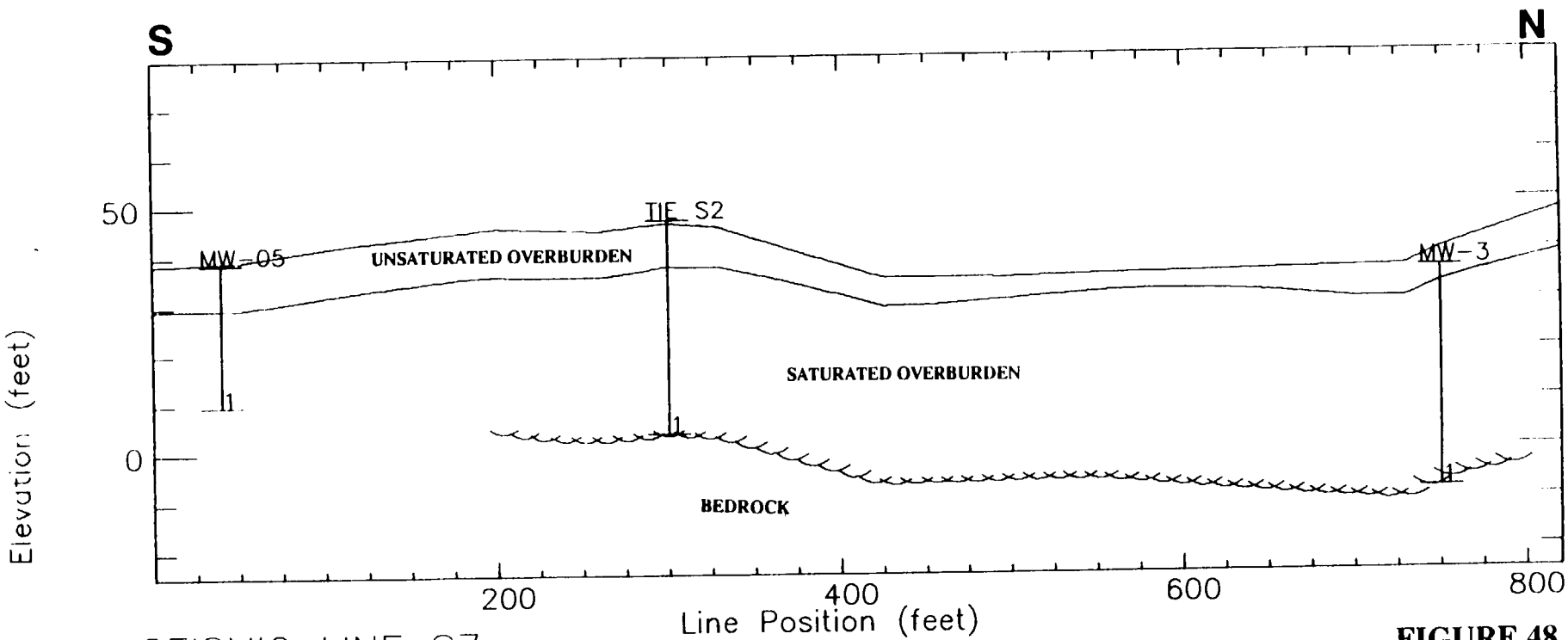
Gartner Lee



SEISMIC LINE S6
ROSE HILL LANDFILL
GARTNER LEE, INC., JUNE 1991

FIGURE 47

Gartner Lee



SEISMIC LINE S7
ROSE HILL LANDFILL
GARTNER LEE, INC. JUNE 1991

FIGURE 48

Gartner Lee

B-7 TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91 - 09/04/91

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		MW-02-01	MW-03-01	MW-03-01	MW-03-01	MW-07-01
SAMPLE DEPTH (FT):		18 - 22	16 - 21	25 - 40	25 - 40	26 - 32
M&E SAMPLE ID:		MW-02-1-18.0-22.0-NX-B-103	MW-03-1-16.2-20.5-NX-B-104-2	MW-03-1-25.0-39.5-FD-B-124-2	MW-03-1-25.0-39.5-NX-B-104-2	MW-07-1-26-32-NX-B-113-2
DATE SAMPLED:		07/26/91	07/31/91	08/01/91	08/01/91	08/06/91
REMARKS:				Field Duplicate		
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	4.6	20.2	5.7	5.7	9.0
Organic Content	(%)	0.5	0.6	0.2	0.2	0.5
Solids Content	(%)	95.4	79.7	94.3	94.4	91.0
GRAIN SIZE						
Clay	(%)	.1	3	0	0	1.3
Gravel	(%)	3.5	0	2.6	3.1	20.3
Sand	(%)	81.9	6.9	90.4	90.6	69.2
Silt	(%)	14.5	90	7	6.3	9.2
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	NA	NA	NA
Plastic Limit	--	NA	NA	NA	NA	NA

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-12-01	MW-13-01
SAMPLE DEPTH (FT):		16 - 26	6.0 - 14	8.0 - 13	27 - 32	9.0 - 17
M&E SAMPLE ID:		MW-09-1-16'-26'-NX-B-116-2	MW-10-1-6'-14'-NX-B-118-2	MW-11-01-8'-13'-NX-B-119-2	MW-12-1-26.9-32-NX-B-121-2	NMW-13-1-9.0-17.0-NX-B-122-2
DATE SAMPLED:		09/04/91	08/26/91	08/15/91	08/09/91	07/22/91
REMARKS:						
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	*	20.9	9.7	21.9	14.2
Organic Content	(%)	0.3	2.6	0.9	0.9	0.4
Solids Content	(%)	*	79.1	90.4	78.1	85.8
GRAIN SIZE						
Clay	(%)	1.8	0	1.7	10.3	0
Gravel	(%)	21.3	.8	23.7	0	7.7
Sand	(%)	57.5	28.9	68.8	6.7	87.4
Silt	(%)	19.4	70.3	5.8	82.9	4.9
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	NA	NA	NA
Plastic Limit	--	NA	NA	NA	NA	NA

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		MW-13-01	PT-01	PT-01	PT-02	PT-02
SAMPLE DEPTH (FT):		21 - 30	0.0 -2.0	0.0 -4.0	0.0 -2.0	0.0 -4.0
M&E SAMPLE ID:		NMW-13-1-21-29.5-NX-B-122-	BH-08-0-02-NX-B-139-2	BH-08-0-04-NX-B-139-2	BH-09-0-02-NX-B-141-2	BH-09-0-04-NX-B-141-2
DATE SAMPLED:		07/25/91	08/27/91	08/27/91	08/27/91	08/27/91
REMARKS:						
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	10.2	NA	16.9	NA	14.6
Organic Content	(%)	0.2	NA	2.3	NA	3.6
Solids Content	(%)	89.8	NA	83.1	NA	85.4
GRAIN SIZE						
Clay	(%)	0.8	NA	6	NA	4.6
Gravel	(%)	26.8	NA	7.7	NA	13.7
Sand	(%)	57.1	NA	44.5	NA	54.3
Silt	(%)	15.3	NA	41.8	NA	27.4
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	--	NA	--
Plastic Limit	--	NA	NA	NP	NA	NP

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		PT-03	PT-03	PT-04	PT-04	PT-05
SAMPLE DEPTH (FT):		0.0 -2.0	0.0 -4.0	0.0 -2.0	0.0 -4.0	0.0 -2.0
M&E SAMPLE ID:		BH-10-0-02-NX-B-143-2	BH-10-0-04-NX-B-143-2	BH-11-0-02-NX-B-155-2	BH-11-0-04-NX-B-155-2	BH-12-0-02-FD-B-144-2
DATE SAMPLED:		08/27/91	08/27/91	08/27/91	08/27/91	08/27/91
REMARKS:						Field Duplicate
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	NA	11.9	NA	10.1	NA
Organic Content	(%)	NA	2.6	NA	2.2	NA
Solids Content	(%)	NA	88.1	NA	89.9	NA
GRAIN SIZE						
Clay	(%)	NA	5	NA	5.1	NA
Gravel	(%)	NA	15	NA	11.5	NA
Sand	(%)	NA	55	NA	57.8	NA
Silt	(%)	NA	24.9	NA	25.5	NA
ATTERBERG LIMITS						
Liquid Limit	--	NA	--	NA	--	NA
Plastic Limit	--	NA	NP	NA	NP	NA

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		PT-05	PT-05	PT-05
SAMPLE DEPTH (FT):		0.0 -2.0	0.0 -4.0	0.0 -4.0
M&E SAMPLE ID:		BH-12-0-02-NX-B-156-2	BH-12-0-04-FD-B-144-2	BH-12-0-04-NX-B-156-2
DATE SAMPLED:		08/27/91	08/27/91	08/27/91
REMARKS:			Field Duplicate	
TOTAL COMBUSTIBLE ORGANICS				
Moisture Content	(%)	NA	11.0	10.8
Organic Content	(%)	NA	1.9	2.1
Solids Content	(%)	NA	95.1	89.2
GRAIN SIZE				
Clay	(%)	NA	3.3	3.3
Gravel	(%)	NA	8.2	10.5
Sand	(%)	NA	59.8	59.9
Silt	(%)	NA	28.6	27.2
ATTERBERG LIMITS				
Liquid Limit	--	NA	--	--
Plastic Limit	--	NA	NP	NP

B-7 TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91 - 09/04/91

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		MW-02-01	MW-03-01	MW-03-01	MW-03-01	MW-07-01
SAMPLE DEPTH (FT):		18 - 22	16 - 21	25 - 40	25 - 40	26 - 32
M&E SAMPLE ID:		MW-02-1-18.0-22.0-NX-B-103	MW-03-1-16.2-20.5-NX-B-104-2	MW-03-1-25.0-39.5-FD-B-124-2	MW-03-1-25.0-39.5-NX-B-104-2	MW-07-1-26-32-NX-B-113-2
DATE SAMPLED:		07/26/91	07/31/91	08/01/91	08/01/91	08/06/91
REMARKS:				Field Duplicate		
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	4.6	20.2	5.7	5.7	9.0
Organic Content	(%)	0.5	0.6	0.2	0.2	0.5
Solids Content	(%)	95.4	79.7	94.3	94.4	91.0
GRAIN SIZE						
Clay	(%)	.1	3	0	0	1.3
Gravel	(%)	3.5	0	2.6	3.1	20.3
Sand	(%)	81.9	6.9	90.4	90.6	69.2
Silt	(%)	14.5	90	7	6.3	9.2
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	NA	NA	NA
Plastic Limit	--	NA	NA	NA	NA	NA

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-12-01	MW-13-01
SAMPLE DEPTH (FT):		16 - 26	6.0 - 14	8.0 - 13	27 - 32	9.0 - 17
M&E SAMPLE ID:		MW-09-1-16'-26'-NX-B-116-2	MW-10-1-6'-14'-NX-B-118-2	MW-11-01-8'-13'-NX-B-119-2	MW-12-1-26.9-32-NX-B-121-2	NMW-13-1-9.0-17.0-NX-B-122-2
DATE SAMPLED:		09/04/91	08/26/91	08/15/91	08/09/91	07/22/91
REMARKS:						
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	*	20.9	9.7	21.9	14.2
Organic Content	(%)	0.3	2.6	0.9	0.9	0.4
Solids Content	(%)	*	79.1	90.4	78.1	85.8
GRAIN SIZE						
Clay	(%)	1.8	0	1.7	10.3	0
Gravel	(%)	21.3	.8	23.7	0	7.7
Sand	(%)	57.5	28.9	68.8	6.7	87.4
Silt	(%)	19.4	70.3	5.8	82.9	4.9
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	NA	NA	NA
Plastic Limit	--	NA	NA	NA	NA	NA

LOCATION NAME:		MW-13-01	PT-01	PT-01	PT-02	PT-02
SAMPLE DEPTH (FT):		21 - 30	0.0 -2.0	0.0 -4.0	0.0 -2.0	0.0 -4.0
M&E SAMPLE ID:		NMW-13-1-21-29.5-NX-B-122-B	H-08-0-02-NX-B-139-2	BH-08-0-04-NX-B-139-2	BH-09-0-02-NX-B-141-2	BH-09-0-04-NX-B-141-2
DATE SAMPLED:		07/25/91	08/27/91	08/27/91	08/27/91	08/27/91
REMARKS:						
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	10.2	NA	16.9	NA	14.6
Organic Content	(%)	0.2	NA	2.3	NA	3.6
Solids Content	(%)	89.8	NA	83.1	NA	85.4
GRAIN SIZE						
Clay	(%)	0.8	NA	6	NA	4.6
Gravel	(%)	26.8	NA	7.7	NA	13.7
Sand	(%)	57.1	NA	44.5	NA	54.3
Silt	(%)	15.3	NA	41.8	NA	27.4
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	--	NA	--
Plastic Limit	--	NA	NA	NP	NA	NP

TEST BORING AND PERMEABILITY TEST POINTS - 07/22/91-09/04/91
ROSE HILL GEOTECHNICAL DATA

LOCATION NAME:		PT-03	PT-03	PT-04	PT-04	PT-05
SAMPLE DEPTH (FT):		0.0 -2.0	0.0 -4.0	0.0 -2.0	0.0 -4.0	0.0 -2.0
M&E SAMPLE ID:		BH-10-0-02-NX-B-143-2	BH-10-0-04-NX-B-143-2	BH-11-0-02-NX-B-155-2	BH-11-0-04-NX-B-155-2	BH-12-0-02-FD-B-144-2
DATE SAMPLED:		08/27/91	08/27/91	08/27/91	08/27/91	08/27/91
REMARKS:						Field Duplicate
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	NA	11.9	NA	10.1	NA
Organic Content	(%)	NA	2.6	NA	2.2	NA
Solids Content	(%)	NA	88.1	NA	89.9	NA
GRAIN SIZE						
Clay	(%)	NA	5	NA	5.1	NA
Gravel	(%)	NA	15	NA	11.5	NA
Sand	(%)	NA	55	NA	57.8	NA
Silt	(%)	NA	24.9	NA	25.5	NA
ATTERBERG LIMITS						
Liquid Limit	--	NA	--	NA	--	NA
Plastic Limit	--	NA	NP	NA	NP	NA

LOCATION NAME:		PT-05	PT-05	PT-05
SAMPLE DEPTH (FT):		0.0 -2.0	0.0 -4.0	0.0 -4.0
M&E SAMPLE ID:		BH-12-0-02-NX-B-156-2	BH-12-0-04-FD-B-144-2	BH-12-0-04-NX-B-156-2
DATE SAMPLED:		08/27/91	08/27/91	08/27/91
REMARKS:			Field Duplicate	
TOTAL COMBUSTIBLE ORGANICS				
Moisture Content	(%)	NA	11.0	10.8
Organic Content	(%)	NA	1.9	2.1
Solids Content	(%)	NA	95.1	89.2
GRAIN SIZE				
Clay	(%)	NA	3.3	3.3
Gravel	(%)	NA	8.2	10.5
Sand	(%)	NA	59.8	59.9
Silt	(%)	NA	28.6	27.2
ATTERBERG LIMITS				
Liquid Limit	--	NA	--	--
Plastic Limit	--	NA	NP	NP

APPENDIX C
SOIL GAS SURVEY DATA

C-1 Handheld Instrument Sampling Data

C-2 Field GC Sampling Data

C-3 Reduced Sulfur Sampling Data

C-4 Data and Regression Analysis

C-5 Summary of Landfill Gas Data Calculations

C-1 HANDHELD INSTRUMENT SAMPLING DATA

ROSE HILL LANDFILL GAS DATA
ROUND 1 HAND HELD INSTRUMENT DATA - JUNE/JULY, 1991 SAMPLING

Location	Type of Point	Waste Area	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
BW(00_000)	TP	bulky	3.36	17.40	35.00	0.00	NA	NA
BW(00_100)	TP	bulky	35.70	2.90	NA	45.10	NA	NA
BW(00_200)	TP	bulky	12.90	NA	NA	21.90	NA	NA
BW(01_000)	TP	bulky	32.90	1.30	NA	49.60	NA	NA
BW(01_300)	TP	bulky	30.70	1.00	NA	49.60	NA	NA
BW(01_-25)	TP	bulky	18.00	2.50	NA	1.15	NA	NA
BW(02_100)	TP	bulky	45.00	2.00	NA	55.60	NA	NA
BW(02_300)	TP	bulky	49.00	4.80	NA	52.00	NA	NA
BW(02_400)	TP	bulky	4.02	19.00	NA	4.90	NA	NA
BW(03_000)	TP	bulky	0.00	20.60	25.00	0.00	NA	NA
BW(03_200)	TP	bulky	43.00	2.00	NA	57.20	NA	NA
BW(03_400)	TP	bulky	25.00	7.30	NA	32.00	NA	NA
BW(03_500)	TP	bulky	18.40	7.30	NA	36.30	NA	NA
BW(04_100)	TP	bulky	30.00	6.40	NA	38.70	NA	NA
BW(04_300)	TP	bulky	47.00	0.90	NA	53.00	NA	NA
BW(04_500)	TP	bulky	41.00	1.10	NA	50.00	NA	NA
BW(04_600)	TP	bulky	4.20	16.70	NA	0.50	NA	NA
BW(05_000)	TP	bulky	3.08	17.40	NA	3.23	NA	NA
BW(05_200)	TP	bulky	35.60	2.20	NA	22.70	NA	NA
BW(05_400)	TP	bulky	43.00	2.70	NA	56.00	NA	NA
BW(05_500)	TP	bulky	42.00	1.10	NA	55.00	NA	NA
BW(05_600)	TP	bulky	7.32	19.50	9.00	0.00	NA	NA
BW(06_200)	TP	bulky	0.00	20.60	NA	0.00	NA	NA
BW(06_300)	TP	bulky	0.00	20.60	20.00	0.00	NA	NA
BW(06_500)	TP	bulky	33.90	3.20	NA	29.50	NA	NA
BW(07_400)	TP	bulky	11.30	15.20	NA	10.30	NA	NA
LFGF-01	PP	north perimeter	1.13	19.60	12.00	0.00	NA	NA
LFGF-02	PP	north perimeter	1.18	19.75	13.00	0.00	NA	NA
LFGF-03	PP	north perimeter	31.50	2.70	NA	58.00	NA	NA
LFGF-04	PP	north perimeter	1.44	19.60	18.00	0.07	NA	NA
LFGF-05	PP	north perimeter	2.28	19.40	5.00	0.08	NA	NA
LFGF-06	PP	north perimeter	0.60	20.30	0.00	0.00	NA	NA

ROSE HILL LANDFILL GAS DATA
ROUND 1 HAND HELD INSTRUMENT DATA - JUNE/JULY, 1991 SAMPLING

Location	Type of Point	Waste Area	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
LFGF-07	PP	north perimeter	0.50	20.30	0.00	0.00	NA	NA
LFGF-08	PP	north perimeter	0.30	20.40	4.00	0.00	NA	NA
LFGF-09	PP	north perimeter	0.60	20.30	0.00	0.00	NA	NA
LFGR-02	PP	west perimeter	2.70	18.60	5.00	0.10	NA	NA
LFGR-03	PP	west perimeter	1.80	19.20	2.00	0.10	NA	NA
LFGR-04	PP	west perimeter	3.35	17.60	5.00	0.10	NA	NA
LFGR-05	PP	west perimeter	2.95	17.90	NA	0.10	NA	NA
LFGR-06	PP	west perimeter	3.43	17.60	2.00	0.11	NA	NA
LFGR-07	PP	west perimeter	24.00	0.90	NA	15.90	NA	NA
LFGR-08	PP	west perimeter	44.20	0.90	NA	60.90	NA	NA
LFGR-09	PP	west perimeter	19.40	20.60	NA	13.80	NA	NA
LFGR-10	PP	west perimeter	47.00	1.10	NA	56.40	NA	NA
LFGR-11	PP	west perimeter	42.20	2.45	NA	46.55	NA	NA
LFGR-12	PP	west perimeter	NA	NA	NA	NA	NA	NA
LFGR-13	PP	west perimeter	43.00	5.60	NA	47.10	NA	NA
LFGR-14	PP	west perimeter	2.30	NA	NA	1.50	NA	NA
LFGR-15	PP	west perimeter	1.50	18.80	10.00	0.80	NA	NA
LFGR-16	PP	west perimeter	21.60	1.30	NA	6.00	NA	NA
LFGR-17	PP	west perimeter	29.20	1.10	NA	17.90	NA	NA
LFGR-18	PP	west perimeter	2.64	18.60	110.00	0.60	NA	NA
LFGR-19	PP	west perimeter	1.40	19.30	30.00	0.15	NA	NA
LFGT-01	PP	south perimeter	22.40	1.60	NA	8.30	NA	NA
LFGT-02	PP	south perimeter	55.00	1.60	NA	54.00	NA	NA
LFGT-03	PP	south perimeter	51.10	0.90	NA	53.60	NA	NA
LFGT-04	PP	south perimeter	31.10	1.10	NA	15.90	NA	NA
LFGT-05	PP	south perimeter	31.50	1.00	NA	18.30	NA	NA
SS(00_000)	TP	sewage sludge	0.74	20.40	1.00	0.00	NA	NA
SS(00_100)	TP	sewage sludge	2.90	17.60	0.60	0.00	NA	NA
SS(01_100)	TP	sewage sludge	11.30	8.20	80.00	0.00	NA	NA
SS(01_200)	TP	sewage sludge	0.30	20.00	0.00	0.00	NA	NA
SS(02_000)	TP	sewage sludge	0.10	20.80	0.25	0.00	NA	NA
SS(02_300)	TP	sewage sludge	2.72	18.50	0.00	0.00	NA	NA

ROSE HILL LANDFILL GAS DATA
ROUND 1 HAND HELD INSTRUMENT DATA - JUNE/JULY, 1991 SAMPLING

Location	Type of Point	Waste Area	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
SS(03_100)	TP	sewage sludge	6.30	14.80	NA	0.00	NA	NA
SS(04_000)	TP	sewage sludge	13.70	11.80	NA	0.00	NA	NA
SS(05_100)	TP	sewage sludge	2.60	18.50	1.60	0.00	NA	NA
SS(05_300)	TP	sewage sludge	0.60	20.20	0.00	0.00	NA	NA
SS(06_200)	TP	sewage sludge	0.62	19.80	1.00	0.00	NA	NA
SS(07_000)	TP	sewage sludge	9.46	12.00	100.00	0.00	NA	NA
SS(07_100)	TP	sewage sludge	0.62	19.80	0.60	0.00	NA	NA
SS(08_000)	TP	sewage sludge	12.10	9.00	NA	8.76	NA	NA
SS(09_100)	TP	sewage sludge	2.80	16.30	NA	0.00	NA	NA
SS(09_300)	TP	sewage sludge	0.00	20.60	0.00	0.00	NA	NA
SS(10_200)	TP	sewage sludge	1.41	18.50	0.00	0.03	NA	NA
SS(11_100)	TP	sewage sludge	0.35	20.50	1.00	0.03	NA	NA
SS(11_300)	TP	sewage sludge	0.30	20.40	0.00	0.00	NA	NA
SS(12_000)	TP	sewage sludge	0.00	20.70	0.00	0.03	NA	NA
SS(13_100)	TP	sewage sludge	1.65	18.00	1.00	0.03	NA	NA
SS(13_300)	TP	sewage sludge	0.00	20.70	0.00	0.00	NA	NA
SW(01_100)	TP	solid	26.40	20.10	NA	31.10	NA	NA
SW(01_300)	TP	solid	35.50	1.40	NA	25.30	NA	NA
SW(01_500)	TP	solid	22.00	7.50	NA	4.60	NA	NA
SW(02_100)	TP	solid	54.10	0.60	NA	55.60	NA	NA
SW(02_200)	TP	solid	NA	4.00	NA	NA	NA	NA
SW(02_300)	TP	solid	NA	1.50	NA	NA	NA	NA
SW(02_500)	TP	solid	43.30	1.10	NA	50.70	NA	NA
SW(03_000)	TP	solid	0.00	20.70	20.00	0.00	NA	NA
SW(03_100)	TP	solid	58.00	1.80	NA	56.00	NA	NA
SW(03_300)	TP	solid	45.00	2.30	NA	36.00	NA	NA
SW(03_500)	TP	solid	13.70	7.30	NA	0.20	NA	NA
SW(04_000)	TP	solid	15.30	16.90	NA	17.90	NA	NA
SW(04_200)	TP	solid	NA	0.70	NA	NA	NA	NA
SW(04_300)	TP	solid	16.40	8.50	NA	13.10	NA	NA
SW(04_400)	TP	solid	NA	1.30	NA	NA	NA	NA
SW(04_500)	TP	solid	44.00	4.30	NA	39.00	NA	NA

ROSE HILL LANDFILL GAS DATA
ROUND 1 HAND HELD INSTRUMENT DATA - JUNE/JULY, 1991 SAMPLING

Location	Type of Point	Waste Area	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
SW(05_000)	TP	solid	53.15	3.20	NA	49.60	NA	NA
SW(05_100)	TP	solid	10.00	10.60	NA	5.00	NA	NA
SW(05_300)	TP	solid	39.00	1.10	NA	40.00	NA	NA
SW(05_500)	TP	solid	40.00	1.40	NA	47.00	NA	NA
SW(05_600)	TP	solid	0.00	NA	7.00	0.00	NA	NA
SW(05_-40)	TP	solid	19.50	6.50	NA	7.70	NA	NA
SW(06_000)	TP	solid	50.20	1.50	NA	55.30	NA	NA
SW(06_100)	TP	solid	44.00	1.40	NA	52.00	NA	NA
SW(06_200)	TP	solid	27.00	2.00	NA	24.00	NA	NA
SW(06_400)	TP	solid	25.00	2.80	NA	27.00	NA	NA
SW(06_600)	TP	solid	18.00	4.60	NA	15.00	NA	NA
SW(07_000)	TP	solid	50.20	0.70	NA	56.00	NA	NA
SW(07_100)	TP	solid	40.00	2.90	NA	50.00	NA	NA
SW(07_300)	TP	solid	41.00	1.00	NA	39.00	NA	NA
SW(07_500)	TP	solid	44.00	1.10	NA	48.00	NA	NA
SW(07_600)	TP	solid	42.00	0.80	NA	48.00	NA	NA
SW(08_000)	TP	solid	50.20	0.60	NA	57.60	NA	NA
SW(08_100)	TP	solid	24.00	0.80	NA	9.00	NA	NA
SW(08_200)	TP	solid	41.00	3.00	NA	45.00	NA	NA
SW(08_400)	TP	solid	45.00	0.70	NA	46.00	NA	NA
SW(08_600)	TP	solid	46.00	1.00	NA	51.00	NA	NA
SW(09_000)	TP	solid	29.10	6.90	NA	33.10	NA	NA
SW(09_100)	TP	solid	34.00	0.50	NA	21.00	NA	NA
SW(09_200)	TP	solid	44.00	1.20	NA	41.00	NA	NA
SW(09_300)	TP	solid	39.00	0.60	NA	41.00	NA	NA
SW(09_400)	TP	solid	28.00	7.00	NA	28.00	0.00	NA
SW(09_500)	TP	solid	37.00	1.00	NA	32.00	0.00	NA
SW(09_600)	TP	solid	43.00	1.20	NA	45.00	0.00	NA
SW(10_000)	TP	solid	41.00	7.00	NA	50.00	NA	NA
SW(10_100)	TP	solid	31.00	4.00	NA	36.00	NA	NA
SW(10_200)	TP	solid	32.00	2.80	NA	25.00	NA	NA
SW(10_300)	TP	solid	38.00	0.60	NA	47.00	0.00	NA

ROSE HILL LANDFILL GAS DATA
ROUND 1 HAND HELD INSTRUMENT DATA - JUNE/JULY, 1991 SAMPLING

Location	Type of Point	Waste Area	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
SW(10_400)	TP	solid	36.00	2.80	NA	42.00	0.00	NA
SW(10_500)	TP	solid	43.00	0.50	0.00	44.00	NA	NA
SW(10_600)	TP	solid	45.00	0.50	NA	48.00	0.00	NA
SW(10_700)	TP	solid	56.10	1.40	NA	54.70	NA	NA
SW(11_000)	TP	solid	4.30	17.00	550.00	0.04	NA	NA
SW(11_100)	TP	solid	43.00	7.50	NA	54.00	NA	NA
SW(11_200)	TP	solid	47.00	8.00	NA	58.00	NA	NA
SW(11_300)	TP	solid	38.00	3.00	NA	41.50	NA	NA
SW(11_400)	TP	solid	41.00	2.50	50.00	50.00	NA	NA
SW(11_500)	TP	solid	47.00	1.00	NA	49.00	NA	NA
SW(11_600)	TP	solid	47.00	1.00	NA	54.00	NA	NA
SW(11_700)	TP	solid	62.40	1.00	NA	56.40	NA	NA
SW(12_000)	TP	solid	0.00	NA	NA	0.00	NA	NA
SW(12_100)	TP	solid	45.00	3.00	NA	51.00	NA	NA
SW(12_200)	TP	solid	42.00	2.00	NA	58.00	NA	NA
SW(12_300)	TP	solid	34.00	4.00	1.00	41.50	0.00	NA
SW(12_400)	TP	solid	44.00	NA	NA	48.00	5.00	NA
SW(12_500)	TP	solid	50.00	0.70	NA	45.00	2.20	NA
SW(12_600)	TP	solid	43.00	0.80	NA	51.00	75.00	NA
SW(12_700)	TP	solid	45.00	0.80	NA	60.00	NA	NA
SW(13_100)	TP	solid	12.00	8.70	700.00	0.03	NA	NA
SW(13_200)	TP	solid	37.00	0.60	NA	59.00	60.00	NA
SW(13_300)	TP	solid	10.00	11.00	0.00	13.50	0.00	NA
SW(13_400)	TP	solid	47.00	0.70	NA	54.00	17.00	NA
SW(13_500)	TP	solid	23.00	18.60	NA	29.00	190.00	NA
SW(13_600)	TP	solid	43.00	0.80	NA	47.00	5.00	NA
SW(13_700)	TP	solid	13.00	0.60	NA	23.00	NA	NA
SW(14_200)	TP	solid	25.00	1.00	NA	27.00	20.00	NA
SW(14_300)	TP	solid	41.00	NA	NA	45.00	9.20	NA
SW(14_400)	TP	solid	0.11	NA	0.00	0.15	0.00	NA
SW(14_500)	TP	solid	37.00	1.00	5.50	51.00	760.00	NA
SW(14_600)	TP	solid	0.05	NA	42.00	0.10	216.00	NA

ROSE HILL LANDFILL GAS DATA
ROUND 1 HAND HELD INSTRUMENT DATA - JUNE/JULY, 1991 SAMPLING

Location	Type of Point	Waste Area	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
SW(14_700)	TP	solid	26.00	9.90	NA	28.00	NA	NA
SW(15_400)	TP	solid	19.60	14.60	NA	22.30	NA	NA
SW(15_500)	TP	solid	32.00	5.60	NA	41.00	NA	NA
SW(15_600)	TP	solid	56.00	0.80	NA	55.00	NA	NA
SW(15_700)	TP	solid	17.30	14.20	NA	17.50	NA	NA

Notes:
T - temporary point, sampled using KV apparatus.
PP - Permenant point installed in the summer of 1991.
NA - Not measured.

ROSE HILL LANDFILL GAS DATA
ROUND 2 HAND HELD INSTRUMENT DATA - SEPTEMBER, 1991 SAMPLING

Location	Area Type	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
LFGF-01	north	3.60	18.00	1.00	0.00	NA	1.00
LFGF-02	north	5.55	17.05	4.50	0.00	39.35	4.00
LFGF-03	north	39.00	0.60	NA	78.00	75.00	12.00
LFGF-04	north	0.00	NA	0.00	0.00	0.00	0.00
LFGF-05	north	5.20	7.00	1.50	0.00	0.00	13.40
LFGF-07	north	0.00	19.20	1.50	0.00	0.00	7.00
LFGF-08	north	1.87	19.50	0.30	0.00	20.00	0.00
LFGF-09	north	1.90	9.80	0.50	0.00	0.00	0.00
LFGR-02	west	17.00	3.60	NA	15.00	2.00	95.00
LFGR-03	west	3.40	18.60	9.00	0.00	25.10	0.00
LFGR-04	west	5.70	16.70	3.00	0.00	0.50	0.00
LFGR-05	west	4.30	17.60	1.00	0.00	0.00	0.00
LFGR-06	west	8.50	13.30	1.00	0.00	0.00	0.00
LFGR-07	west	21.80	1.00	NA	24.50	36.10	1.00
LFGR-08	west	44.40	0.70	NA	66.60	47.00	NA
LFGR-09	west	32.00	10.00	NA	39.00	0.00	98.00
LFGR-10	west	46.00	0.70	NA	68.00	0.00	NA
LFGR-11	west	42.20	2.00	NA	67.00	5.10	1.00
LFGR-12	west	NA	NA	NA	NA	NA	NA
LFGR-13	west	15.00	0.70	NA	13.00	0.00	NA
LFGR-14	west	1.00	20.20	0.00	0.00	0.00	0.00
LFGR-15	west	2.50	15.50	4.00	0.00	0.00	0.00
LFGR-16	west	33.00	1.20	NA	35.00	0.00	NA
LFGR-17	west	34.00	0.90	NA	42.00	0.00	NA
LFGR-18	west	6.00	15.70	15.00	0.00	0.00	0.00
LFGR-19	west	4.20	16.40	7.00	0.00	0.00	0.00
LFGT-01	south	28.20	1.50	NA	50.40	0.00	9.00
LFGT-02	south	NA	2.40	NA	NA	5.60	9.00

ROSE HILL LANDFILL GAS DATA
ROUND 2 HAND HELD INSTRUMENT DATA - SEPTEMBER, 1991 SAMPLING

Location	Area Type	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methane (percent)	PID(10.6) (ppm)	LEL (percent)
LFGT-03	south	51.00	0.90	NA	62.00	38.00	NA
LFGT-04	south	NA	NA	NA	NA	NA	NA
LFGT-05	south	43.00	NA	NA	56.00	15.00	NA

Notes: NA - Not measured.

ROSE HILL LANDFILL GAS DATA
ROUND 3 HAND HELD INSTRUMENT DATA - DECEMBER 1991 SAMPLING

Location	Type of Point	Final Depth (feet)	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methan (percent	PID(10.6) (ppm)	LEL (percent)
LFG-AD	NP	5.7	residential	Y	8.6	18.2	0	0	2	0
LFG-ETR	NP	8.7	residential	Y	3.6	19.8	0	0	1.2	0
LFG-GT	NP	4.2	residential	Y	0	20.8	0	0	1	0
LFG-JB	NP	5.6	residential	Y	0	20.9	0	0	0	0
LFG-JF	NP	6.4	residential	Y	0.7	20.7	0	0	0	0
LFG-LHR	NP	5.4	residential	Y	5.6	18.8	0	0	1	0
LFG-NG	NP	4.8	residential	Y	1.7	20.7	0	0	2	0
LFG-RK	NP	5.6	residential	Y	1.5	20.9	0	0	8	0
LFGF-3	PP	3	north	Y	34.9	1.3	>1000	52.5	NA	NA
LFGF-4	PP	3	north	N	NA	21.1	0	NA	5.5	0
LFGF-8	PP	3	north	Y	0.5	20.9	0	0	9	0
TP-F1	T	3	north	Y	NA	21.2	0	NA	0	0
TP-F2	T	3	north	Y	9	4.3	>1000	NA	26	75
TP-F3	T	3	north	Y	2.3	18.3	>1000	0.3	5	NA
TP-F4	T	2.5	north	N	NA	20.9	75	NA	1	0
TP-F5	T	4	north	Y	0.6	20.7	10	0	46	0
TP-F6	T	3	north	Y	0.3	20.9	0	0	3	0
LFGT-6	TP	5.3	south	N	5.6	NA	7.5	0	NA	NA
LFGT-7	TP	3.2	south	Y	0	NA	0	0	0	NA
LFGT-8	TP	5.3	south	Y	0	20.6	200	0.1	0	0
TP-T1	T	3	south	N	0.06	NA	0	0	NA	NA
TP-T2	T	6	south	Y	0	NA	7	0	NA	NA
TP-T2	T	3	south	N	0.46	NA	0	0	NA	NA
TP-T3	T	3	south	Y	2.4	NA	10	0	NA	NA
TP-T4	T	3	south	Y	12.8	NA	>1000	21.6	NA	NA
TP-T5	T	3	south	Y	0	NA	5	0	0	NA

ROSE HILL LANDFILL GAS DATA
ROUND 3 HAND HELD INSTRUMENT DATA - DECEMBER 1991 SAMPLING

Location	Type of Point	Final Depth (feet)	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methan (percent	PID(10.6) (ppm)	LEL (percent)
TP-T5	T	6	south	N	0.65	17	>1000	1.3	0	247
LFGR-10	PP	3	west	Y	34.2	20.1	NA	50.4	550	200
LFGR-20	TP	8.8	west	Y	0.06	20.5	200	0	0	1
LFGR-21	TP	5.0	west	N	0	20.8	0	0	1	0
LFGR-22	TP	2.7	west	Y	0.8	18	7	0	3	0
LFGR-23	TP	6	west	Y	0	20.2	0	0	2.5	0
LFGR-5-9	NP	8.7	west	Y	0	20.9	3	0	0	0
LFGR-8	PP	3	west	Y	33	1.7	NA	51	43	168
TP-R1	T	6	west	Y	0.1	20.5	0	0	1	0
TP-R1	T	3	west	N	0.02	20.6	0	0	0	0
TP-R10	T	3	west	N	0	20.9	7	0	NA	0
TP-R10	T	6	west	Y	20	7.2	>1000	29.9	NA	NA
TP-R11	T	3	west	N	0	20.4	25	0	NA	0
TP-R11	T	6	west	N	5.6	17	10	0	26	2
TP-R12	T	3	west	Y	18	6.2	>1000	20	NA	NA
TP-R13	T	3	west	N	0	21	70	0	NA	0
TP-R13	T	3	west	Y	27	5	>1000	33	NA	NA
TP-R14	T	4	west	Y	4.5	18	0	0	NA	0
TP-R2	T	3	west	Y	0.14	20.6	>1000	0	5.1	1
TP-R2	T	6	west	Y	0.1	20.4	800	0	0.3	4
TP-R3	T	6	west	Y	12	10.5	>1000	7	1	31
TP-R4	T	3	west	N	NA	NA	70	NA	NA	NA
TP-R5	T	3	west	N	0	20.9	5	0	0	0
TP-R6	T	3	west	N	1.76	NA	>1000	1.79	0	24
TP-R7	T	6	west	N	15	3.2	>1000	1	2	15
TP-R7	T	3	west	Y	6.6	17.8	0	0	7.5	NA

ROSE HILL LANDFILL GAS DATA
ROUND 3 HAND HELD INSTRUMENT DATA - DECEMBER 1991 SAMPLING

Location	Type of Point	Final Depth (feet)	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Oxygen (percent)	OVA (ppm)	Methan (percent	PID(10.6) (ppm)	LEL (percent)
TP-R8	T	3	west	N	4.5	14.1	>1000	8	0	68
TP-R9	T	3	west	Y	10.1	17	>1000	13	46	170

Notes: T - temporary point, sampled using KV apparatus.
TP - Tempoary point that was subsequently installed as a permenant point. It will be resampled in the future.
PP - Previously existing permenant point. These points were installed in the summer of 1991.
They were sampled for confirmation of previous results and comparison with results obtained this round.
NP - Newly installed permanent points. These points were installed in locations determined prior to field work.

ROSE HILL LANDFILL GAS DATA
ROUND 4 HAND HELD INSTRUMENT DATA - JANUARY, 1992 SAMPLING

Location	Type of Point	Final Depth (feet)	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Methane (percent)	OVA (ppm)	PID(10.6) (ppm)	PID(11.7) (ppm)	LEL (percent)	Oxygen (percent)
LFGF-2A	PP	3	north	Y	2.35	0	8	NA	NA	11	18.6
LFGF-2B	PP	3.0	north	Y	NA	NA	25	NA	NA	NA	NA
LFGF-3	PP	3	north	Y	30	43	NA	16	NA	NA	0.5
LFGF-8	PP	3	north	Y	4	0	NA	NA	NA	0	21.7
LFGR-11	PP	3.0	west	Y	35	59	NA	NA	NA	NA	0.6
LFGR-15	PP	3.0	west	Y	0.8	0	0	NA	NA	0	17.7
LFGR-17	PP	3.0	west	Y	20.4	16.7	NA	NA	NA	NA	0.5
LFGR-20	TP	8.8	west	N	0	0	>1000	0.4	NA	NA	NA
LFGR-21	TP	5.0	west	Y	2.7	7	>1000	0	NA	105	18.8
LFGR-22	TP	2.7	west	Y	4	0	3	NA	NA	2	16
LFGR-23	TP	6	west	Y	11.3	0	9	NA	NA	2	3.9
LFGR-4	PP	3.0	west	Y	1.9	0	0	NA	NA	2	22
LFGR-5-9	NP	8.7	west	Y	0	0	>1000	NA	NA	NA	NA
LFGR-8	PP	3	west	Y	35	56	NA	24.8	NA	NA	0.5
LFGT-5	PP	3	south	Y	28	41	NA	0.33	NA	NA	0.5
LFGT-6	TP	5.3	south	Y	4.4	0	0	0.2	0	0	22
LFGT-7	TP	3.2	south	N	15	0	>1000	0	0	4	2
LFGT-8	TP	5.3	south	N	NA	NA	NA	NA	NA	NA	NA
LFG-AD	NP	5.7	residential	Y	4.2	0	0	0	NA	0	14.8
LFG-ETR	NP	8.7	residential	Y	2	0	0	0	0	0	22
LFG-GT	NP	4.2	residential	Y	0.8	0	0.4	NA	NA	0	21.5
LFG-JB	NP	5.6	residential	Y	1.1	0	0	0	0	0	22
LFG-JF	NP	6.4	residential	N	0.33	0	0	0.3	0	0	21.9
LFG-LHR	NP	5.4	residential	Y	1.3	1.05	10	NA	NA	37	2.2
LFG-NG	NP	4.8	residential	Y	0.77	0	0	0.5	0	0	21.2
LFG-RK	NP	5.6	residential	Y	0.9	0	0	NA	NA	2	21.2

Notes:
T - temporary point, sampled using KV apparatus.
TP - Tempoary point that was subsequently installed as a permenant point. It will be resampled in the future.
PP - Previously existing permenant point. These points were installed in the summer of 1991.
They were sampled for confirmation of previous results and comparison with results obtained this round.
NP - Newly installed permanent points. These points were installed in December 1991.

ROSE HILL LANDFILL GAS DATA
ROUND 5 HAND HELD INSTRUMENT DATA - FEBRUARY, 1992 SAMPLING

Location	Type of Point	Final Depth (feet)	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Methane (percent)	OVA (ppm)	PID(10.6) (ppm)	PID(11.7) (ppm)	LEL (percent)	Oxygen (percent)
LFGF-3	PP	3	north	Y	NA	29.6	>1000	18.3	NA	NA	2.5
LFGF-8	PP	3	north	Y	0.42	0	0	0	NA	0	20.8
LFGF-9	PP	3	north	Y	0.53	0	0	0	NA	0	20.9
LFGR-11	PP	3	west	Y	NA	41.2	>1000	4.3	NA	NA	NA
LFGR-14	PP	3	west	N	NA	NA	>1000	1	NA	0	20.9
LFGR-17	PP	3	west	N	NA	NA	>1000	0	NA	0	20.9
LFGR-20	TP	8.8	west	Y	NA	NA	>1000	8.1	NA	0	20.8
LFGR-21	TP	5.0	west	N	NA	NA	NA	NA	NA	NA	NA
LFGR-22	TP	2.7	west	Y	NA	NA	>10	3	NA	0	18.4
LFGR-23	TP	6	west	Y	12	2.4	>1000	0	NA	44	14.9
LFGR-3	PP	3	west	N	NA	NA	150	2.8	NA	0	20
LFGR-5	PP	3	west	Y	NA	NA	>1000	9.7	NA	0	21
LFGR-5-9	NP	8.7	west	N	NA	NA	>1000	1.6	NA	0	20.9
LFGR-8	PP	3	west	Y	NA	NA	>1000	22	NA	NA	0.6
LFGT-2	PP	3	south	N	NA	15.6	NA	NA	NA	NA	NA
LFGT-4	PP	3	south	Y	NA	45.6	>1000	0	NA	NA	NA
LFGT-6	TP	5.3	south	Y	4	0	7	0	NA	2	19.6
LFGT-7	TP	3.2	south	Y	16	0.23	>1000	11.5	NA	5	15.4
LFGT-8	TP	5.3	south	N	NA	NA	NA	NA	NA	NA	NA
LFG-AD	NP	5.7	residential	Y	9.3	0	0	0	NA	4	16.5
LFG-ETR	NP	8.7	residential	N	2.63	0	0	3.1	NA	0	19.6
LFG-GT	NP	4.2	residential	Y	1.36	0	0	0	NA	0	20.6
LFG-JB	NP	5.6	residential	N	0.15	0	1.3	0	NA	0	21
LFG-JF	NP	6.4	residential	N	NA	NA	NA	NA	NA	NA	NA
LFG-LHR	NP	5.4	residential	Y	12.5	0.55	>1000	1.4	NA	9	16.5
LFG-NG	NP	4.8	residential	Y	0.58	0	0	0	NA	0	20.4
LFG-RK	NP	5.6	residential	N	0.97	0	0	0	NA	0	20.5

Notes: T - temporary point, sampled using KV apparatus.
TP - Tempoary point that was subsequently installed as a permenant point. It will be resampled in the future.
PP - Previously existing permenant point. These points were installed in the summer of 1991.
They were sampled for confirmation of previous results and comparison with results obtained this round.
NP - Newly installed permanent points. These points were installed in December 1991.

ROSE HILL LANDFILL GAS DATA
ROUND 6 HAND HELD INSTRUMENT DATA - MARCH, 1992 SAMPLING

Location	Type of Point	Final Depth (feet)	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Methane (percent)	OVA (ppm)	PID(10.6) (ppm)	PID(11.7) (ppm)	LEL (percent)	Oxygen (percent)
LFGF-1	PP	3.0	north	Y	0	0	0	1	NA	0	19.7
LFGF-3	PP	3	north	Y	27.8	35.3	>1000	34	NA	0	5.2
LFGF-5	PP	3.0	north	Y	0	0	0	0	NA	0	20.9
LFGF-9	PP	3	north	Y	0.58	0	0	0	NA	0	20.5
LFGR-11	PP	3	west	Y	40.2	67	>1000	0	NA	52	6
LFGR-14	PP	3.0	west	Y	0	0	400	2.4	NA	25	20.4
LFGR-18	PP	3	west	N	1.75	0	7	2.4	NA	6	19.6
LFGR-2	PP	3.0	west	Y	13.5	5.7	>1000	0	NA	142	7
LFGR-20	TP	8.8	west	Y	NA	NA	>1000	1.8	NA	199	15
LFGR-22	TP	2.7	west	N	NA	NA	NA	NA	NA	NA	NA
LFGR-23	TP	6	west	Y	12	0	>1000	3.9	NA	5	11.3
LFGR-4	PP	3.0	west	Y	1.11	0	0	0	NA	0	20.3
LFGR-6	PP	3.0	west	Y	2.8	0	0	0	NA	0	18
LFGR-8	PP	3	west	Y	39.8	69.5	NA	32	3500	66	4.9
LFGT-1	PP	3.0	south	N	12	40	NA	0	NA	NA	3
LFGT-3	PP	3.0	south	Y	37	67	NA	0	NA	0	1.6
LFGT-5	PP	3.0	south	N	21.8	10	>1000	0	NA	55	3.9
LFGT-6	TP	5.3	south	Y	3.78	0	0	0	0	1	18.3
LFGT-7	TP	3.2	south	Y	16.7	0.1	>1000	0	0		6.2
LFG-AD	NP	5.7	residential	Y	9.5	0	NA	0	NA	0	12.5
LFG-ETR	NP	8.7	residential	N	2.7	0	0	0	NA	0	19.1
LFG-GT	NP	4.2	residential	Y	1.3	0	0	0	NA	0	20.2
LFG-JB	NP	5.6	residential	N	0	0	0	0	NA	0	20.8
LFG-LHR	NP	5.4	residential	Y	9.3	0	>1000	2.8	NA	5	11.4

ROSE HILL LANDFILL GAS DATA
ROUND 6 HAND HELD INSTRUMENT DATA - MARCH, 1992 SAMPLING

Location	Type of Point	Final Depth (feet)	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Methane (percent)	OVA (ppm)	PID(10.6) (ppm)	PID(11.7) (ppm)	LEL (percent)	Oxygen (percent)
LFG-NG	NP	4.8	residential	N	0.91	0	0	0	NA	0	20.9
LFG-RK	NP	5.6	residential	N	1.5	0	0	0	NA	0	20.3
FBW	FB	--	solid	Y	0.3	0.3	>1000	3.5	NA	0.6	20.8
FBE	FB	--	solid	Y	22	38	NA	50	NA	145	9.3

Notes: T - temporary point, sampled using KV apparatus.
TP - Tempoary point that was subsequently installed as a permenant point in December 1991. It will be resampled in the futu
PP - Previously existing permenant point. These points were installed in the summer of 1991.
They were sampled for confirmation of previous results and comparison with results obtained this round.
NP - Newly installed permanent points. These points were installed in December 1991.

ROSE HILL LANDFILL GAS DATA
ROUND 7 HAND HELD INSTRUMENT DATA - APRIL, 1992 SAMPLING

Location	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Methane (percent)	OVA (ppm)	PID(10.6) (ppm)	PID(11.7) (ppm)	LEL (percent)	Oxygen (percent)
LFGF-1	north	Y	0.5	0	0	3.3	NA	0	19.6
LFGF-2A	north	Y	1.55	0	0	6.5	NA	0	17.1
LFGF-2B	north	N	NA	NA	NA	NA	NA	NA	NA
LFGF-3	north	Y	28.3	31.4	NA	18.3	716	NA	0.1
LFGF-4	north	N	NA	NA	NA	NA	NA	NA	NA
LFGF-5	north	Y	0.75	0	0	59.2	193	0	18.5
LFGF-7	north	Y	1.16	0	0	6.7	133	0	20.2
LFGF-8	north	Y	0.57	0	0	16.5	100	0	20.6
LFGF-9	north	Y	0	0	0	42.3	252	0	20.7
LFGR-10	west	Y	42.1	56.3	NA	5.1	346.9	NA	0.6
LFGR-11	west	Y	42.3	55.2	>1000	181	3049	NA	0.8
LFGR-12	west	Y	15.9	29	>1000	28.7	101	NA	10
LFGR-13	west	Y	37.5	50	NA	43.1	1562	NA	4
LFGR-14	west	Y	21.5	19.9	>1000	0	683	0	5.2
LFGR-15	west	Y	2.95	0.13	NA	1.1	255	0	15.6
LFGR-16	west	Y	16.2	8.53	NA	22.3	443	NA	0.6
LFGR-18	west	Y	1.46	0	0	6.4	NA	0	19.2
LFGR-19	west	Y	1.03	0	0	4.7	NA	0	18.9
LFGR-2	west	N	NA	NA	NA	NA	NA	NA	NA
LFGR-20	west	Y	15.1	17.9	>1000	NA	NA	NA	6.2
LFGR-21	west	Y	8.5	19.5	>1000	0	NA	NA	NA
LFGR-22	west	N	NA	NA	NA	NA	NA	NA	NA
LFGR-3	west	Y	0.71	0	110	2.6	NA	0	19.9
LFGR-4	west	Y	0	0	110	19.7	NA	0	21.1
LFGR-5	west	Y	2.47	0	1	0	NA	0	19.1
LFGR-5-9	west	N	NA	NA	NA	NA	NA	NA	NA
LFGR-6	west	Y	4.07	0	0	21.1	NA	0	15.5
LFGR-7	west	Y	24.2	30.6	>1000	23.1	307	NA	0.6
LFGR-8	west	Y	41	57.4	NA	22.2	NA	NA	0.1
LFGR-9	west	Y	26.6	28.2	NA	103.9	867	NA	11.9
LFGT-1	south	Y	10.7	36.9	NA	0	NA	NA	2
LFGT-2	south	Y	33.9	58.8	NA	0	NA	NA	3

ROSE HILL LANDFILL GAS DATA
ROUND 7 HAND HELD INSTRUMENT DATA - APRIL, 1992 SAMPLING

Location	Area Type	GC Analysis (Y/N)	Carbon Dioxide (percent)	Methane (percent)	OVA (ppm)	PID(10.6) (ppm)	PID(11.7) (ppm)	LEL (percent)	Oxygen (percent)
LFGT-3	south	Y	40.2	54.3	NA	0	115	NA	1
LFGT-4	south	N	NA	NA	NA	NA	NA	NA	NA
LFGT-5	south	Y	30	37.5	NA	0	50	NA	1
LFGT-6	south	Y	3.2	0	0	14.8	59	0	21
LFGT-7	south	Y	21.9	0	1	4.7	35	0	17.3
LFGT-8	south	N	NA	NA	NA	NA	NA	NA	NA
LFG-AD	residential	Y	9.3	0	120	0	31.9	7	11.1
LFG-GT	residential	Y	1.83	0	110	0	0	7	19.7
LFG-JB	residential	N	NA	NA	NA	NA	NA	NA	NA
LFG-JF	residential	N	NA	NA	NA	NA	NA	NA	NA
LFG-LHR	residential	Y	17.9	1.6	>1000	0	180.5	NA	0.7
LFG-NG	residential	Y	1.32	0	100	0	NA	0	20.7
LFG-RK	residential	Y	1.07	0	180	0	0	0	20.6
LGR-ETR	residential	Y	2.26	0	0	24.3	NA	0	19.1
FBW	solid waste	Y	1.67	0	4	4	660	3	19.3
FBE	solid waste	Y	36.3	58.3	NA	23.5	1800	NA	NA

Notes: TP - Tempoary point that was subsequently installed as a permenant point in December 1991.
PP - Previously existing permenant point. These points were installed in the summer of 1991.
They were sampled for confirmation of previous results and comparison with results obtained this round.
NP - Newly installed permanent points. These points were installed in December 1991.

ROSE HILL LANDFILL GAS DATA
ROUND 8 HAND HELD INSTRUMENT DATA - MAY, 1992 SAMPLING - SUMMA canister sampling round.

Location	Sample (feet)	Waste Area	Carbon Dioxide (percent)	Methane (percent)	OVA (ppm)	PID(10.6) (ppm)	PID(11.7) (ppm)	LEL (percent)	Oxygen (percent)
BW(04+100)-03	3.0	bulky	23	57	NA	0	NA	NA	7.4
BW(04+100)-06	6.0	bulky	28	45	NA	0	NA	NA	2.0
BW(05+500)-03	3.0	bulky	32	51	NA	0	0	NA	4.0
BW(05+500)-06	6.0	bulky	32	49	NA	0	0	NA	4.4
BW(05+500)-9.5	9.5	bulky	NA	NA	NA	NA	NA	NA	NA
BW(05+500)-12	2.0	bulky	NA	NA	NA	NA	NA	NA	NA
SS(08+000)-03	3.0	sewage sludge	0	0	120	0	NA	0	20.8
SS(08+000)-06	6.0	sewage sludge	0	0	100	0	0	0	20.7
SS(08+000)-09	9.0	sewage sludge	0	0	NA	0	0	1	20.7
SS(08+000)-12	12.0	sewage sludge	0	0	NA	0	0	8	20.8
SW(03+300)-03	3.0	solid	NA	NA	NA	NA	NA	NA	NA
SW(03+300)-06	6.0	solid	30	44	NA	0	NA	NA	0.6
SW(11+500)-03	3.0	solid	34	50	NA	27	NA	NA	3.9
SW(11+500)-05	5.0	solid	23	22	NA	48	NA	NA	6.8
SW(11+500)-06	6.0	solid	35	54	NA	28	NA	NA	3.0
SW(13+300)-09	9.0	solid	31	61	NA	26	NA	NA	0.5
SW(13+300)-12	12.0	solid	38	59	NA	35	NA	NA	0.7

Notes: NA - Not measured.

C-2 FIELD GC SAMPLING DATA

ROSEHILL REGIONAL LANDFILL
ROUND 1 LANDFILL GAS - FIELD GC ANALYSIS

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
BULKY WASTE AREA SAMPLING POINTS														
BW(00_000)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
BW(00_100)	ND	ND	ND	2	ND	NA	NA	3	3	ND	NA	NA	NA	65
BW(00_200)	ND	ND	ND	3	ND	3	ND	3	2	ND	NA	NA	NA	43
BW(01_000)	ND	26	ND	125	ND	ND	20	22	12	NA	NA	NA	NA	481
BW(01_300)	ND	12	ND	180	ND	137	NA	63	26	ND	ND	ND	ND	1850
BW(01_-25)	ND	ND	ND	2	ND	2	ND	3	3	NA	NA	NA	NA	32
BW(02_100)-3'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
BW(02_100)-4.5	ND	ND	ND	46	ND	NA	24	31	82	NA	12	10	9	750
BW(02_100)-6'	ND	NA	NA	36	ND	ND	NA	20	183	NA	NA	NA	NA	591
BW(02_300)	NA	NA	NA	91	ND	ND	NA	NA	127	NA	NA	NA	NA	832
BW(02_400)	ND	NA	NA	3	ND	ND	ND	ND	2	ND	NA	NA	NA	27
BW(03_000)	ND	ND	ND	ND	ND	1	ND	1	5	NA	NA	NA	NA	15
BW(03_200)	ND	ND	NA	110	ND	ND	43	43	77	NA	15	16	11	952
BW(03_400)	ND	NA	NA	28	ND	ND	NA	33	107	NA	NA	NA	NA	481
BW(03_500)	ND	ND	ND	24	ND	ND	NA	ND	5	NA	NA	NA	NA	293
BW(04_100)	ND	ND	ND	30	ND	ND	13	8	829	NA	15	12	ND	1653
BW(04_100)-3'	ND	ND	ND	NA	ND	ND	ND	3	TRACE	ND	NA	NA	NA	28
BW(04_300)	NA	ND	ND	245	ND	NA	NA	94	83	NA	14	16	5	1401
BW(04_500)	ND	36	ND	126	ND	NA	26	56	53	NA	26	18	ND	1923
BW(04_600)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
BW(05_000)	ND	1	ND	10	ND	NA	ND	6	4	NA	NA	NA	NA	79
BW(05_200)	ND	ND	ND	TRACE	ND	ND	ND	2	119	NA	20	54	27	232
BW(05_400)	ND	34	ND	79	ND	NA	60	24	4791	NA	19	16	ND	19590
BW(05_500)	ND	119	ND	3485	ND	NA	121	188	171	NA	19	21	ND	10061
BW(05_600)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14	NA	NA	ND
BW(06_200)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
BW(06_300)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
BW(06_500)	ND	NA	NA	34	ND	NA	ND	26	43	NA	NA	12	ND	641
BW(07_400)	ND	ND	ND	47	ND	NA	ND	NA	35	ND	NA	NA	NA	299
PERMANENT LANDFILL GAS SAMPLING POINTS														
LFGF-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
LFGF-03	NA	ND	NA	1269	NA	ND	ND	22	31	ND	5	5	ND	3119
LFGF-04	ND	ND	ND	5	ND	5	ND	ND	ND	ND	ND	ND	ND	19

ROSEHILL REGIONAL LANDFILL
ROUND 1 LANDFILL GAS - FIELD GC ANALYSIS

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
LFGF-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-08	ND	ND	ND	ND	ND	TRACE	ND	4	ND	ND	ND	ND	ND	7
LFGF-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-2A	ND	NA	ND	6	ND	6	ND	13	ND	ND	ND	ND	ND	128
LFGF-2B	ND	ND	ND	8	ND	5	ND	16	ND	ND	ND	ND	ND	57
LFGR-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
LFGR-05	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	NA	NA	NA	1
LFGR-06	ND	ND	ND	ND	ND	ND	ND	ND	TRACE	ND	NA	NA	NA	TRACE
LFGR-07	ND	ND	ND	15	ND	11	5	6	16	NA	7	6	9	223
LFGR-08	NA	161	ND	5619	ND	ND	ND	25	103	ND	22	21	18	11690
LFGR-09	ND	ND	ND	126	ND	NA	NA	4	8	NA	5	5	TRACE	502
LFGR-10	ND	ND	ND	9	ND	NA	6	8	9	NA	3	4	TRACE	181
LFGR-11	ND	ND	ND	16	ND	16	13	7	22	NA	NA	NA	NA	210
LFGR-12	ND	ND	ND	ND	ND	ND	TRACE	3	3	NA	3	2	ND	82
LFGR-13	ND	ND	ND	ND	ND	3	4	5	6	NA	4	3	ND	175
LFGR-14	ND	ND	ND	ND	ND	ND	1	ND	3	NA	5	4	NA	65
LFGR-15	ND	ND	ND	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	TRACE
LFGR-16	ND	ND	ND	ND	ND	ND	ND	2	2	ND	2	TRACE	ND	42
LFGR-17	ND	ND	ND	ND	ND	ND	ND	3	4	ND	4	1	ND	57
LFGR-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
LFGT-01	ND	ND	ND	ND	ND	ND	ND	2	3	NA	6	2	ND	64
LFGT-02	ND	ND	ND	ND	ND	ND	2	5	8	NA	13	8	NA	217
LFGT-03	ND	ND	ND	ND	ND	ND	ND	4	18	NA	16	8	TRACE	182
LFGT-04	ND	ND	ND	ND	ND	1	ND	7	6	NA	7	4	NA	194
LFGT-05	ND	ND	ND	ND	ND	ND	ND	3	3	ND	5	3	ND	89
SOLID WASTE AREA SAMPLING POINTS														
SW(01_100)	ND	ND	ND	ND	ND	NA	2	3	7	NA	42	29	TRACE	294
SW(01_300)	ND	ND	ND	ND	ND	NA	ND	TRACE	12	ND	10	8	10	60
SW(01_500)	ND	ND	ND	1	ND	5	ND	8	29	ND	44	6	TRACE	229

ROSEHILL REGIONAL LANDFILL
ROUND 1 LANDFILL GAS - FIELD GC ANALYSIS

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
SW(02_100)	ND	ND	ND	ND	ND	2	4	5	8	ND	37	18	NA	380
SW(02_200)	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND
SW(02_500)	ND	ND	ND	6	ND	11	6	8	10	NA	15	8	TRACE	353
SW(03_000)	ND	ND	ND	51	ND	NA	8	36	89	NA	90	98	59	970
SW(03_100)	ND	ND	ND	ND	ND	NA	6	8	9	NA	30	12	TRACE	537
SW(03_300)	ND	ND	ND	16	ND	NA	5	4	32	NA	NA	NA	NA	158
SW(03_500)	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	2	1	ND	12
SW(04_000)	ND	ND	ND	ND	ND	NA	TRACE	ND	2	ND	NA	NA	NA	32
SW(04_200)	ND	ND	ND	11	ND	NA	NA	15	134	NA	NA	NA	NA	238
SW(04_300)	ND	ND	ND	ND	ND	6	ND	4	11	NA	3	TRACE	ND	203
SW(04_400)	ND	ND	ND	47	ND	NA	NA	24	108	NA	NA	NA	NA	371
SW(04_500)	ND	ND	ND	18	ND	19	5	13	102	NA	NA	NA	NA	435
SW(05_000)	56	NA	NA	496	ND	53	28	11	165	NA	42	32	TRACE	1908
SW(05_100)	ND	ND	ND	TRACE	ND	ND	ND	1	4	NA	NA	NA	NA	6
SW(05_300)	ND	13	ND	160	ND	ND	ND	25	41	NA	NA	NA	NA	429
SW(05_500)	ND	ND	ND	60	ND	ND	NA	46	106	NA	NA	NA	NA	302
SW(05_600)	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	ND
SW(05_-40)	ND	ND	ND	ND	ND	ND	TRACE	TRACE	TRACE	ND	TRACE	TRACE	ND	30
SW(06_000)	ND	ND	ND	ND	ND	NA	4	6	79	NA	NA	NA	NA	252
SW(06_100)	ND	ND	ND	9	ND	14	NA	20	141	NA	47	123	68	275
SW(06_200)	ND	ND	ND	18	ND	ND	ND	11	18	NA	NA	NA	NA	102
SW(06_400)	ND	ND	ND	70	ND	ND	NA	25	71	NA	NA	NA	NA	221
SW(06_600)	ND	ND	ND	4	ND	ND	NA	5	5	NA	NA	NA	NA	34
SW(07_000)	ND	ND	ND	ND	ND	4	3	4	16	NA	NA	NA	NA	125
SW(07_100)	ND	ND	ND	13	ND	NA	NA	8	ND	NA	NA	NA	NA	72
SW(07_300)	ND	ND	ND	15	ND	ND	NA	14	20	NA	NA	NA	NA	92
SW(07_500)	ND	ND	ND	10	ND	ND	NA	10	12	NA	NA	NA	NA	74
SW(07_600)	ND	ND	ND	8	ND	ND	NA	11	50	NA	NA	NA	NA	81
SW(08_000)	ND	ND	ND	ND	ND	NA	3	3	4	NA	NA	NA	NA	85
SW(08_100)	ND	ND	ND	11	ND	ND	ND	31	88	NA	27	31	NA	267
SW(08_200)	ND	ND	ND	118	ND	ND	ND	34	114	NA	NA	NA	NA	296
SW(08_400)	ND	ND	ND	18	ND	ND	NA	12	16	NA	NA	NA	NA	74
SW(08_600)	ND	ND	ND	10	ND	ND	NA	13	16	NA	NA	NA	NA	79
SW(09_000)	ND	ND	ND	ND	ND	ND	3	4	2	NA	11	9	6	178
SW(09_100)	ND	ND	ND	27	ND	ND	NA	32	318	NA	NA	NA	NA	276

ROSEHILL REGIONAL LANDFILL
ROUND 1 LANDFILL GAS - FIELD GC ANALYSIS

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
SW(09_200)	ND	ND	ND	11	ND	ND	NA	16	14	NA	NA	NA	NA	101
SW(09_300)	ND	ND	ND	9	ND	ND	ND	10	4	NA	NA	NA	NA	75
SW(09_400)	ND	ND	ND	17	ND	ND	NA	8	9	NA	NA	NA	NA	78
SW(09_500)	ND	ND	NA	21	ND	ND	NA	16	NA	NA	37	22	NA	217
SW(09_600)	ND	ND	ND	16	ND	ND	NA	16	NA	NA	NA	NA	NA	109
SW(10_000)	ND	ND	ND	5	ND	7	ND	7	TRACE	NA	NA	NA	NA	66
SW(10_100)	ND	ND	ND	TRACE	ND	ND	ND	TRACE	ND	NA	NA	NA	NA	5
SW(10_200)	ND	ND	ND	8	ND	ND	8	8	34	NA	NA	NA	NA	87
SW(10_300)	ND	ND	ND	16	ND	ND	NA	18	5	NA	NA	NA	NA	130
SW(10_400)	ND	ND	ND	26	ND	ND	NA	22	263	NA	NA	NA	NA	200
SW(10_500)	ND	ND	ND	19	ND	ND	NA	16	NA	NA	NA	NA	NA	132
SW(10_600)	ND	ND	ND	35	ND	ND	NA	16	NA	NA	NA	NA	NA	165
SW(10_700)	ND	ND	ND	9	ND	12	7	10	17	NA	48	29	28	480
SW(11_100)	ND	ND	ND	13	ND	11	ND	10	15	NA	NA	NA	NA	113
SW(11_200)	ND	ND	ND	14	ND	12	10	11	4	NA	NA	NA	NA	130
SW(11_300)	ND	ND	ND	14	ND	29	ND	44	15	NA	NA	NA	NA	275
SW(11_400)	ND	ND	ND	7	ND	8	8	11	17	NA	NA	NA	NA	108
SW(11_500)	ND	164	ND	45912	ND	NA	TRACE	461	39	NA	NA	NA	NA	89292
SW(11_600)	NA	58	ND	1754	ND	NA	TRACE	74	21	NA	NA	NA	NA	3699
SW(11_700)	ND	ND	ND	10	ND	12	7	10	18	NA	50	30	30	515
SW(12_100)	ND	ND	ND	31	ND	12	ND	17	67	ND	TRACE	TRACE	TRACE	99
SW(12_200)	ND	ND	ND	16	ND	16	ND	22	23	NA	NA	NA	NA	195
SW(12_300)	ND	ND	ND	2	ND	4	ND	9	4	NA	NA	NA	NA	54
SW(12_400)	ND	ND	ND	7	ND	ND	7	10	10	NA	NA	NA	NA	168
SW(12_500)	2	32	26	58	308	ND	44	69	60	ND	69	14	ND	1647
SW(12_600)	ND	ND	ND	62	ND	ND	ND	62	45	NA	NA	NA	NA	1373
SW(12_700)	ND	ND	ND	16	ND	NA	10	24	9	NA	33	22	NA	880
SW(13_100)	ND	ND	ND	ND	ND	ND	ND	TRACE	ND	ND	TRACE	TRACE	TRACE	15
SW(13_200)	ND	113	93	9472	ND	ND	51	52	170	NA	NA	NA	NA	30306
SW(13_300)	ND	ND	ND	14	ND	ND	ND	28	ND	NA	NA	NA	NA	170
SW(13_400)	ND	ND	ND	3	15	15	ND	18	ND	NA	47	54	ND	469
SW(13_500)	ND	ND	ND	20	ND	ND	ND	19	ND	NA	NA	NA	NA	370
SW(13_600)	ND	ND	ND	24	ND	ND	ND	18	ND	NA	NA	NA	NA	423
SW(13_700)	ND	ND	ND	ND	ND	2	2	4	14	NA	13	7	NA	114
SW(14_200)	ND	ND	ND	4	ND	ND	8	6	ND	NA	NA	NA	NA	142

ROSEHILL REGIONAL LANDFILL
ROUND 2 LANDFILL GAS - FIELD GC ANALYSIS - September 1991

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
LFGF-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-02A	ND	ND	ND	63	ND	28	ND	86	ND	ND	ND	ND	ND	410
LFGF-02B	ND	ND	ND	60	ND	173	ND	ND	ND	NA	NA	NA	NA	324
LFGF-03	ND	61	ND	1667	ND	ND	NA	ND	54	NA	10	14	ND	5501
LFGF-04	ND	ND	ND	166	ND	ND	ND	7	ND	ND	NA	NA	NA	496
LFGF-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
LFGF-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TRACE
LFGF-08	ND	ND	ND	ND	ND	11	ND	45	ND	ND	ND	ND	ND	114
LFGF-09	ND	ND	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	ND	TRACE
LFGR-02	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	10
LFGR-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-07	ND	12	ND	10	ND	ND	5	5	71	ND	3	3	ND	360
LFGR-08	ND	72	ND	1267	ND	NA	ND	ND	59	NA	ND	ND	ND	5338
LFGR-09	ND	ND	ND	11	ND	ND	5	5	4	ND	2	2	ND	156
LFGR-10	ND	ND	ND	9	ND	ND	7	7	30	NA	3	3	ND	320
LFGR-11	ND	ND	ND	3	ND	ND	8	7	12	NA	5	6	ND	281
LFGR-13	ND	ND	ND	ND	ND	3	2	4	4	NA	NA	ND	ND	191
LFGR-14	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	5
LFGR-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
LFGR-16	ND	ND	ND	ND	ND	TRACE	ND	4	4	ND	ND	ND	ND	113
LFGR-17	ND	ND	ND	ND	ND	TRACE	ND	4	5	ND	ND	ND	ND	93
LFGR-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-01	ND	ND	ND	1	ND	ND	ND	1	3	ND	7	4	ND	90
LFGT-02	ND	ND	ND	ND	ND	ND	2	3	5	NA	13	11	TRACE	212
LFGT-03	ND	ND	ND	ND	ND	ND	1	3	13	NA	NA	NA	NA	81
LFGT-04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LFGT-05	ND	ND	ND	TRACE	ND	ND	3	5	4	NA	6	ND	ND	216

Notes:
ND - Not detected above the minimum detection limit for that compound.
NA - Not analized for, or unable to make a determination due to matrix interferances.
TRACE - Detected below the minumum quantitation limit.

ROSEHILL REGIONAL LANDFILL
ROUND 3 LANDFILL GAS - FIELD GC ANALYSIS - December 1991

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
LFGF-03	NA	NA	ND	1362	NA	NA	NA	ND	49	NA	4	6	ND	4285
LFGF-08	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	16
LFGF-10	ND	ND	ND	4	ND	ND	4	ND	7	ND	2	1	ND	225
LFGR-05-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-08	ND	NA	ND	1439	ND	ND	ND	ND	34	ND	ND	ND	ND	7232
LFGR-20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-AD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-ETR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-GT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-JF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-LHR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-NG	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-RK	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-F1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-F2	NA	NA	ND	ND	ND	16	ND	5	TRACE	ND	ND	ND	ND	149
TP-F3	NA	NA	ND	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	2
TP-F5	ND	ND	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	37
TP-F6	ND	ND	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	ND	1
TP-R01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-R02-3'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-R02-6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-R03	ND	ND	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	126
TP-R07-3'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-R07-6'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-R09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-R10	ND	ND	ND	ND	ND	7	ND	TRACE	TRACE	ND	ND	ND	ND	58
TP-R12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-R13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6
TP-R14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-T2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ROSEHILL REGIONAL LANDFILL

ROUND 3 LANDFILL GAS - FIELD GC ANALYSIS - December 1991

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
TP-T3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TP-T4	ND	ND	ND	ND	ND	ND	ND	2	1	ND	4	3	ND	153
TP-T5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

ND - Not detected above the minimum detection limit for that compound.

NA - Not analized for, or unable to make a determination due to matrix interferances.

TRACE - Detected below the minumum quantitation limit.

ROSEHILL REGIONAL LANDFILL
ROUND 4 LANDFILL GAS - FIELD GC ANALYSIS - Jaunuary 1992

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
LFGF-02A	ND	ND	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	ND	4
LFGF-02B	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND	ND	ND	5
LFGF-03	ND	ND	ND	3733	ND	ND	ND	ND	17	ND	ND	ND	ND	1289
LFGF-08	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND	ND	ND	5
LFGR-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-05-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-08	ND	421	ND	10623	ND	ND	ND	ND	53	NA	TRACE	TRACE	ND	20468
LFGR-11	ND	ND	ND	ND	ND	11	ND	TRACE	ND	ND	ND	ND	ND	65
LFGR-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-17	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	4
LFGR-21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14
LFGT-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-AD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-ETR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-GT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-LHR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-RK	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
ND - Not detected above the minimum detection limit for that compound.
NA - Not analized for, or unable to make a determination due to matrix interferances.
TRACE - Detected below the minumum quantitation limit.

ROSEHILL REGIONAL LANDFILL
ROUND 5 LANDFILL GAS - FIELD GC ANALYSIS - February 1992

POINT	1,1-DCE	t-1,2 DCE	c-1,2 DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m-Xylene	o-Xylene	Total VOC
LFGF-03	ND	ND	1190	ND	5	69	ND	ND	ND	ND	30727
LFGF-08	ND	ND	ND	ND	3	ND	ND	ND	ND	ND	27
LFGF-09-3	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	ND	TRACE
LFGR-05-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-08	ND	ND	6044	198	55	102	ND	16	23	ND	70042
LFGR-11	ND	ND	16	3	2	7	NA	TRACE	TRACE	ND	835
LFGR-22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14
LFGR-23	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	7
LFGT-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13
LFGT-04	ND	ND	ND	3	5	6	NA	4	2	ND	393
LFGT-06	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	2
LFGT-07	ND	ND	ND	ND	ND	TRACE	ND	ND	ND	ND	52
LFG-AD	ND	ND	TRACE	ND	ND	ND	ND	ND	ND	ND	27
LFG-GT	ND	ND	TRACE	ND	ND	TRACE	ND	ND	ND	ND	2
LFG-LHR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	19
LFG-NG	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
ND - Not detected above the minimum detection limit for that compound.
NA - Not analized for, or unable to make a determination due to matrix interferances.
TRACE - Detected below the minumum quantitation limit.

ROSEHILL REGIONAL LANDFILL
ROUND 6 LANDFILL GAS - FIELD GC ANALYSIS - April 1992

POINT	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
FLUXEAST	ND	301	ND	2750	ND	ND	ND	TRACE	114	ND	ND	TRACE	TRACE	11167
FLUXWEST	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-03	ND	ND	ND	880	ND	ND	ND	20	32	ND	7	ND	ND	9175
LFGF-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-11	ND	ND	ND	17	ND	ND	TRACE	6	9	ND	ND	ND	ND	137
LFGR-14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
LFGR-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	27
LFGR-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-08	ND	ND	ND	4535	ND	ND	ND	34	78	ND	23	30	ND	4534
LFGT-03	ND	ND	ND	ND	ND	ND	TRACE	ND	7	ND	11	7	ND	44
LFGT-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-AD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-GT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-LHR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15

Notes:
ND - Not detected above the minimum detection limit for that compound.
NA - Not analized for, or unable to make a determination due to matrix interferances.
TRACE - Detected below the minumum quantitation limit.

ROSEHILL REGIONAL LANDFILL

ROUND 7 LANDFILL GAS - FIELD GC ANALYSIS - April 1992 - 11.7 eV lamp

POINT	Vinyl Chloride	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chlorofor	1,1,1-TCA	Benzen	TCE	Toluene	PCE	Ethylbenz	m-Xylene	o-Xylene	Total VOC
FLUXEAST	484	ND	409	ND	6306	ND	ND	ND	ND	59	ND	ND	ND	ND	20611
LFGF-03	5331	ND	ND	ND	768	ND	ND	ND	TRACE	64	ND	ND	ND	ND	4994
LFGF-08	NA	ND	ND	ND	ND	ND	ND	ND	3	ND	NA	NA	NA	NA	6
LFGR-08	5582	ND	ND	ND	4046	ND	ND	ND	ND	232	ND	TRACE	78	ND	13106
LFGR-11	NA	ND	ND	ND	16	ND	ND	TRACE	13	12	NA	ND	ND	ND	445
LFGR-14	ND	ND	ND	ND	ND	ND	7	ND	ND	ND	ND	ND	ND	ND	73
LFGT-03	ND	ND	ND	ND	ND	ND	ND	ND	5	113	ND	10	5	TRACE	125
LFGT-07	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-AD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
LFG-ETR	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-GT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
LFG-LHR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
LFG-NG	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-RK	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND

Notes: ND - Not detected above the minimum detection limit for that compound.
NA - Not analized for, or unable to make a determination due to matrix interferances.
TRACE - Detected below the minumum quantitation limit.

ROSEHILL REGIONAL LANDFILL
ROUND 7 LANDFILL GAS - FIELD GC ANALYSIS - April 1992 - 10.2 eV lamp

POINT	Vinyl Chloride	t-1,2 DCE	c-1,2 DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m-Xylene	o-Xylene	Total VOC
FLUXEAST	1728	ND	21926	ND	ND	207	ND	ND	ND	ND	323066
FLUXWEST	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
LFGF-01	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-02A	NA	ND	ND	ND	TRACE	ND	NA	NA	NA	NA	7
LFGF-03	3533	ND	1004	ND	30	89	NA	TRACE	ND	ND	30546
LFGF-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGF-08	ND	ND	ND	ND	4	ND	ND	ND	ND	ND	7
LFGF-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-02	ND	ND	ND	ND	1	7	ND	17	12	ND	292
LFGR-03	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-05	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
LFGR-06	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-07	495	ND	36	9	11	34	ND	24	ND	ND	3410
LFGR-08	3749	ND	5034	ND	ND	241	ND	ND	ND	ND	66945
LFGR-09	158	ND	137	ND	7	11	NA	ND	ND	ND	2373
LFGR-10	243	ND	ND	11	11	23	ND	ND	ND	ND	1787
LFGR-11	ND	ND	ND	9	15	49	NA	TRACE	TRACE	ND	2148
LFGR-12	ND	ND	ND	ND	2	9	NA	17	ND	ND	402
LFGR-13	ND	ND	ND	3	4	11	NA	48	71	ND	1049
LFGR-14	ND	ND	TRACE	ND	ND	5	ND	ND	ND	ND	229
LFGR-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-16	ND	ND	ND	ND	TRACE	TRACE	ND	ND	ND	ND	16
LFGR-18	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-19	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGR-20	ND	ND	3	ND	2	1	ND	ND	ND	ND	127
LFGR-21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-01	NA	NA	ND	ND	1	4	NA	10	ND	11	208
LFGT-02	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
LFGT-03	ND	ND	ND	TRACE	1	21	NA	23	15	ND	322
LFGT-05	ND	ND	ND	TRACE	TRACE	3	ND	ND	ND	ND	150
LFGT-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFGT-07	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	7
LFG-AD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	34

ROSEHILL REGIONAL LANDFILL

ROUND 7 LANDFILL GAS - FIELD GC ANALYSIS - April 1992 - 10.2 eV lamp

POINT	Vinyl Chloride	t-1,2 DCE	c-1,2 DCE	Benzene	TCE	Toluene	PCE	Ethylbenzene	m-Xylene	o-Xylene	Total VOC
LFG-ETR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-GT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4
LFG-LHR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	18
LFG-NG	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LFG-RK	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

ND - Not detected above the minimum detection limit for that compound.

NA - Not analized for, or unable to make a determination due to matrix interferances.

TRACE - Detected below the minumum quantitation limit.

ROSEHILL REGIONAL LANDFILL

ROUND 8 LANDFILL GAS - FIELD GC ANALYSIS - May 1992 - SUMMA Canister Sampling round

POINT	Vinyl Chloride	Methylene Chloride	t-1,2 DCE	1,1-DCA	c-1,2 DCE	Chloroform	1,1,1-TCA	Benzene	TCE	Toluene	PCE	Ethylbenzen	m-Xylene	o-Xylene	Total VOC
BW(04+100)-03	ND	ND	ND	ND	ND	ND	ND	6	ND	16	NA	ND	ND	ND	87
BW(04+100)-06	ND	ND	ND	ND	4	ND	ND	6	ND	37	NA	ND	ND	ND	159
BW(05+500)-03	ND	ND	ND	ND	86	ND	ND	ND	60	53	NA	8	5	ND	684
BW(05+500)-06	ND	ND	ND	ND	91	ND	ND	ND	51	59	ND	6	6	ND	850
BW(05+500)-12	ND	ND	ND	ND	101	ND	ND	ND	20	31	ND	13	7	ND	346
BW(05+500)-9.5	ND	ND	ND	ND	75	ND	ND	ND	36	40	NA	ND	ND	ND	498
SS(08+000)-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS(08+000)-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS(08+000)-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SS(08+000)-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SW(03+300)-03	ND	ND	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	36
SW(03+300)-06	ND	ND	ND	ND	7	ND	ND	TRACE	12	38	NA	42	64	ND	576
SW(11+500)-03	ND	ND	ND	ND	41227	ND	ND	ND	93	755	ND	ND	ND	ND	97424
SW(11+500)-05	83	162	142	ND	3824	ND	ND	ND	196	141	ND	18	29	ND	10844
SW(11+500)-06	ND	ND	ND	ND	6833	ND	ND	ND	65	59	ND	ND	ND	ND	16951
SW(13+300)-09	46	ND	396	ND	11041	ND	ND	ND	ND	121	ND	ND	ND	ND	39695
SW(13+300)-12	85	ND	TRACE	ND	12204	ND	ND	ND	ND	109	ND	ND	ND	ND	29883

Notes:

ND - Not detected above the minimum detection limit for that compound.

NA - Not analized for, or unable to make a determination due to matrix interferances.

TRACE - Detected below the minumum quantitation limit.

C-3 REDUCED SULFUR SAMPLING DATA

ROSE HILL REGIONAL LANDFILL
REDUCED SULFUR SAMPLING

PARAMETER	SAMPLE DATA						
Sample ID	BW(04+100)-6	SS(08+000)-12	BW(05+500)-1	SW(13+300)-12	SW(11+500)-5	SW(03+300)-6	SW(03+300)-6-DUP
Sampling Information							
Sampling Date	5/8/92	5/11/92	5/11/92	5/12/92	5/12/92	5/13/92	5/13/92
Start Time	14:40	10:34	17:15	10:43	15:37	09:59	12:12
End Time	15:34	13:20	18:01	12:56	18:08	11:59	14:18
Total Flow Time (min)	56	160	36	133	150	120	123
Average Flow Rate (l/min)	2.80	2.55	3.60	2.77	3.00	3.36	3.36
Average Temperature (degrees C)	10.00	16.51	18.33	11.74	17.28	17.78	23.22
Average Pressure (atmospheres)	0.545	0.520	0.465	0.630	0.551	0.548	0.549
Total Volume Sampled (L)	88.1	210.3	58.9	237.5	245.6	217.9	217.5
Vapor Pr. of Water at t (mm of Hg)	9.209	14.077	15.772	10.177	14.809	15.284	20.07
Analytical Information							
Date of Analysis	5/8/92	5/11/92	5/12/92	5/12/92	5/12/92	05/13/92	5/13/92
First Impinger							
Iodine Solution, added I1 (ml)	20	25		15	10	15	15
Normality of I solution, N1	0.049	0.00976		0.0105	0.0105	0.01	0.01
Sodium Thio. used for titration (ml)	19.3	25.1		6.7	8.7	8.3	7.4
Normality of Sodium Thiosulfate	0.05	0.01		0.01	0.01	0.01	0.01
Hydrogen Sulfide Detected (mg)	0.65604	0.06816	0	1.42284	0.18744	1.1076	1.26096
Second Impinger							
Iodine Solution, added I1 (ml)	20	5	25	10	10	10	10
Normality of I solution, N1	0.049	0.00976	0.0105	0.0105	0.0105	0.01	0.01
Sodium Thio. used for titration (ml)	20.05	5	24.6	9.4	9.4	8.9	9.2
Normality of Sodium Thiosulfate	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Hydrogen Sulfide Detected (mg)	0.01704	0.166992	0.16188	0.06816	0.06816	0.15336	0.10224
Third Impinger							
Iodine Solution, added I1 (ml)	20	25	20	10	10	10	10
Normality of I solution, N1	0.049	0.00976	0.0105	0.0105	0.0105	0.01	0.01
Sodium Thio. used for titration (ml)	20.4	25.2	20.9	9.4	9.4	9.3	9.2
Normality of Sodium Thiosulfate	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Methyl Mercaptan Detected (mg)	-0.9622	-0.024055	-0.38488	-0.14433	-0.14433	-0.19244	-0.072165

ROSE HILL REGIONAL LANDFILL
REDUCED SULFUR SAMPLING

PARAMETER						SAMPLE DATA	
Sample ID	BW(04+100)-6	SS(08+000)-12	BW(05+500)-1	SW(13+300)-12	SW(11+500)-5	SW(03+300)-6	SW(03+300)-6-DUP
Hydrogen Sulfide Blank							
Sodium Thio blank adjust. (subt. ml	0.47	1.1	-0.7	-0.7	-0.7	-0.2	-0.2
Methyl Mercaptan Blank							
Sodium Thio blank adjust. (subt. ml	0	0.7	-1.7	-1.7	-1.7	-1.1	-1.1
Results							
Hydrogen Sulfide (mg/Cubic M)	7.64	1.12	2.75	6.28	1.04	5.79	6.27
Hydrogen Sulfide (ppm)	5.38	0.79	1.93	4.42	0.73	4.07	4.41
Mercaptan as Methyl Mercaptan (mg/cubic M) *	-10.93	-0.11	-6.53	-0.61	-0.59	-0.88	-0.33
Mercaptan as Methyl Mercaptan (ppm)						-0.44	

Note: * - Negative sample results should be interpreted as non-detected (ND).

ROSE HILL REGIONAL LANDFILL
REDUCED SULFUR SAMPLING
Raw Sampling Data

	Time	flow rate (sec/140ml)	Temperature (degrees F)	Vacuum (in Hg)
BW(04+100)-6	14:40	3		
	14:50	3		
	15:00	3	50	13.6
	15:20	3	50	
	15:34	3	50	
Averages		3	50	13.6

	Time	flow rate (sec/140ml)	Temperature (degrees F)	Vacuum (in Hg)
SS(08-000)-12	10:34/10:48		60	14
	10:55	3.3		
	11:10	3.3	61	14.5
	11:30	3.3	61	14.5
	11:50	3.3	61	14
	12:05	3.3	62	14
	12:25	3.3	63	14.5
	12:43	3.3	64	15
	13:05	3.3	70	15
Averages		3.3	61.7	14.4

	Time	flow rate (sec/140ml)	Temperature (degrees F)	Vacuum (in Hg)
BW(05+500)-12	17:15			16
	17:40	3	65	
	17:50	2		
	17:58	2		
Averages		2.3	65	16

	Time	flow rate (sec/140ml)	Temperature (degrees F)	Vacuum (in Hg)
BW(13+300)-12	10:43	3	52	11
	10:59	3.1	52	11
	11:14	3.2	54	11
	11:30	3	54	11
	11:45	3	53	11
	12:02	3	52	11
	12:15	3	52	11
	12:35	3	56	11.5
Averages		3.0	53.1	11.1

ROSE HILL REGIONAL LANDFILL
REDUCED SULFUR SAMPLING
Raw Sampling Data

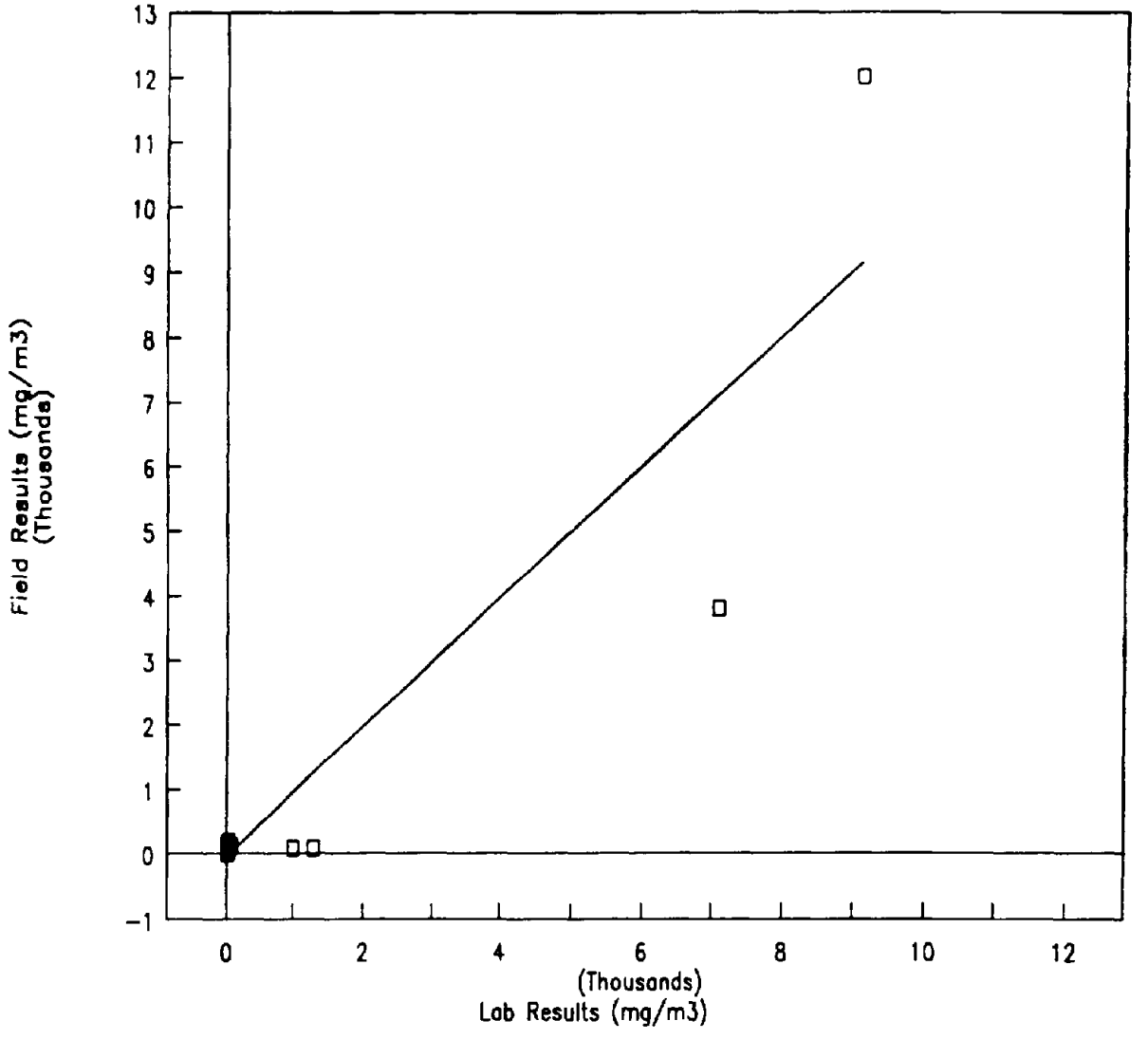
	Time	flow rate (sec/140ml)	Temperature (degrees F)	Vacuum (in Hg)
BW(11+500)-5	15:37	3.1	64	13.5
	15:51	3	62	13.3
	16:13	2.8	63	13.2
	16:34	2.8	64	13.3
	16:56	2.8	64	13.4
	17:10	2.9	64	13.5
	17:30	2.8	66	13.5
	18:00	2.5	61	13.6
	18:07	2.5	60	13.6
Averages		2.8	63.1	13.4

	Time	flow rate (sec/140ml)	Temperature (degrees F)	Vacuum (in Hg)
SW(03+300)-6	09:59	2.5	62	14
	10:12	2.5	60	13.4
	10:30	2.5	60	13.4
	10:45	2.5	60	13.5
	11:05	2.5	60	13.5
	11:30	2.5	70	13.5
	11:45	2.5	70	13.5
	11:59	2.5	70	13.5
Averages		2.5	64	13.5

	Time	flow rate (sec/140ml)	Temperature (degrees F)	Vacuum (in Hg)
BW(03+300)-6-DUP	12:12	2.5	70	13.5
	12:32	2.4	74	13.4
	13:03	2.5	76	13.5
	13:30	2.6	73	13.5
	13:48	2.5	76	13.5
Averages		2.5	73.8	13.48

C-4 DATA AND REGRESSION ANALYSIS

Field GC Results vs. Fixed Lab Results for VOCs in Soil Gas

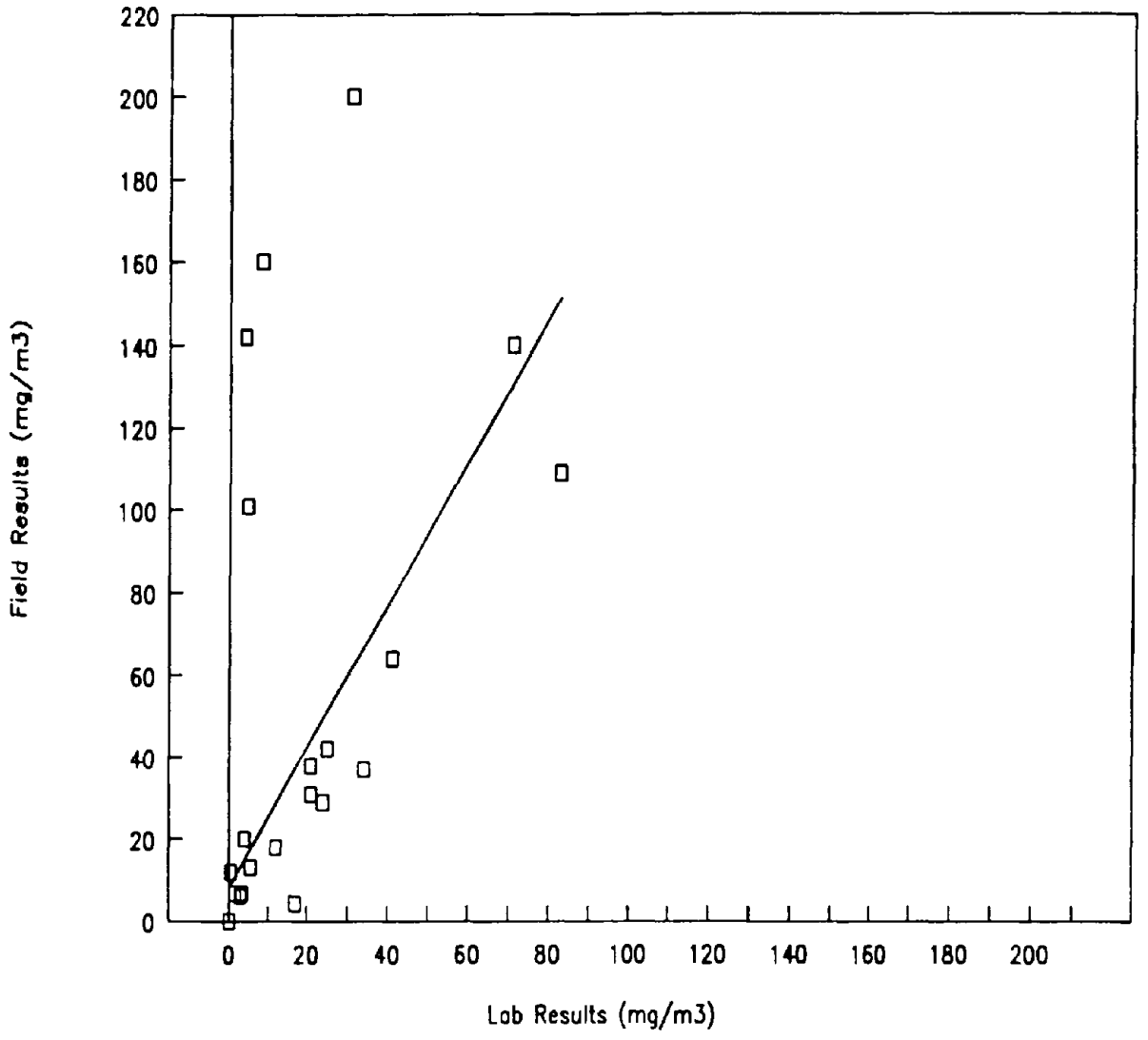


COMPOUND	lab result	Field Result mg/m3
Benzene	2.9	6.1
cis-1,2-Dichloroethene	1.5	6.7
cis-1,2-Dichloroethene	7100	3800
cis-1,2-Dichloroethene	17	4.3
cis-1,2-Dichloroethene	9100	12000
cis-1,2-Dichloroethene	4.8	101
Ethylbenzene	25	42
Ethylbenzene	12	18
Ethylbenzene	5.6	13
m,p-Xylene	24	29
m,p-Xylene	3.3	6.7
m,p-Xylene	41	64
Methylene Chloride	8.3	160
Toluene	83	109
Toluene	21	31
Toluene	71	140
Toluene	21	38
Toluene	34	37
trans-1,2-Dichloroethene	4	142
Trichloroethene	0.45	12
Trichloroethene	3.8	20
Trichloroethene	31	200
Vinyl Chloride	1300	85
Vinyl Chloride	1000	83

38 (0,0) points

Regression Output:		
Constant	-30.8865	
Std Err of Y Est	600.6389	R
R Squared	0.859304	0.926986
No. of Observations	62	
Degrees of Freedom	60	
X Coefficient(s)	1.007830	
Std Err of Coef.	0.052647	

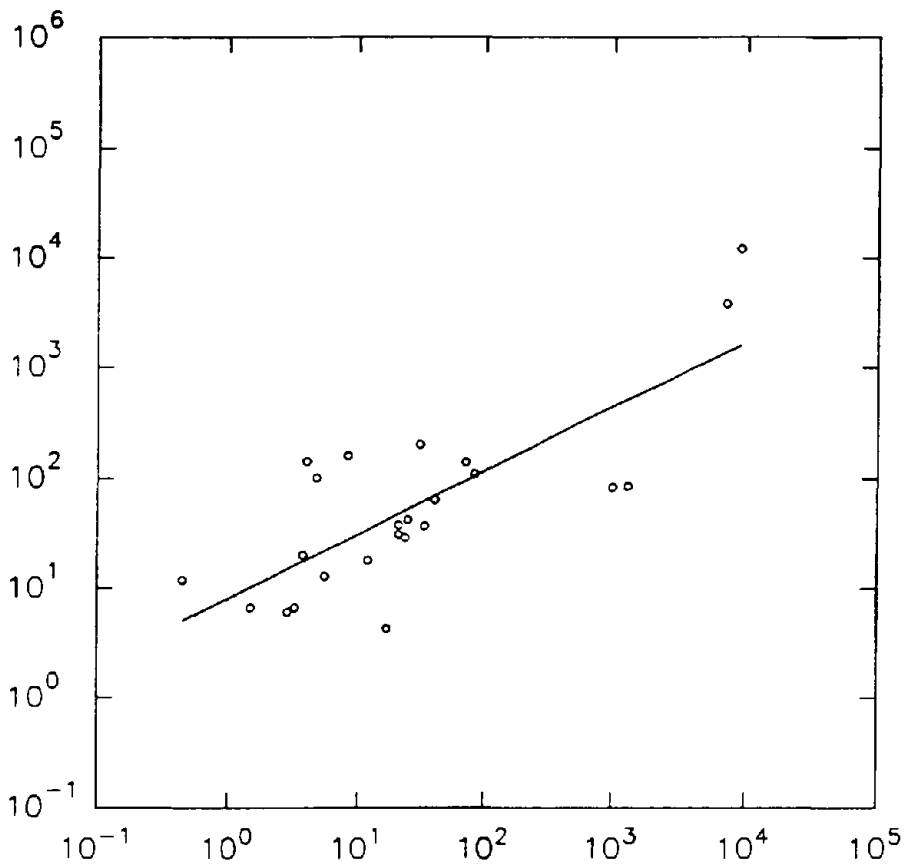
Field GC Results vs. Fixed Lab Results for VOCs in Soil Gas
(Omitting the highest four data points)



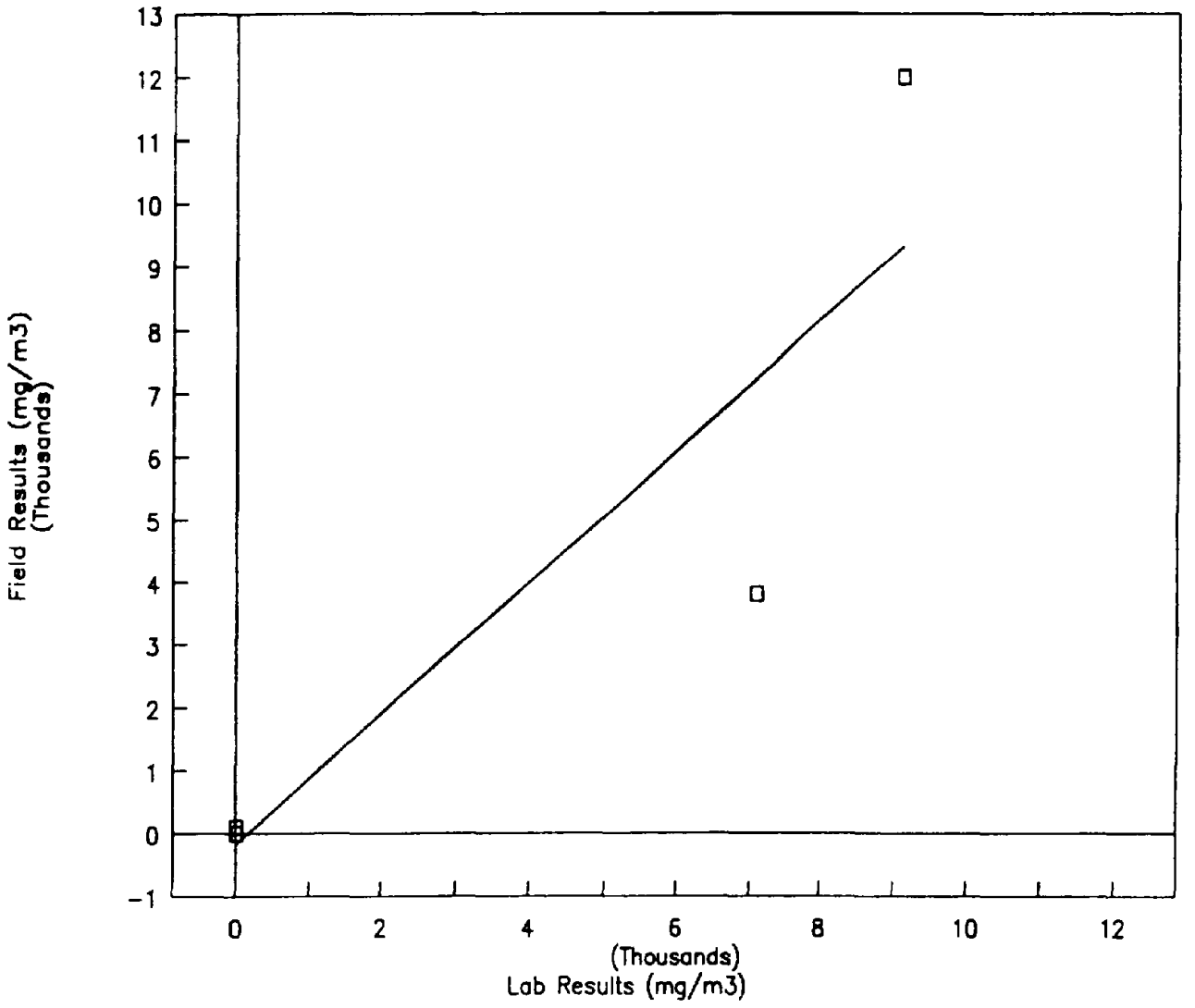
COMPOUND	lab result	Field Result mg/m3
Benzene	2.9	6.1
cis-1,2-Dichloroethene	1.5	6.7
cis-1,2-Dichloroethene	17	4.3
cis-1,2-Dichloroethene	4.8	101
Ethylbenzene	25	42
Ethylbenzene	12	18
Ethylbenzene	5.6	13
m,p-Xylene	24	29
m,p-Xylene	3.3	6.7
m,p-Xylene	41	64
Methylene Chloride	8.3	160
Toluene	83	109
Toluene	21	31
Toluene	71	140
Toluene	21	38
Toluene	34	37
trans-1,2-Dichloroethene	4	142
Trichloroethene	0.45	12
Trichloroethene	3.8	20
Trichloroethene	31	200

38 (0,0) points

Regression Output:		
Constant	7.989057	
Std Err of Y Est	35.09335	R
R Squared	0.400837	0.633117
No. of Observations	58	
Degrees of Freedom	56	
X Coefficient(s)	1.727805	
Std Err of Coef.	0.282285	


10^6
10^5
10^4
10^3
10^2
10^1
10^0
10^{-1}
10^{-1}
10^0
10^1
10^2
10^3
10^4
10^5

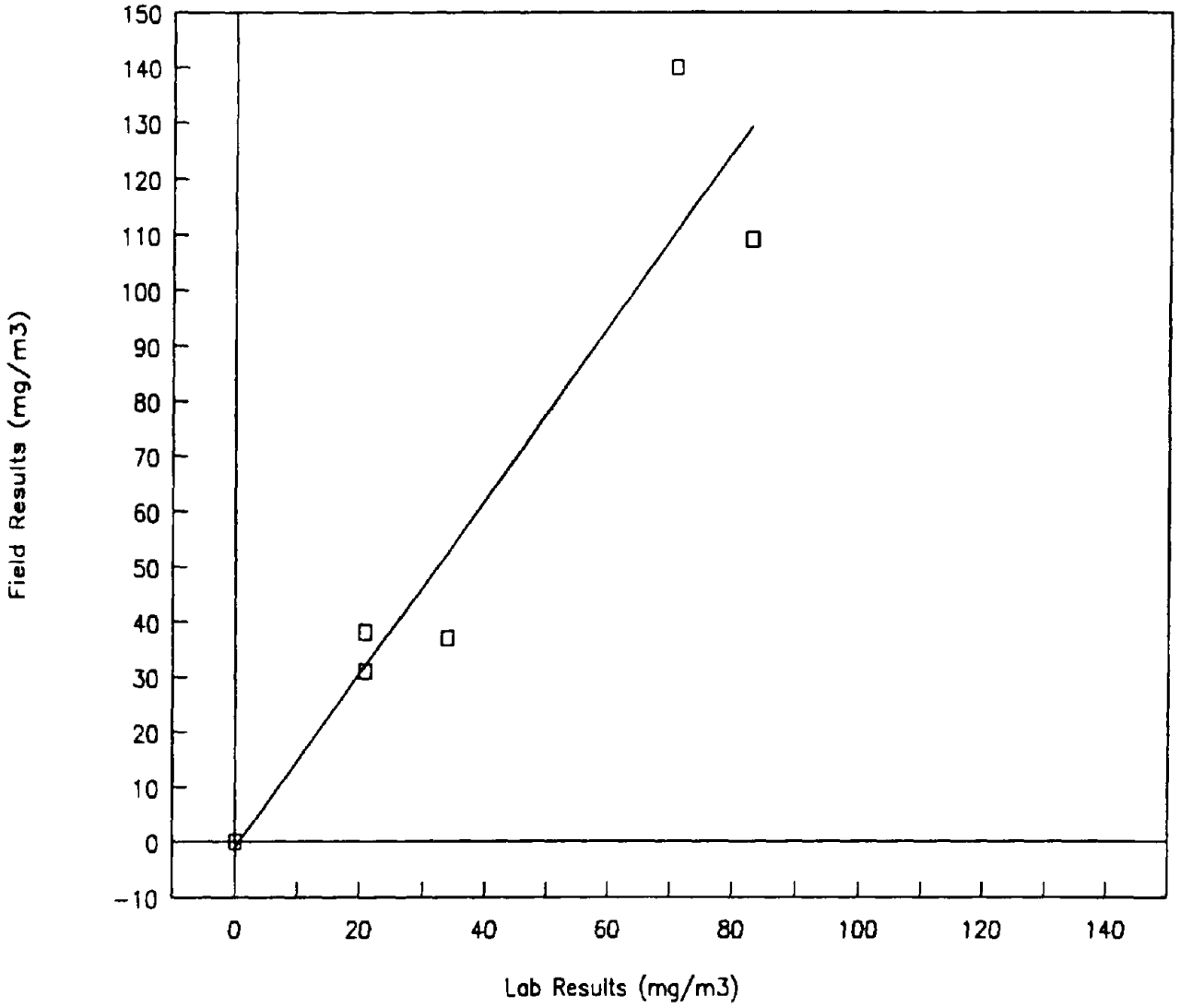
Field GC Results vs. Fixed Lab Results for cis-1,2-Dichloroethene in Soil Gas



COMPOUND	Lab result	Field Result mg/m3
cis-1,2-Dichloroethene	1.5	8.7
cis-1,2-Dichloroethene	4.8	101
cis-1,2-Dichloroethene	17	4.3
cis-1,2-Dichloroethene	7100	3800
cis-1,2-Dichloroethene	9100	12000
one (0,0) point		

Regression Output:		
Constant	-166.931	
Std Err of Y Est	2186.979	R
R Squared	0.835430	0.914018
No. of Observations	6	
Degrees of Freedom	4	
X Coefficient(s)	1.042549	
Std Err of Coef.	0.231359	

Field GC Results vs. Fixed Lab Results
Toluene in Soil Gas

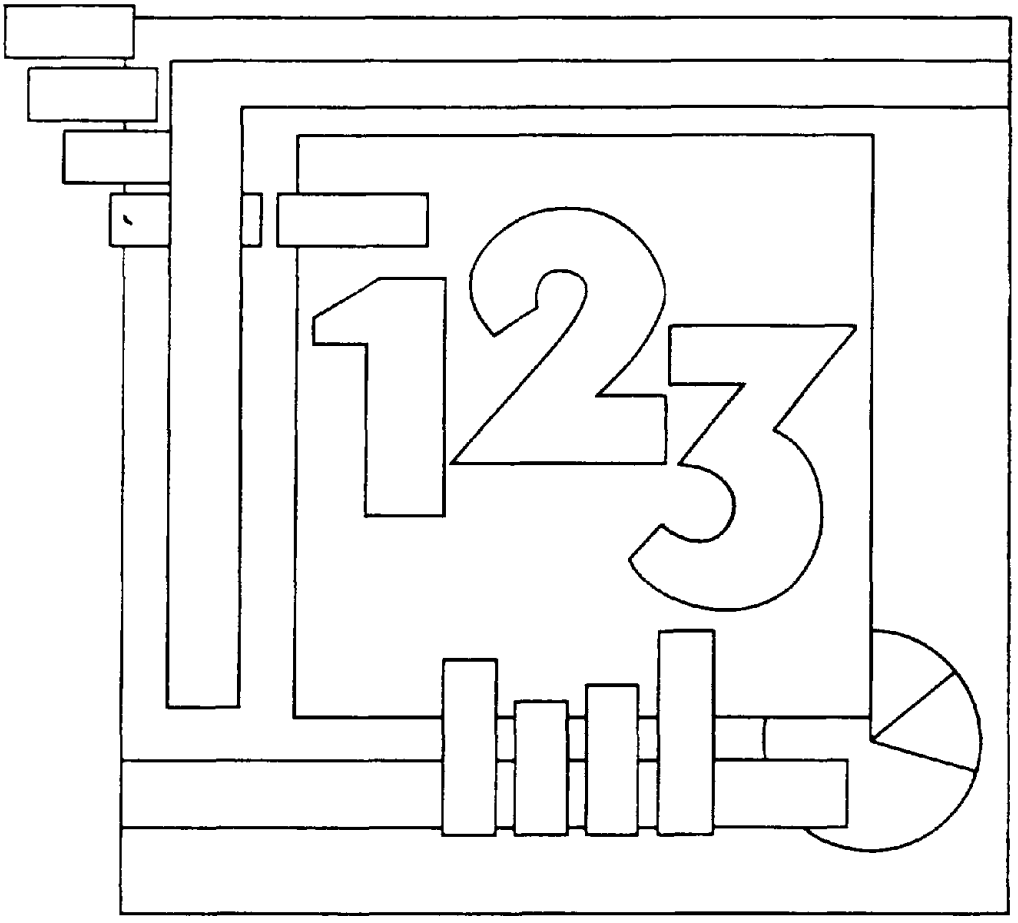


COMPOUND	Lab result	Field Result mg/m3
Toluene	21	38
Toluene	21	31
Toluene	34	37
Toluene	71	140
Toluene	83	109
one (0,0) point		

Regression Output:		
Constant	-1.00232	
Std Err of Y Est	19.74437	R
R Squared	0.890577	0.943704
No. of Observations	6	
Degrees of Freedom	4	
X Coefficient(s)	1.569625	
Std Err of Coef.	0.275095	

Lotus 1-2-3 Release 2.2

Reference



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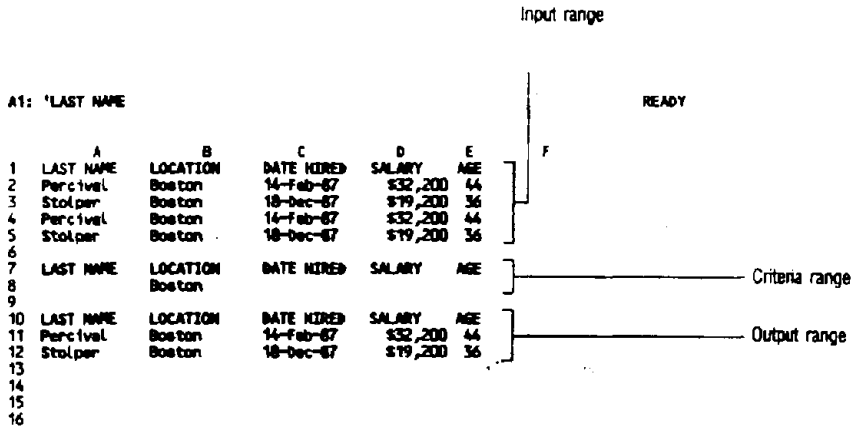

Figure 4-26 /Data Query Unique eliminates duplicate records matching the criteria

Procedure

1. Before you use /Data Query Unique, you must specify an input range, a criteria range, and an output range.

   For more information, see "Required /Data Query Ranges" earlier in this section.

2. Select /Data Query Unique.

   1-2-3 copies to the output range the records in the input range that match your criteria, eliminating any duplicate records in the output range. Like /Data Query Extract, 1-2-3 keeps the records in the same order they were in in the database.

   1-2-3 displays an error message if you specified a multiple row output range and there are more matching records than can fit in the range. Press ESC to return 1-2-3 to READY mode. Use /Data Query Output to specify an output range with more rows, or if you have a lot of empty space below the output range, specify just the row that contains the field names as the output range.

   CAUTION If you specify a single row output range, 1-2-3 erases all data in the columns below the field names to the bottom row of the worksheet. Then 1-2-3 creates an output range that contains as many rows as needed to contain the data. To avoid possible data loss, save the worksheet before using /Data Query Unique. If you make a mistake when extracting records and the undo feature is on, press UNDO (ALT-F4) immediately to restore the worksheet to its original state.

/Data Regression

/Data Regression lets you perform a regression analysis on existing data. A **regression analysis** is a statistical application used for predicting likely future data based on current data.

Use the following commands to perform a data regression:

Command	Task
Go	Calculates a data regression for the selected X range, Y range, and output range.
Intercept	Determines whether 1-2-3 calculates the y-axis intercept automatically (default) or uses zero as the intercept. The y-axis intercept appears in the results as the constant.
Output-Range	Specifies the range in which 1-2-3 places the results of the regression analysis.
Quit	Returns 1-2-3 to READY mode.
Reset	Clears the X range, Y range, and output range; resets the intercept to Compute.
X-Range	Specifies the independent variables.
Y-Range	Specifies the dependent variable.

Use /Data Regression to predict a value for a dependent variable based on the values for one or more independent variables. /Data Regression also indicates the statistical accuracy of these values. Figure 4-27 shows an example of /Data Regression.

You can also use /Data Regression when you have several sets of values and you want to see how and whether one set is dependent on the others, and also to determine the slope and the y-axis intercept of the best-fitting line for a set of data points.

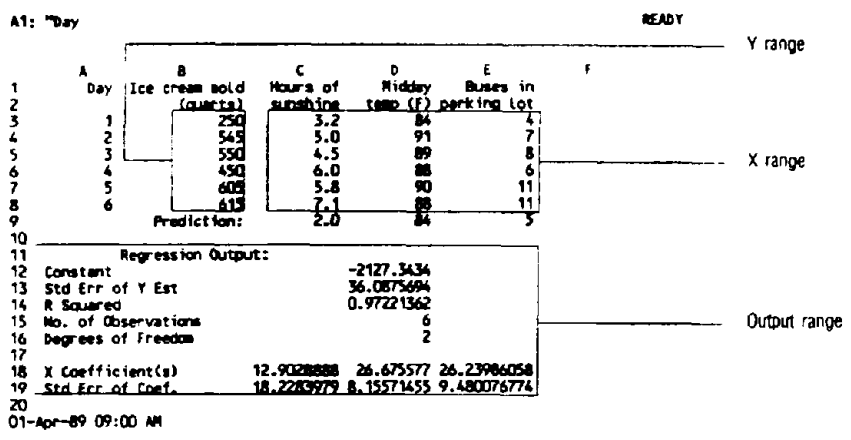

Figure 4-27 /Data Regression

How to Use This Section

- "Terms You Need to Know" defines important terms that are used frequently in this section.

- "Before You Use /Data Regression" explains procedures you must follow before using the Data Regression commands.
- "The /Data Regression Settings Sheet" describes the status screen that appears when you select /Data Regression.
- "Performing Regression Analysis: An Example" provides an illustrated example of performing regression analysis and using regression results. If you are not familiar with data regression, follow these examples before you try using /Data Regression.
- "How to Use /Data Regression" lists the steps you need to follow to complete the command.
- The remaining subsections describe each of the Data Regression commands in alphabetical order.

Terms You Need to Know

- An **independent variable** is a value used to determine a prediction.
- A **dependent variable** is the data for which you have current information, but which you want to predict.
- The **intercept** is the point at which the Y-axis is crossed by the predicted line.

Before You Use /Data Regression

Before you can use /Data Regression to perform a regression analysis, you need to create three data regression ranges: an X range, a Y range, and an output range. The X range contains the independent variables in the database. The Y range contains the dependent variable in the database. The output range is where 1-2-3 will place the results of the regression analysis.

The /Data Regression Settings Sheet

When you select /Data Regression, 1-2-3 displays a settings sheet like the one illustrated in Figure 4-28. The settings sheet lists by cell address the location of the X range, Y range, output range, and y-axis intercept. These are the settings 1-2-3 will use when you are ready to perform the regression with /Data Regression Go.

```
A6: (H) [W6] 0.4218332789                                        MENU
X-Range  Y-Range  Output-Range  Intercept  Reset  Go  Quit
Specify independent variables, (X-range)
                    Regression Settings
   X range:        A3..A19
   Y range:        B3..B19

   Output range:   G2..G2

   Intercept:      Compute
8
9
10
11
```

Figure 4-28 The /Data Regression settings sheet

Performing Regression Analysis: An Example

You are the proprietor of an ice cream stand at a tourist location, and you want to be able to predict in advance roughly how many quarts of ice cream you will sell the next day. You believe that your sales are influenced by three key factors: the number of hours of sunshine, the midday temperature, and the number of buses in a nearby parking lot.

You created a database that contains the available information for a six day period. (In practice, you would probably collect data for a much longer period to get greater accuracy.) Figure 4-29 shows the sample database.

A1: "Day READY

	A	B	C	D	E	F
1	Day	Ice cream sold	Hours of	Midday	Buses in	
2		(quarts)	sunshine	temp (F)	parking lot	
3	1	250	3.2	84	4	
4	2	545	5.0	91	7	
5	3	550	4.5	88	8	
6	4	450	6.0	88	6	
7	5	605	5.8	90	11	
8	6	615	7.1	88	11	
9						
10						
11						

X range

Y range

Figure 4-29 Sample database

Before you can predict sales, you need to perform a regression analysis on the existing data, as described in the steps below.

1. Select /Data Regression X-Range. The X range contains the independent variables in the database (the variables you can estimate with some degree of accuracy already). For the ice cream stand, the independent variables are the number of hours of sunshine, the midday temperature, and the number of buses in the parking lot (the range C3..E8).
2. Select /Data Regression Y-Range. The Y range contains the dependent variable in the database (the variable you want to predict). For the ice cream stand, the dependent variable is the amount of ice cream sold (the range B3..B8).
3. Select /Data Regression Output-Range to indicate the area of the worksheet in which you want 1-2-3 to place the results of the regression analysis. You need to specify only the first cell of the range (the cell A11).

4. Select /Data Regression Go. 1-2-3 automatically enters the following calculated results (including labels) in the output range, as illustrated in the figure below:

A1: 'Day READY

	A	B	C	D	E	F
1	Day	Ice cream sold	Hours of	Midday	Buses in	
2		(quarts)	sunshine	temp (F)	parking lot	
3	1	290	3.2	84	4	
4	2	545	5.0	91	7	
5	3	590	4.5	89	8	
6	4	430	6.0	88	6	
7	5	605	5.8	90	11	
8	6	615	7.1	88	11	
9						
10						
11		Regression Output:				
12	Constant			-2127.3434		
13	Std Err of Y Est			36.0875694		
14	R Squared			0.97221362		
15	No. of Observations			6		
16	Degrees of Freedom			2		
17						
18	X Coefficient(s)		12.9028888	26.675577	26.23986058	
19	Std Err of Coef.		18.2283979	8.15571455	9.480076774	
20						

01-Apr-89 09:00 AM

Output range

Figure 4-30 Results of data regression

Using the Regression Results

Now you can use the regression data you have generated for the prediction. Suppose the weather forecast tells you that tomorrow will be cloudy, with only two hours of sunshine and a midday temperature of 84° F. You guess that no more than five buses will visit. These are the predicted X values (independent variables).

To predict the ice cream sales (Y value) for tomorrow, complete the following steps.

1. Enter the predicted values (2, 84, 5) in cells C9..E9 of the database.
2. Enter the following formula in the cell where you want to see the prediction. (Enter the formula in cell F9 so that the prediction is in sequence with actual sales, but in a different column so that it is not confused with actual sales.)

   +(C9*$C$18)+(D9*$D$18)+(E9*$E$18)+$D$12

   This formula may look complicated, but it is really only the sum of the following:

   - the first predicted x value multiplied by the first x coefficient, plus
   - the second predicted x value multiplied by the second x coefficient, plus
   - the third predicted x value multiplied by the third x coefficient, plus
   - the constant

   Use absolute references for the x coefficients and the constant because you may want to copy the formula to other cells, and you do not want any adjustment made in references to the coefficients or the constant.

With labels added to cells B9, F1, and F2, the worksheet looks like this:

```
F9: (F0) [W11] (C9*$C$18)+(D9*$D$18)+(E9*$E$18)+$D$12                    READY

        A          B              C          D          E          F
1       Day  Ice cream sold   Hours of    Midday     Buses in  Estimated
2                (quarts)    sunshine   temp (F) parking lot       sale
3         1            250        3.2         84          4
4         2            545        5.0         91          7
5         3            550        4.5         89          8
6         4            450        6.0         88          6
7         5            605        5.8         90         11
8         6            615        7.1         88         11
9              Prediction:       2.0         84          5        270
10
11          Regression Output:
12  Constant                                -2127.3434
13  Std Err of Y Est                        36.0875694
14  R Squared                               0.97221362
15  No. of Observations                              6
16  Degrees of Freedom                               2
17
18  X Coefficient(s)          12.9028888  26.675577 26.23986058
19  Std Err of Coef.          18.2283979 8.15571455 9.480076774
20
01-Apr-89 09:00 AM
```

Figure 4-31 Using the regression analysis

The prediction indicates that you should expect to sell approximately 270 quarts of ice cream tomorrow.

Tip

- You can enter any number of values in each column of variables, assuming that the number does not exceed the number of rows in the worksheet.

How to Use /Data Regression

NOTE You can select Reset at any time to clear the regression settings.

1. Select /Data Regression.
2. Select X-Range to specify the independent variables.

   Independent variables are the values needed to determine a prediction. You can specify up to 16 independent variables.
3. Specify the X range and press **ENTER**.
4. Select Y-Range to specify the dependent variable.

   The **dependent variable** is the variable for which you have current information, but which you want to predict in the future.
5. Specify the Y range and press **ENTER**.

   NOTE The X range and Y range must have the same number of rows.

6. If you select Intercept, select one of the following options:

Compute	Calculates the y-axis intercept automatically.
Zero	Uses zero as the y-axis intercept. Do not select Zero unless your data is such that when all of the independent variables equal zero the dependent variable must equal zero.

7. Select Output-Range.

8. Specify the output range in a blank area of the worksheet and press **ENTER**.

   Use the cell address of the first cell in the range, a range name, or a range address. If you select a range that is too small to contain the regression calculations, 1-2-3 cannot perform the regression and displays an error message when you select Go.

9. Select Go to calculate the regression or select Quit to return 1-2-3 to READY mode without calculating the regression.

   When you select Go, 1-2-3 enters the following information in the output range:

Item	Description
Constant	The y-axis intercept.
Degrees of freedom	The number of observations minus the number of independent variables minus 1.
	If you use a zero intercept, the degrees of freedom equal the number of observations minus the number of independent variables.
No. of observations	The number of rows of data in the X and Y ranges.
R squared	The reliability of the regression (a value from 0 to 1, inclusive).
	NOTE If 1-2-3 displays a value less than zero, you specified a zero intercept when it was not appropriate to do so. Use /Data Regression Intercept Compute and then /Data Regression Go to recalculate the regression and adjust the R^2 value accordingly.
Std Err of Coef.	The standard error of each of the x coefficients.
Std Err of Y Est	The standard error of the estimated y values.
X coefficient(s)	The slope for each independent variable.

/Data Regression Go

/Data Regression Go lets you calculate a data regression for the selected X range, Y range, and output range.

Procedure

1. Before you use /Data Regression Go, you must specify the X range, Y range, and output range.

   For more information, see "How to Use /Data Regression" earlier in this section.

2. Select /Data Regression Go.

/Data Regression Intercept

/Data Regression Intercept lets you determine whether 1-2-3 calculates the y-axis intercept automatically or uses zero as the intercept. The y-axis intercept appears as the constant in the results.

Procedure

1. Select /Data Regression Intercept.
2. Select one of the following options:

Compute	Calculates the y-axis intercept automatically.
Zero	Uses zero as the y-axis intercept. Do not select this unless your data is such that when all of the independent variables equal zero the dependent variable must equal zero.

/Data Regression Output-Range

/Data Regression Output-Range lets you specify the range in which 1-2-3 places the results of the regression analysis. For more information, see "How to Use /Data Regression" earlier in this section.

Procedure

1. Select /Data Regression Output-Range.
2. Specify an output range in a blank area of the worksheet and press ENTER.
   - If you specify just one cell 1-2-3 will use that cell as the upper left cell of the output range, and determine how big a range it needs.
   - If you specify a larger range but one which is not big enough to contain the regression calculations, 1-2-3 will display an error message when you select Go.

/Data Regression Reset

/Data Regression Reset lets you clear range address settings for the X range, the Y range, and the output range, and resets the intercept to Compute.

Procedure

1. Select /Data Regression Reset.

/Data Regression X-Range

/Data Regression X-Range lets you specify the independent variables. For more information, see "Performing Regression Analysis" earlier in this section.

Procedure

1. Select /Data Regression X-Range.
2. Specify the independent variables and press ENTER.

   You can specify up to 16 independent variables (the values needed to make a prediction).

/Data Regression Y-Range

/Data Regression Y-Range lets you specify the dependent variable. For more information, see "Performing Regression Analysis" earlier in this section.

Procedure

1. Select /Data Regression Y-Range.
2. Specify the dependent variable (the variable for which you have current information, but want to predict in the future) and press ENTER.

   The X range and the Y range must have the same number of rows.

/Data Sort

/Data Sort lets you arrange the data in a range in the order you specify. The range can be records in a database or rows in the worksheet.

Use the following commands to perform a data sort:

Command	Task
Data-Range	Selects the range you want to sort.
Go	Sorts the data according to the current selections and returns 1-2-3 to READY mode.
Primary-Key	Determines the primary field for sorting records or rows. The data can be in either ascending or descending order.
Quit	Returns 1-2-3 to READY mode and does not sort the records or rows.
Reset	Clears range address settings and sort keys.
Secondary-Key	Determines the order for records or rows that have the same primary sort key entries. The data can be in either ascending or descending order.

How to Use This Section

- "Before You Use /Data Sort" explains procedures you must follow before using the Data Sort commands.
- "The /Data Sort Settings Sheet" describes the status screen that appears when you select /Data Sort.
- "Sort Order" includes information about the order in which 1-2-3 will sort both numeric and text data.
- "How to Use /Data Sort" lists the steps you need to follow to complete the command.
- The remaining subsections describe each of the Data Sort commands in alphabetical order.

C-5 SUMMARY OF LANDFILL GAS DATA CALCULATIONS

Project Rose Hill RT Acct. No. Page of
Subject Land fill Gas Comptd. By Date
Detail Summary of field GC Calculations Ck'd. By Date

Calibration:

- Identification of Compounds was based on the retention time (RT) of that compound in a standard mixture on a given day under a given set of conditions.
- A response factor (RF) was calculated for each compound for each calibration run.

$$RF = \frac{\text{concentration}}{\text{peak hieght}}$$

Typically several RF's calculated from different calibration runs were averaged together for one RF used for all analysis on that day.

- Total VOC - Because many of the compounds detected by field GC did not correspond to calibration compounds an RF was calculated for total VOC concentrations.

$RF_{\text{total VOC}}$ = Average of All other RF's for that day.

NONREPRODUCIBLE GRID FORM 145
METCALF & EDDY, ENGINEERS

Project _____ Acct. No. _____ Page _____ of _____
Subject _____ Comptd. By _____ Date _____
Detail _____ Ck'd. By _____ Date _____

- Quantitation:

sample concentration = RF × peak height
peak height is generally in GC units

frequently several analysis were performed on the same sample using the same or different analytical parameters. Different sample concentrations may have been averaged ~~or~~ or the most appropriate analysis reported.

NONREPRODUCIBLE GRID FORM 145
METCALF & EDDY, ENGINEERS

#9802
Rose Hill
3.6
#9082

EPA Contract No. 68-W9-0036
EPA Work Assignment No. 18-1LA5

EPA Project Officer: Diane Kelley
EPA Remedial Project Manager: David Newton

REMEDIAL INVESTIGATION FINAL REPORT

Volume V
Appendices D-G

Rose Hill Regional Landfill Superfund Site
South Kingstown, Rhode Island

May 1994

Prepared by:

Metcalf & Eddy
An Air & Water Technologies Company

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D-2 Summary of Evaluation Results for "rose1"

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- June 1991
- September/October 1991
- January/February 1992
- April 1992
- September 1993

D-4 Data Flag Notes

D-5 M&E Sample IDs Cross-Referenced to CLP Numbers

D-6 Complete Analytical Data, Surface Soils

- September/October 1991
- April 1992

D-7 Complete Analytical Data, Subsurface Soils

- September/October 1991

D-8 Complete Analytical Data, Leachate

- June 1991
- April 1992

D-9 Complete Analytical Data, Groundwater (Monitoring Wells)

- June 1991
- September/October 1991
- January/February 1992
- April 1992

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D-10 Complete Analytical Data, Groundwater (Residential Wells)

- June 1991
- September/October 1991
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M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Wetland at Flag M&E A29	Date: May 30, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Acer rubrum	30/50	60	FAC
Lianas:			
Smilax rotundifolia	20/20	100	FAC
Saplings:			
Prunus serotina	14/20	70	FACU
Shrubs:			
Viburnum dentatum	12/30	40	FAC
Clethra alnifolia	9/30	30	FAC
Vaccinium corymbosum	6/30	20	FACW
Seedlings and Herbs:			
Symplocarpus foetidus	12/60	20	OBL
Impatiens capensis	12/60	20	FACW
Osmunda cinnamomea	12/60	20	FACW
Carex stricta	12/60	20	OBL
Thelypteris thelypteroides	12/60	20	FACW
Mosses and Liverworts:			

Tally:	OBL 2	FACW 4	FAC 4	FACU 1	UPL	SUM 11

{OBL+FACW+FAC} / SUM X 100 =	Area Disturbed?	Yes	X N
10/11 = 91%	Describe:		

Wetland at Flag M&E A29 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch	10 YR 2/2 Matrix		
0-6 inch	10 YR 5/5 Mottles	Sandy loam	
6-12 inch	10 YR 2/1 Matrix	Sandy loam	
18 inch	10 YR 3/1 Matrix	Sandy loam	Groundwater at 17"

Soil Pedigree: aeric Haplaquepts — Permeability: <6.0 in/hr

Series and Phase: Raypol Silt Loam — Drainage Class: Poorly Drained

X	NTCHS List		Organic Soil		High Organic Content in Surface Horizon
	Histic Epipedon		Sulfidic Material		Aquic Moisture Regime
	Peraquic Moisture Regime		Reducing Condition	X	Iron Concretions
	Manganese Concretions		Gleyed		Wet Spodosols
	Dark Vertical Streaking of Subsurface Horizons				OBL Plants
X	OBL and FACW Plants and Wetland/Upland Boundary Abrupt				

HYDROLOGY

	Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season				
Source:			Dated:		
	Inundation (Depth _____)	X	Saturation (Depth 17")		
	Water Marks		Oxidized Rhizosphere	X	Drift Lines
X	Sediment Deposits	X	Water Stained Leaves		Drainage Patterns
	Surface Scoured Areas		Pneumatophores		Buttressed Trees
X	Stooling		Adventitious Roots		Shallow Root Systems
	Floating Stems		Polymorphic Leaves		Hypertrophied Lenticels
	Inflated Leaves, Stems, Roots		Aerenchyma	X	Hydric Soils

CONCLUSIONS

Yes	Hydrophytes Prevalent	Yes	Hydric Soils
Yes	Wetland Hydrology	Yes	Wetland?

Wetlands Technician(s): [illegible]

Wetlands Scientist(s): [illegible]

Wetlands Technical Specialist: [illegible], Ph.D.

M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Upland at Flag M&E A29	Date: May 30, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Quercus alba	20/50	50	FACU
Acer rubrum	20/50	40	FAC
Lianas:			
Saplings:			
Quercus alba	6/20	30	FACU
Shrubs:			
Vaccinium corymbosum (dead)	6/30	20	FACW
Viburnum dentatum	6/30	20	FAC
Seedlings and Herbs:			
Maianthemum canadense	16/40	40	FAC
Lycopodium obscurum	12/40	30	FACU
Phleum pratense	12/40	30	FACU
Mosses and Liverworts:			

Tally:	OBL	FACW 1	FAC 3	FACU 4	UPL	SUM 8

{OBL+FACW+FAC} / SUM X 100 = 4/8 = 50%	Area Disturbed? Yes ___ X N ___ Describe:

Upland at Flag M&E A29 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch			
20 inch	10 YR 6/4 Matrix	Loamy sand	No groundwater to 20"
inch			
inch			

Soil Pedigree: Typic Dystrochrepts — Permeability: <20.0 in/hr

Series and Phase: Agawam fine sandy loam — Drainage Class: Well Drained

____ NTCHS List	____ Organic Soil	____ High Organic Content in Surface Horizon
____ Histic Epipedon	____ Sulfidic Material	____ Aquic Moisture Regime
____ Peraquic Moisture Regime	____ Reducing Condition	____ Iron Concretions
____ Manganese Concretions	____ Gleyed	____ Wet Spodosols
____ Dark Vertical Streaking of Subsurface Horizons		____ OBL Plants
____ OBL and FACW Plants and Wetland/Upland Boundary Abrupt		

HYDROLOGY

____ Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season

Source: Dated:

____ Inundation (Depth ____)	____ Saturation (Depth >20")	
____ Water Marks	____ Oxidized Rhizosphere	____ Drift Lines
____ Sediment Deposits	____ Water Stained Leaves	____ Drainage Patterns
____ Surface Scoured Areas	____ Pneumatophores	____ Buttressed Trees
____ Stooling	____ Adventitious Roots	____ Shallow Root Systems
____ Floating Stems	____ Polymorphic Leaves	____ Hypertrophied Lenticels
____ Inflated Leaves, Stems, Roots	____ Aerenchyma	____ Hydric Soils

CONCLUSIONS

No	Hydrophytes Prevalent	No	Hydric Soils
No	Wetland Hydrology	No	Wetland?

Wetlands Technician(s): Barbara Nelson

Wetlands Scientist(s): Carol E. Tann

Wetlands Technical Specialist: Sandra M. Kerr

M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Wetland at Flag M&E A97	Date: May 30, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Quercus bicolor	21/70	30	FACW
Acer rubrum	28/70	40	FAC
Lianas:			
Saplings:			
Acer rubrum	5/10	50	FAC
Quercus bicolor	2/10	20	FACW
Shrubs:			
Seedlings and Herbs:			
Impatiens capensis	30/60	50	FACW
Osmunda cinnamomea	24/60	40	FACW
Onoclea sensibilis	12/60	20	FACW
Mosses and Liverworts:			

Tally:	OBL	FACW 5	FAC 2	FACU	UPL	SUM 7

{OBL+FACW+FAC} / SUM X 100 = 7/7 = 100%

Area Disturbed? Yes X N

Describe:

Wetland at Flag M&E A97 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch	10 YR 2/2 Matrix		
10 inch	10 YR 6/8 Mottles	Sandy loam	
20 inch	10 YR 2/1 Matrix	Sandy loam	Groundwater at 16"
inch			

Soil Pedigree: Aeric Haplaquepts — Permeability: <6.0 in/hr

Series and Phase: Walpole Sandy Loam — Drainage Class: Poorly Drained

X	NTCHS List		Organic Soil		High Organic Content in Surface Horizon
	Histic Epipedon		Sulfidic Material	X	Aquic Moisture Regime
	Peraquic Moisture Regime		Reducing Condition	X	Iron Concretions
	Manganese Concretions		Gleyed		Wet Spodosols
	Dark Vertical Streaking of Subsurface Horizons				OBL Plants
	OBL and FACW Plants and Wetland/Upland Boundary Abrupt				

HYDROLOGY

	Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season				
Source:			Dated:		
	Inundation (Depth _____)	X	Saturation (Depth 16")		
	Water Marks		Oxidized Rhizosphere		Drift Lines
	Sediment Deposits	X	Water Stained Leaves		Drainage Patterns
	Surface Scoured Areas		Pneumatophores	X	Buttressed Trees
	Stooling		Adventitious Roots		Shallow Root Systems
	Floating Stems		Polymorphic Leaves		Hypertrophied Lenticels
	Inflated Leaves, Stems, Roots		Aerenchyma	X	Hydric Soils

CONCLUSIONS

Yes	Hydrophytes Prevalent	Yes	Hydric Soils
Yes	Wetland Hydrology	Yes	Wetland?

Wetlands Technician(s): [illegible]

Wetlands Scientist(s): [illegible]

Wetlands Technical Specialist: [illegible] M. Kent, Ph.D.

M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Upland at Flag M&E A97	Date: May 31, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Acer rubrum	25/50	50	FAC
Lianas:			
Smilax rotundifolia	5/5	100	FAC
Saplings:			
Shrubs:			
Kalmia latifolia	25/50	50	FACU
Seedlings and Herbs:			
Lycopodium obscurum	25/50	50	FACU
Parthenocissus quinquefolia	15/50	30	FACU
Onoclea sensibilis	10/50	20	FACW
Mosses and Liverworts:			

Tally:	OBL	FACW 1	FAC 2	FACU 3	UPL	SUM 6

{OBL+FACW+FAC} / SUM X 100 = 3/6 = 50%

Area Disturbed? Yes X N

Describe:

Upland at Flag M&E A97 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch			
0–10 inch	7.5 YR 3/2	Sandy loam	
10–20 inch	10 YR 3/3	Sandy loam	No groundwater to 20"
____ inch			

Soil Pedigree: Typic Fragiodrepts — Permeability: 0.6 – 2.0 in/hr

Series and Phase: Rainbow Silt Loam — Drainage Class: Moderately Well Drained

____ NTCHS List	____ Organic Soil	____ High Organic Content in Surface Horizon
____ Histic Epipedon	____ Sulfidic Material	____ Aquic Moisture Regime
____ Peraquic Moisture Regime	____ Reducing Condition	____ Iron Concretions
____ Manganese Concretions	____ Gleyed	____ Wet Spodosols
____ Dark Vertical Streaking of Subsurface Horizons		____ OBL Plants
____ OBL and FACW Plants and Wetland/Upland Boundary Abrupt		

HYDROLOGY

____ Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season

Source: Dated:

____ Inundation (Depth ____)	____ Saturation (Depth >20")	
____ Water Marks	____ Oxidized Rhizosphere	____ Drift Lines
____ Sediment Deposits	____ Water Stained Leaves	____ Drainage Patterns
____ Surface Scoured Areas	____ Pneumatophores	____ Buttressed Trees
____ Stooling	____ Adventitious Roots	____ Shallow Root Systems
____ Floating Stems	____ Polymorphic Leaves	____ Hypertrophied Lenticels
____ Inflated Leaves, Stems, Roots	____ Aerenchyma	____ Hydric Soils

CONCLUSIONS

No	Hydrophytes Prevalent	No	Hydric Soils
No	Wetland Hydrology	No	Wetland?

Wetlands Technician(s): [illegible]

Wetlands Scientist(s): Carl E. [illegible]

Wetlands Technical Specialist: Donald M. Kent, Ph.D.

M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Wetland at Flag M&E B2	Date: May 30, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Salix nigra	10/10	100	FACW
Lianas:			
Saplings:			
Shrubs:			
Seedlings and Herbs:			
Phragmites australis	54/90	60	FACW
Typha latifolia	18/90	20	OBL
Carex stricta	18/90	20	OBL
Mosses and Liverworts:			

Tally:	OBL 2	FACW 2	FAC	FACU	UPL	SUM 4

{OBL+FACW+FAC} / SUM	X 100 = 100%	Area Disturbed?	X Yes ___ No
		Describe: Landfill cover	

Wetland at Flag M&E B2 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch			On landfill
inch			No borings taken
inch			
inch			

Soil Pedigree: Permeability:

Series and Phase: Drainage Class:

____ NTCHS List	____ Organic Soil	____ High Organic Content in Surface Horizon
____ Histic Epipedon	____ Sulfidic Material	____ Aquic Moisture Regime
____ Peraquic Moisture Regime	____ Reducing Condition	____ Iron Concretions
____ Manganese Concretions	____ Gleyed	____ Wet Spodosols
____ Dark Vertical Streaking of Subsurface Horizons		____ OBL Plants
____ OBL and FACW Plants and Wetland/Upland Boundary Abrupt		

HYDROLOGY

____ Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season

Source: Dated:

____ Inundation (Depth ____)	____ Saturation (Depth ____)	
X Water Marks	____ Oxidized Rhizosphere	____ Drift Lines
____ Sediment Deposits	____ Water Stained Leaves	____ Drainage Patterns
X Surface Scoured Areas	____ Pneumatophores	____ Buttressed Trees
X Stooling	____ Adventitious Roots	____ Shallow Root Systems
____ Floating Stems	____ Polymorphic Leaves	____ Hypertrophied Lenticels
____ Inflated Leaves, Stems, Roots	X Aerenchyma	____ Hydric Soils

CONCLUSIONS

Yes	Hydrophytes Prevalent	-	Hydric Soils
Yes	Wetland Hydrology	Yes	Wetland?

Wetlands Technician(s): R. William Nettrour

Wetlands Scientist(s): Chris E. Lawrence

Wetlands Technical Specialist: David M. Kent, Ph.D.

M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Upland at Flag M&E B2	Date: May 30, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Lianas:			
Saplings:			
Shrubs:			
Seedlings and Herbs:			
Rubus occidentalis	24/80	30	UPL
Daucus carota	16/80	20	UPL
Graminae	24/80	30	UPL
Mosses and Liverworts:			

Tally:	OBL	FACW	FAC	FACU	UPL 3	SUM 3

{OBL+FACW+FAC} / SUM	X 100 = 0%	Area Disturbed?	X Yes ___ No
		Describe: Landfill cover	

Upland at Flag M&E B2 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch			On landfill
inch			No borings taken
inch			
inch			

Soil Pedigree: Permeability:

Series and Phase: Drainage Class:

____ NTCHS List	____ Organic Soil	____ High Organic Content in Surface Horizon
____ Histic Epipedon	____ Sulfidic Material	____ Aquic Moisture Regime
____ Peraquic Moisture Regime	____ Reducing Condition	____ Iron Concretions
____ Manganese Concretions	____ Gleyed	____ Wet Spodosols
____ Dark Vertical Streaking of Subsurface Horizons		____ OBL Plants
____ OBL and FACW Plants and Wetland/Upland Boundary Abrupt		

HYDROLOGY

____ Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season

Source: Dated:

____ Inundation (Depth ____)	____ Saturation (Depth ____)	
____ Water Marks	____ Oxidized Rhizosphere	____ Drift Lines
____ Sediment Deposits	____ Water Stained Leaves	____ Drainage Patterns
____ Surface Scoured Areas	____ Pneumatophores	____ Buttressed Trees
____ Stooling	____ Adventitious Roots	____ Shallow Root Systems
____ Floating Stems	____ Polymorphic Leaves	____ Hypertrophied Lenticels
____ Inflated Leaves, Stems, Roots	____ Aerenchyma	____ Hydric Soils

CONCLUSIONS

No	Hydrophytes Prevalent	-	Hydric Soils
No	Wetland Hydrology	No	Wetland?

Wetlands Technician(s): [illegible]

Wetlands Scientist(s): [illegible]

Wetlands Technical Specialist: [illegible], Ph.D.

M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Wetland at Flag M&E C1	Date: May 31, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Acer rubrum	10/10	100	FAC
Lianas:			
Saplings:			
Shrubs:			
Seedlings and Herbs:			
Onoclea sensibilis	20/40	50	FACW
Mosses and Liverworts:			

Tally:	OBL	FACW 1	FAC 1	FACU	UPL	SUM 2

{OBL+FACW+FAC} X 100 =
SUM
100%

Area Disturbed? Yes X N
Describe:

Wetland at Flag M&E C1 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch			
0–4 inch	10 YR 2/1	Sandy loam	Groundwater at surface
4–20 inch	7.5 YR 2/0	Organic	
inch			

Soil Pedigree: Aeric Haplaquepts — Permeability: <6.0 in/hr

Series and Phase: Walpole Fine Sandy Loam — Drainage Class: Poorly Drained

X	NTCHS List	X	Organic Soil		High Organic Content in Surface Horizon
	Histic Epipedon		Sulfidic Material		Aquic Moisture Regime
X	Peraquic Moisture Regime		Reducing Condition		Iron Concretions
	Manganese Concretions		Gleyed		Wet Spodosols
	Dark Vertical Streaking of Subsurface Horizons				OBL Plants
	OBL and FACW Plants and Wetland/Upland Boundary Abrupt				

HYDROLOGY

	Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season				
Source:		Dated:			
X	Inundation (Depth 5")		Saturation (Depth _____)		
X	Water Marks		Oxidized Rhizosphere	X	Drift Lines
	Sediment Deposits	X	Water Stained Leaves	X	Drainage Patterns
	Surface Scoured Areas		Pneumatophores	X	Buttressed Trees
	Stooling		Adventitious Roots		Shallow Root Systems
	Floating Stems		Polymorphic Leaves		Hypertrophied Lenticels
	Inflated Leaves, Stems, Roots		Aerenchyma	X	Hydric Soils

CONCLUSIONS

Yes	Hydrophytes Prevalent	Yes	Hydric Soils
Yes	Wetland Hydrology	Yes	Wetland?

Wetlands Technician(s): [illegible]

Wetlands Scientist(s): [illegible]

Wetlands Technical Specialist: [illegible]

M&E 3 PARAMETER WETLAND DELINEATION
SUMMARY SHEET

Project Title: Rose Hill Landfill	Project Location: Kingston, RI
Sample Location: Upland at Flag M&E C1	Date: May 31, 1991

VEGETATION

DOMINANTS BY STRATUM	Dominance Ratio	Percent Dominance	NWI Status
Trees:			
Acer rubrum	53/70	75	FAC
Lianas:			
Smilax rotundifolia	5/5	100	FAC
Saplings:			
Shrubs:			
Seedlings and Herbs:			
Onoclea sensibilis	20/50	40	FACW
Lycopodium obscurum	15/50	30	FACU
Maianthemum canadense	10/50	20	FAC
Mosses and Liverworts:			

Tally:	OBL	FACW 1	FAC 3	FACU 1	UPL	SUM 5

{OBL+FACW+FAC} / SUM X 100 = 4/5 = 80%	Area Disturbed? Yes ___ X N ___ Describe:

Upland at Flag M&E C1 cont'd

SOIL			
Depth	Munsell Color (Wet) Matrix/Mottle	USDA Texture (Wet)	Remarks
0 inch			
0-5 inch	10 YR 2/2	Sandy loam	No groundwater to 20"
5-20 inch	10 YR 3/2	Sandy loam	
inch			

Soil Pedigree: Typic Fragiochrepts — Permeability: 0.6 – 2.0 in/hr

Series and Phase: Rainbow silt loam — Drainage Class: Moderately Well Drained

____ NTCHS List	____ Organic Soil	____ High Organic Content in Surface Horizon
____ Histic Epipedon	____ Sulfidic Material	____ Aquic Moisture Regime
____ Peraquic Moisture Regime	____ Reducing Condition	____ Iron Concretions
____ Manganese Concretions	____ Gleyed	____ Wet Spodosols
____ Dark Vertical Streaking of Subsurface Horizons		____ OBL Plants
____ OBL and FACW Plants and Wetland/Upland Boundary Abrupt		

HYDROLOGY

____ Recorded Data Indicating Inundation or Saturation for Extended Period During the Growing Season

Source: Dated:

____ Inundation (Depth ____)	X Saturation (Depth >20")	
____ Water Marks	____ Oxidized Rhizosphere	____ Drift Lines
____ Sediment Deposits	____ Water Stained Leaves	____ Drainage Patterns
____ Surface Scoured Areas	____ Pneumatophores	____ Buttressed Trees
____ Stooling	____ Adventitious Roots	____ Shallow Root Systems
____ Floating Stems	____ Polymorphic Leaves	____ Hypertrophied Lenticels
____ Inflated Leaves, Stems, Roots	____ Aerenchyma	____ Hydric Soils

CONCLUSIONS

Yes	Hydrophytes Prevalent	No	Hydric Soils
No	Wetland Hydrology	No	Wetland?

Wetlands Technician(s): [illegible]

Wetlands Scientist(s): [illegible]

Wetlands Technical Specialist: [illegible], Ph.D.

D-2 SUMMARY OF EVALUATION RESULTS FOR "ROSE1"

****

Summary of Evaluation Results for "rose1"

****

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge	M	U	*
Ground Water Discharge	M	L	*
Floodflow Alteration	L	M	M
Sediment Stabilization	L	H	*
Sediment/Toxicant Retention	H	L	H
Nutrient Removal/Transformation	M	L	H
Production Export	*	M	*
Wildlife Diversity/Abundance	H	*	*
Wildlife D/A Breeding	*	H	*
Wildlife D/A Migration	*	H	*
Wildlife D/A Wintering	*	H	*
Aquatic Diversity/Abundance	L	L	*
Uniqueness/Heritage	L	*	*
Recreation	L	*	*

Note: "H" = High, "M" = Moderate, "L" = Low, "U" = Uncertain, and "*"'s identify conditions where functions and values are not evaluated

WET Answer Dataset for "rose1"

s1 - n	6.2 - n	12Be(w) - i	13Ba(d) - i
s2 - n	7 - i	12Be(d) - i	13Bb(x) - n
s3 - n	8.1 - y	12C(x) - n	13Bb(w) - i
s4 - n	8.2 - n	12C(w) - i	13Bb(d) - i
s5 - n	8.3 - y	12C(d) - i	13Bc(x) - n
s6 - n	8.4 - n	12Ca(x) - n	13Bc(w) - i
s7 - n	9.1 - n	12Ca(w) - i	13Bc(d) - i
s8 - y	9.2 - n	12Ca(d) - i	13Bd(x) - n
s9 - y	9.3 - n	12Cb(x) - n	13Bd(w) - i
s10 - y	10A - n	12Cb(w) - i	13Bd(d) - i
s11 - n	10B - y	12Cb(d) - i	13Be(x) - y
s12 - n	10C - n	12Cc(x) - n	13Be(w) - i
s13 - n	10D - n	12Cc(w) - i	13Be(d) - i
s14 - n	10E - n	12Cc(d) - i	13C(x) - n
s15 - n	10F - n	12Cd(x) - n	13C(w) - i
s16 - n	11(x) - y	12Cd(w) - i	13C(d) - i
s17 - n	11(w) - i	12Cd(d) - i	13Ca(x) - n
s18 - n	11(d) - i	12D(x) - n	13Ca(w) - i
s19 - n	12A(x) - y	12D(w) - i	13Ca(d) - i
s20 - n	12A(w) - i	12D(d) - i	13Cb(x) - n
s21 - n	12A(d) - i	12Da(x) - n	13Cb(w) - i
s22 - y	12Aa(x) - n	12Da(w) - i	13Cb(d) - i
s23 - n	12Aa(w) - i	12Da(d) - i	13Cc(x) - n
s24 - n	12Aa(d) - i	12Db(x) - n	13Cc(w) -
s25 - n	12Ab(x) - n	12Db(w) - i	13Cc(d) -
s26 - n	12Ab(w) - i	12Db(d) - i	13Cd(x) - n
s27 - n	12Ab(d) - i	12E(x) - n	13Cd(w) - i
s28 - n	12Ac(x) - n	12E(w) - i	13Cd(d) - i
s29 - n	12Ac(w) - i	12E(d) - i	13D(x) - y
s30 - n	12Ac(d) - i	13A(x) - y	13D(w) - i
s31 - y	12Ad(x) - n	13A(w) - i	13D(d) - i
1.1 - n	12Ad(w) - i	13A(d) - i	13Da(x) - n
1.2 - n	12Ad(d) - i	13Aa(x) - n	13Da(w) - i
1.3 - n	12Ae(x) - y	13Aa(w) - i	13Da(d) - i
2.1.1 - n	12Ae(w) - i	13Aa(d) - i	13Db(x) - y
2.1.2 - n	12Ae(d) - i	13Ab(x) - n	13Db(w) - i
2.1.3 - n	12B(x) - y	13Ab(w) - i	13Db(d) - i
2.2.1 - n	12B(w) - i	13Ab(d) - i	13E(x) - n
2.2.2 - n	12B(d) - i	13Ac(x) - n	13E(w) - i
3.1 - y	12Ba(x) - n	13Ac(w) - i	13E(d) - i
3.2 - n	12Ba(w) - i	13Ac(d) - i	14.1(x) - n
3.3 - y	12Ba(d) - i	13Ad(x) - n	14.1(w) - i
4.1 - n	12Bb(x) - n	13Ad(w) - i	14.1(d) - i
4.2A - y	12Bb(w) - i	13Ad(d) - i	14.2(x) - n
4.2B - n	12Bb(d) - i	13Ae(x) - y	14.2(w) - i
4.2C - n	12Bc(x) - n	13Ae(w) - i	14.2(d) - i
4.2D - n	12Bc(w) - i	13Ae(d) - i	15.1A - y
5.1.1 - y	12Bc(d) - i	13B(x) - y	15.1B - n
5.1.2 - n	12Bd(x) - n	13B(w) - i	15.1C - r
5.2 - n	12Bd(w) - i	13B(d) - i	15.2 -
blank - u	12Bd(d) - i	13Ba(x) - n	16A(x) - y
6.1 - n	12Be(x) - y	13Ba(w) - i	16A(w) - i

WET Answer Dataset for "rose1"

16A(d) - i
16B(x) - n
16B(w) - i
16B(d) - i
16C(x) - n
16C(w) - i
16C(d) - i
17 - y
18 - n
19.1A - y
19.1B - i
19.2 - n
19.3 - n
20.1 - y
20.2 - n
21A - y
21B - n
21C - n
21D - n
21E - n
22.1.1 - y
22.1.2 - y
22.2 - n
22.3 - n
23 - n
24.1 - i
24.2 - y
24.3 - n
24.4 - n
24.5 - n
25.1 - y
25.2A - n
25.2B - y
25.3 - n
26.1 - y
26.2 - n
26.3 - y
27.1 - y
27.2 - y
27.3 - n
28 - n
29.1 - y
29.2 - y
30(x) - n
30(w) - i
30(d) - i
31.1(x) - n
31.1(w) - i
31.1(d) - i
31.2(x) - n
31.2(w) - i
31.2(d) - i
31.3(x) - n
31.3(w) - i
31.3(d) - i
31.4(x) - i
31.4(w) - i
31.4(d) - i
31.5(x) - y
31.5(w) - i
31.5(d) - i
31.6A(x) - n
31.6A(w) - i
31.6A(d) - i
31.6B(x) - y
31.6B(w) - i
31.6B(d) - i
31.6C(x) - n
31.6C(w) - i
31.6C(d) - i
31.6D(x) - n
31.6D(w) - i
31.6D(d) - i
31.6E(x) - n
31.6E(w) - i
31.6E(d) - i
32A - n
32B - n
32C - y
32D - n
32E - n
32F - n
32G - n
32H - n
32I - n
32J - n
32K - n
33A - n
33B - n
33C - y
33D - n
33E - n
33F - n
33G - n
33H - n
33I - n
33J - n
33K - n
34.1 - n
34.2 - n
34.3.1 - n
34.3.2 - i
35.1 - n
35.2 - y
36.1.1(x) - y
36.1.1(w) - i
36.1.1(d) - i
36.1.2(x) - n
36.1.2(w) - i
36.1.2(d) - i
36.2.1(x) - y
36.2.1(w) - i
36.2.1(d) - i
36.2.2(x) - n
36.2.2(w) - i
36.2.2(d) - i
36.2.3(x) - n
36.2.3(w) - i
36.2.3(d) - i
37 - y
38.1 - y
38.2 - n
38.3 - n
38.4 - n
38.5 - n
38.6 - n
38.7 - y
38.8 - i
39 - y
40.1 - y
40.2 - n
41.1 - n
41.2 - y
42.1.1(x) - y
42.1.1(w) - i
42.1.1(d) - i
42.1.2(x) - y
42.1.2(w) - i
42.1.2(d) - i
42.1.3(x) - n
42.1.3(w) - i
42.1.3(d) - i
42.2.1(x) - y
42.2.1(w) - i
42.2.1(d) - i
42.2.2(x) - y
42.2.2(w) - i
42.2.2(d) - i
42.2.3(x) - n
42.2.3(w) - i
42.2.3(d) - i
43A(x) - n
43A(w) - i
43A(d) - i
43B(x) - n
43B(w) - i
43B(d) - i
43C(x) - n
43C(w) - i
43C(d) - i
43D(x) - y
43D(w) - i
43D(d) - i
43E(x) - n
43E(w) - i
43E(d) - i
43F(x) - n
43F(w) - i
43F(d) - i
43G(x) - n
43G(w) - i
43G(d) - i
43H(x) - n
43H(w) - i
43H(d) - i
43I(x) - n
43I(w) - i
43I(d) - i
44A(x) - n
44A(w) - i
44A(d) - i
44B(x) - y
44B(w) - i
44B(d) - i
44C(x) - y
44C(w) - i
44C(d) - i
44D(x) - y
44D(w) - i
44D(d) - i
44E(x) - y
44E(w) - i
44E(d) - i
44F(x) - y
44F(w) - i
44F(d) - i
44G(x) - n
44G(w) - i
44G(d) - i
44H(x) - n
44H(w) - i
44H(d) - i
44I(x) - n
44I(w) - i
44I(d) - i
45A - n
45B - n
45C - n

WET Answer Dataset for "rose1"

45D - y	48B(w) - i	49.2(x) - y	55.3 - u
45E - n	48B(d) - i	49.2(w) - i	55.4 - u
45F - n	48C(x) - n	49.2(d) - i	56.1 - u
45G - n	48C(w) - i	49.3(x) - n	56.2 - u
46A(x) - n	48C(d) - i	49.3(w) - i	57.1 - u
46A(w) - i	48D(x) - n	49.3(d) - i	57.2 - u
46A(d) - i	48D(w) - i	50(x) - n	58 - u
46B(x) - y	48D(d) - i	50(w) - i	59.1 - u
46B(w) - i	48E(x) - n	50(d) - i	59.2 - u
46B(d) - i	48E(w) - i	51.1 - u	60 - u
46C(x) - n	48E(d) - i	51.2 - u	61 - u
46C(w) - i	48F(x) - n	52.1 - u	62 - u
46C(d) - i	48F(w) - i	52.2 - u	63.1 - u
47A - n	48F(d) - i	53.1 - u	63.2 - u
47B - y	49.1.1(x) - y	53.2 - u	64 - u
47C - n	49.1.1(w) - i	54(x) - u	CR - 1
48A(x) - y	49.1.1(d) - i	54(w) - u	1 - n
48A(w) - i	49.1.2(x) - y	54(d) - u	2 - n
48A(d) - i	49.1.2(w) - i	55.1 - u	3 - n
48B(x) - n	49.1.2(d) - i	55.2 - u	4 - n

D-3 FIELD DATA, WELL SAMPLING WORKSHEETS
(METCALF & EDDY)

- JUNE 1991
- SEPTEMBER/OCTOBER 1991
- JANUARY/FEBRUARY 1992
- APRIL 1992
- SEPTEMBER 1993

WELL SAMPLING WORKSHEETS - JUNE 1991

WELL SAMPLING WORKSHEET

Job Name Rose Hill RI/FS Job No. WA#18 Samplers D.H. Berler / S. O'Brien

Well ID MW-04 Date Sampled 6/26/91 Time: Start 14:10 End _____

Casing Diameter _____ inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y) N

Depth of well from T.O.C. 19.30 ft. Standing water (gal.) = .52

Depth of water from T.O.C. 13.66 ft. x _____ well volumes

Feet of standing water 5.64 (h) ft. = _____ gallons to purge

Standing Water Volume	= π [(d)² ÷ 4] (h)
	= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals

PID Readings (ppm)

Breathing 0.0

Well 0.0

Purging method Water Pump Purge: Time Start 14:17 End 14:34

		pH (probe pH meter)	Conductivity	Temperature, (C)	
1 well volume = .75	gal.	6.45	180	18.7	light gr
2 well volume = .65	gal.	6.63	190	18.7	brown, fine sand
3 well volume = .6	gal.	6.80	210	18.7 13°C	very lt. grey
Final volume = .6	gal.	6.82	195	18.7 12°C	sandy

Thermometer

Sample Collection: Time Start 14:35 End _____ Bailer ID# _____

Final Aliquot 6.20 210 14°C Temp probe on pH meter is broken.

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red ~~light grey~~

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae _____

Organic Layer? No Length? _____ Samples preserved? _____

Comments _____

CSe + line + screen do not exceed 40psi

WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 004609-0018-00 003 Samplers S.C. + SO.

Well ID 1.5" MW-5 Date Sampled 6/27/91 Time: Start 9:00 End 10:30

Casing Diameter _____ inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y) N

Depth of well from T.O.C. 28.85 ft. Standing water (gal.) = 6.3

Depth of water from T.O.C. 21.99 ft. x 3 well volumes

Feet of standing water 6.86 (h) ft. = 1.9 gallons to purge

Standing Water Volume = π [(d)² ÷ 4] (h) .0012 x 6.86

= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals

PID Readings (ppm)

Breathing _____

Well _____

Purging method Wattera Pump Purge: Time Start _____ End _____

		pH	Conductivity	Temperature, (C)
1 well volume = 0.65	gal.	6.69	340	14
2 well volume = 0.65	gal.	6.55	4039	13.5
3 well volume = 0.65	gal.	6.53	38	13.5
Final volume = _____	gal.	7.11	140	

Sample Collection: Time Start 0945 End 1030 Bailer ID# _____

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen

(clear) multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? _____

Comments clear w/ occasional volumes of ~~turb~~ slightly cloudy water

WELL SAMPLING WORKSHEET

001609-
0015-01C-
003

Job Name Rose Hill Job No. _____ Samplers SC + SO

Well ID OW-27 Date Sampled 6/27/91 Time: Start 12:00 End 1:10

Casing Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. 17.60 ft. Standing water (gal.) = ~~.06~~ .1 SC

Depth of water from T.O.C. 16.46 ft. x 3 well volumes

Feet of standing water ~~1.14~~ (h) ft. = 0.183 gallons to purge

PID Readings (ppm)

Breathing _____

Well _____

Standing Water Volume = π [(d)² ÷ 4] (h) .092 × ~~.64~~ 1.14

= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals

Purging method Waterra Pump Purge: Time Start 12:10 End 12:30

		pH	Conductivity	Temperature, (C)
1 well volume = 0.3	gal.	6.16	640	14
2 well volume = 0.3	gal.	6.10	640	14
3 well volume = 0.3	gal.	6.27	520	13
~~Final~~ Final volume = 0.3	gal.	6.25	640	13 ~~15~~ 14

Sample Collection: Time Start 1230 End 1305 Bailer ID# _____

6.58 810

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum _____

Describe color: colorless (black) brown orange red _____

Describe appearance: turbid (silty) sand clay floaters (sheen) _____

clear multiphased foaming slimy algae

Organic Layer? _____ Length? _____ Samples preserved? _____

Comments _____

WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 010-003 Samplers SC & SC

Well ID 1.5" OW30 Date Sampled 6/27/91 Time: Start 2:50 End 3:25

Casing Diameter 1.5 inches ÷ 12 = _____ (d)ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. 16.0 ft. Standing water (gal.) = .86

Depth of water from T.O.C. 6.7 ft. x 3 well volumes

Feet of standing water 9.3 (h) ft. = 2.6 gallons to purge

Standing Water Volume	= π [(d)² ÷ 4] (h) .092 × 9.3
	= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals

PID Readings (ppm)

Breathing _____

Well _____

Purging method Waterra Pump Purge: Time Start 3:00 End 1515

		pH	Conductivity	Temperature, (C)
1 well volume = 0.9	gal.	6.64 ~~7.21~~	575	15°C
2 well volume = 0.9	gal.	6.41	595	14.5°C
3 well volume = 0.9	gal.	6.53	599	14°C
Final volume = _____	gal.	~~7~~ 680	750	15

Sample Collection: Time Start 1530 End 1600 Bailer ID# _____

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty (petroleum) _____

Describe color: colorless black (brown) orange red _____

Describe appearance: (turbid) (oily) sand clay floaters sheen

clear multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? _____

Comments _____

WELL SAMPLING WORKSHEET

Job Name Rose Hill CI Job No. 00409 Samplers D.H. Berler / P. Eunus

Well ID OW25 Date Sampled 06-27-91 Time: Start 11:00 End _____

Casing Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. 36.73 ft. Standing water (gal.) = .13

Depth of water from T.O.C. 34.68 ft. x _____ well volumes

Feet of standing water ~~[illegible]~~ 2.05 (h) ft. = _____ gallons to purge

Standing Water Volume	= π [(d)² ÷ 4] (h)
	= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)

Breathing _____

Well _____

Purging method Vacuum Pump Purge: Time Start _____ End _____

		pH	Conductivity	Temperature, (C)
1 well volume = 0.2	gal.	6.64	5600	22.5
2 well volume = _____	gal.			
3 well volume = _____	gal.			
Final volume = _____	gal.			

Sample Collection: Time Start _____ End _____ Bailer ID# _____

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum _____

Describe color: colorless (black) brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? _____

Comments _____

WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 004609-009-010-003 Samplers SC + PDG

Well ID MW 02 Date Sampled 6/20/91 Time: Start 12:20 PM End 2:45

Casing Diameter 1.5 Inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y) N

Depth of well from T.O.C. 29.96 ft. Standing water (gal.) = 0.92

Depth of water from T.O.C. 20.00 ft. x 3 well volumes

Feet of standing water 9.96 (h) ft. = 2.75 gallons to purge

Standing Water Volume	= π [(d)² ÷ 4] (h) 9.96 x .092 = 0.92
	= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals

PID Readings (ppm)

Breathing 0.0

Well 0.0

Purging method Bailer 125-l teflon Purge: Time Start 12:25 PM End 13:40

		pH	Conductivity	Temperature, (C)
1 well volume = .9	gal.	6.33	260	16
2 well volume = .9	gal.	6.36	300	14
3 well volume = .9	gal.	6.34	280	15
~~Final volume~~ =	gal.	6.30	260	14.5

Sample Collection: Time Start 13:45 End 14:45 Bailer ID# _____

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown (orange) red turned orange later

Describe appearance: turbid silty sand clay floaters sheen

(clear) multiphased foaming slimy algae minor silt

Organic Layer? No Length? _____ Samples preserved? _____

Comments _____

WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 004605 (001801003) Samplers PO6 + SC

Well ID MW-01 Date Sampled 6/20/91 Time: Start 0840 End

Casing Diameter 1.50 inches ÷ 12 = (d) ft. Well secured upon arrival? (Y) (N) but covered with ice

Depth of well from T.O.C. 26.66 ft. Standing water (gal.) = 1.5

Depth of water from T.O.C. 10.34 ft. x 3 well volumes

Feet of standing water 16.32 (h) ft. = 4.5 gallons to purge

16.32 x 0.092 = 1.5 gal/purge

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals

PID Readings (ppm)
Breathing 0.0
Well 0.0

Purging method Bailer (PE/Teflon) Purge: Time Start 0850 End

		pH	Conductivity (umhos/cm)	Temperature, (C)
1 well volume = 1.5	gal.	~~6.25~~ 6.13	21	11.0
2 well volume = 3.0	gal.	6.48	21	10.5
3 well volume = 4.5	gal.	6.14	20	10.8
Final volume = after Sample	gal.	6.13	21	12.5

NO PID, Cl clear, No odor

Sample Collection: Time Start 1000 End 10:45 Bailer ID# Dedicated

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen _____
clear multiphased foaming slimy algae

Organic Layer? No Length? — Samples preserved? yes

Comments First bailer full is clear, no apparent odor

THIS Well is BAILED + SAMPLED w/ Bailer from

WELL SAMPLING WORKSHEET

Job Name Rock Hill Job No. WA #18 Samplers Slogodzieski / Gar

Well ID MW-03 Date Sampled 6/26/91 Time: Start 9:15 End 12:05

Casing Diameter _____ inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. 19.65 ft. Standing water (gal.) = _____

Depth of water from T.O.C. 11.8 ft. x .72 well volumes

Feet of standing water 7.85 (h) ft. = 2.16 gallons to purge

Standing Water Volume	= $\pi [(d)^2 \div 4] (h)$
	= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = 2.16 gals.

PID Readings (ppm)

Breathing _____

Well _____

Purging method Waterra Pump Purge: Time Start 9:30 End 9:55

			pH	Conductivity	Temperature, (C)
1 well volume =	.75	gal.	6.54	40	13
2 well volume =	.75	gal.	7.48	22	12
3 well volume =	.75	gal.	7.44	30	13
Final volume =	.75	gal.	7.30	45	13
	.75		6.94	51	11

Sample Collection: Time Start 10:00 End 12:00 Bailer ID# _____

AFTER SAMPLING 7.25 72 14

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black (brown) orange red _____

Describe appearance: turbid (silty) sand clay floaters sheen

clear multiphased foaming slimy algae _____

Organic Layer? No Length? _____ Samples preserved? _____

Comments _____

WELL SAMPLING WORKSHEETS - SEPTEMBER/OCTOBER 1991

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers Dash U.Y./Kris A./Jim F.

Well ID MW-01-01 Date Sampled 10/1/91 Time: Start 0815 End _____

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 5.6 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 19.7 (19.7) ft.

Feet of standing water ~~8.4~~ 14.1 (h) ft. Standing water (gal.) = ~~1.4~~ 2.4

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.0

purge H_2O - f

Purging method BAILER Purge: Time Start 1040 End 11:10

			pH	Conductivity	Temperature, (C)
1 well volume =	2.4	gal.	(5.93) 5.47	(145) 180	~~25.0~~ NM
2 well volume =	4.8	gal.	5.66	185	– NM
3 well volume =	9.6	gal.	5.91	185	
		Final =	6.21	200	NM

Final water level = 5.9 (from T.O. PVC)

Sample Collection: Time Start 11:15 End 11:53

Sampling method BAIL Bailer Type Teflon

purge - 0

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red lt brown

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? No Length? — Samples preserved? Y - HCL for VOAs

Comments Smp - dwgt - colorless
~~Smp - other - silty/brn~~

Refer to page _____ of the corresponding field log book.

revised 9/16/91

NM - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers BARB W/ KRIS A. / JIM F.

Well ID MW-01-02 Date Sampled Purged 10/1/91 and 10/2/91 Time: Start 0815 End 8 45

Well Diameter 6 inches ÷ 12 = . (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 6.0 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 81.0 (81.2) ft.

Feet of standing water 75 (h) ft. Standing water (gal.) = ~~3~~ 110

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.0
Background 10/2/91 - 2.0-2.5
well - " "

Purging method Submersible Purge: Time Start 0908 (Sampled 10/2/91) End 16 45

		pH (9.6)	Conductivity (150)	Temperature, (C)
1 well volume = 110	gal.	7.76	160	12°C
2 well volume = 220	gal.	5.3	110	10°C
3 well volume = 330	gal.	7.1	110	10°C
Final =				

Final water level = ≈ 21' / 6" on 10/2/91 (from T.O. PVC)

Sample Collection: Time Start 710 End 750

Sampling method Bailer, Filter for meta's (10/2/91) Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy (musty) petroleum

Describe color: colorless black brown orange red — lt. brown to clear

Describe appearance: turbid (silty) sand clay floaters sheen
(clear) multiphased foaming slimy algae — initial silt, then clear

Organic Layer? NO Length? — Samples preserved? _____

Comments Background PID Readings 2.0-2.5 ppm 7" 10/2/91
SULFIDE SAMPLE REQUIRED AT 0943 (MISSED THE BOTTLE

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

Job Name ROSE HILL Job No. 004609-0018 Samplers K. Arena + J. Fenstermacher

Well ID MW-03-01 Date Sampled 10/2/91 Time: Start 1215 End 1610

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 2.8 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 14.6 (14.6) ft.

Feet of standing water 12.8 (h) ft. Standing water (gal.) = 21

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 1.6 (1.2 bkg)
Well

Purging method BAILING Purge: Time Start 1225 End 1430

			(6.35) pH	(450) Conductivity	Temperature, (C)	Time
1 well volume =	2.1	gal.	5.98	340	13°	1233
2 well volume =	4.2	gal.	7.15	400	13°	1435
3 well volume =	6.3	gal.	7.29	540	13°	1421
Final =			6.70	440	12°	1610

Final water level = 2.75 (from T.O. PVC)

Sample Collection: Time Start ~~1225~~ 1530 End 1600

Sampling method BAILER Bailer Type

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? X Length? X Samples preserved? ICE

Comments

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 001609-0018 Samplers K. Arenat J. Feathermacher

Well ID MW-03-02 Date Sampled 10/2/91 Time: Start 12:30 End 15:30

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 1.8 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 47.7 ft.

Feet of standing water 45.9 (h) ft. Standing water (gal.) = 7.3 (7.5) (47.7)

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing ____
Well ____

Purging method BAILING Purge: Time Start 12:20 End 15:00

			pH (9.48)	Conductivity (280)	Temperature, (C)
1 well volume =	7.3	gal.	7.02	800	12°
2 well volume =	14.5	gal.	7.03	800	11°
3 well volume =	22.0	gal.	7.19	800	10°
		Final =	N/A	N/A	N/A

Final water level = ~~[illegible]~~ 1.7 (from T.O. PVC)

Sample Collection: Time Start ~~[illegible]~~ 15:00 End 15:30

Sampling method BAILER Bailer Type ____

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: (colorless) black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae ____

Organic Layer? ✓ Length? X Samples preserved? ICE

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

N.M. N.I. + Measured

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers K. Arena J Feustman

Well ID MW-03-03 Date Sampled 10/2/91 Time: Start 1140 End 1600

Well Diameter 6 inches ÷ 12 = . (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. N.M. ft. Depth of water from ~~T.O. PVC~~ TOP OF CASING 2.0 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 143.4 (143.4) ft.

Feet of standing water 141.4 (h) ft. Standing water (gal.) = 207

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(___ ft)² ÷ 4] (___ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm) 10/3/91
Breathing 0 0ppm
Well (m7) / 1.9 ppm

Purging method Submersible pump Purge: Time Start 11:22 End

			(6.95) pH	(150) Conductivity	Temperature, (C)
1 well volume =	207	gal.	6.34	140	N/M.
2 well volume =	414	gal.	6.90	140	11°C
3 well volume =	621	gal.	7.50	140	12°C
A. Mason 10/3/91		Final =	(9.14)	120	13.2

Final water level = _____ (from T.O. PVC)

Sample Collection: Time Start ~~Below 730~~ 730 End 830

Sampling method Submersable pump Bailer Type _____

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? NO Length? _____ Samples preserved? _____

Comments Sample taken day after purging - 10/3/91
Duplicate sample collected here 730

Refer to page 35-39 of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

Job Name ROSE HILL Job No. 004609-0018 Samplers K. Arena + J. Feustermaker

Well ID MW-04-01 Date Sampled 10/3/91 Time: Start _____ End _____

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 4.39 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 15.05 (15.0) ft.

Feet of standing water 10.61 (h) ft. Standing water (gal.) = 1.8

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.0

Purging method Bailing Purge: Time Start 11:36 End _____

			pH (6.44)	Conductivity (230)	Temperature, (C)
1 well volume =	1.8	gal.	6.85	395	14.5
2 well volume =	3.6	gal.	6.58	300	15.2
3 well volume =	5.4	gal.	7.10	300	14.8
		Final =	6.90	290	15.2

Final water level = 4.50 (from T.O. PVC)

Sample Collection: Time Start 13:40 End 14:10

Sampling method Bailer Bailer Type _____

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? X Length? X Samples preserved? ICE

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers K. Arena, J. Feustermacher

Well ID MW-04-02 Date Sampled 10/3/91 Time: Start _____ End _____

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 4.28 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 31.98 (31.9) ft.

Feet of standing water 27.70 (h) ft. Standing water (gal.) = 4.6

2" well

Standing Water Volume = $\pi[(d)^2 \div 4](h)$

= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)

Breathing 0.0

Well 1.9

Purging method Bailing Purge: Time Start 11:40 End 12:15

		(6.81) pH	(850) Conductivity	Temperature, (C)
1 well volume =	4.6 gal.	6.91	860	13.1
2 well volume =	9.2 gal.	6.79	980	12.0
3 well volume =	13.8 gal.	7.07	960	12.1
Final =		7.22	1000	12.4

Final water level = 4.35 (from T.O. PVC)

Sample Collection: Time Start 12:30 End 12:49

Sampling method Bailer Bailer Type _____

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide (fishy) musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid (silty) sand clay floaters sheen

clear multiphased foaming slimy algae _____

Organic Layer? NO Length? _____ Samples preserved? _____

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N.M- NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers K. Arena / J. Fenstermaker

Well ID MW-04-03 Date Sampled 10/7/91 Time: Start 1102 End 1130

Well Diameter 6 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 6.6 ft. (89.9' on 10/7/91)

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 140 ft. (140)

Feet of standing water 133.4 (h) ft. Standing water (gal.) = 195

Standing Water Volume = π[(d)² ÷ 4] (h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.0
Pump off: 11:41
Pump on:

Purging method Submersible Purge Date 10/3/91 Purge: Time Start 11:09 End 1215

		pH (9.21)	Conductivity (220)	Temperature, (C)
1 well volume =	195 (did 179) gal.			
2 well volume =	390 gal.			
3 well volume =	585 gal.			
10/7/91 before sampling 7.5 gal Final =		7.05 7.55	370 340	12.4 11.4

Final water level = 95.12 (from T.O. PVC)

Sample Collection: Time Start 1102 End 1130

Sampling method BAILER Bailer Type ____

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum NONE

Describe color: colorless black brown orange red gray

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae very slightly silty

Organic Layer? ____ Length? ____ Samples preserved? ____

Comments The well did not recharge well — only volume of 179 gallons purged
purged another 5' of water (37.5 gallons) on 10/7/91

Refer to page 40 - 44 of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers K. Arena, J. Fenstermacher

Well ID MW-06-01 Date Sampled 10/4/91 Time: Start 1045 End 11:10

Well Diameter 2 inches ÷ 12 = ___ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 4.8 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 20.3 (20.3) ft.

Feet of standing water 15.5 (h) ft. Standing water (gal.) = 2.5

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = ___ gals.

PID Readings (ppm)
Breathing 0.0
Well 3.0

Purging method Bailer Purge: Time Start 1020 End 1040

		pH (6.83)	Conductivity (540)	Temperature, (C)
1 well volume =	2.5 gal.	6.85	220	18.4
2 well volume =	5.0 gal.	6.41	200	18.7
3 well volume =	7.5 gal.	6.90	230	18.2
Final =		6.26	210	19.4

Final water level = 5.7 (from T.O. PVC)

Sample Collection: Time Start 1045 End 11:10

Sampling method Bailer Bailer Type ___

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum — sulfide

Describe color: colorless black brown orange red — grayish

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae — vaguely silty

Organic Layer? NO Length? ___ Samples preserved? ___

Comments ___

Refer to page ___ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING LOG

Job Name ROSEHILL Job No. 001609-0018 Samplers K. Arenz + J. Fenstermacher

Well ID MW-06-02 Date Sampled 10/4/91 Time: Start 1015 End 1140

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 5.28 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 34.10 (34.1) ft.

Feet of standing water ~~29.10~~ KA (h) ft. 28.92 or 29.0 Standing water (gal.) = 4.7

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.2

Purging method Bailer Purge: Time Start 1015 End 1120

			(7.22) pH	(1610) Conductivity	Temperature, (C)
1 well volume =	4.7	gal.	7.0	1600	13.4
2 well volume =	9.0 9.7	gal.	7.00	1600	13.9
3 well volume =	14.2	gal.	6.94	1500	14.0
Final =			7.0	1600	

Final water level = 5.6 (from T.O. PVC)

Sample Collection: Time Start 1130 End 1140

Sampling method Bailing Bailer Type ____

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum — Sulfide

Describe color: colorless black brown orange red — light gray

Describe appearance: (turbid) silty sand clay floaters sheen — slightly silty-turbid
clear multiphased foaming slimy algae

Organic Layer? ____ Length? ____ Samples preserved? ____

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 001609-0018 Samplers J. Fenstermacher / K. Are

Well ID MW-08-02 Date Sampled 10/7/91 Time: Start 14:15 End 15:45

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 7.66 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 27.9 (27.8) ft.

Feet of standing water 20.3 (h) ft. Standing water (gal.) = ____

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 3.5 ppm

Purging method BAIL Purge: Time Start 1430 End 1530

		pH (9.61)	Conductivity (300)	Temperature, (C)
1 well volume =	~~6.6~~ 3.3 gal.	10.35	510	17
2 well volume =	~~13.2~~ 9.8 gal.	9.81	240	17
3 well volume =	~~19.8~~ 16.3 gal.	9.6	230	17
Final =		8.47	210	17

Final water level = 7.65 (from T.O. PVC)

Sample Collection: Time Start 1530 End 1545

Sampling method BAILER Bailer Type ____

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: (colorless) black brown orange red ____

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? X Length? X Samples preserved? ICE

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 001609-0018 Samplers K. ARENA / J. FENSTERMACHER

Well ID MW-08-01 Date Sampled 10/7/91 Time: Start 14:15 End 1530

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 5.66 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 15.26 ~~(15.3)~~ ft.

Feet of standing water 9.6 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 15.2

Purging method BAIL Purge: Time Start 14:30 End 1456

			pH (8.1)	Conductivity (80)	Temperature, (C)
1 well volume =	1.6	gal.	6.56	160	17
2 well volume =	4.9	gal.	6.74	160	17
3 well volume =	8.2	gal.	7.10	170	16.5
Final =			7.10	170	16.0

Final water level = 6.85 (from T.O. PVC)

Sample Collection: Time Start 1456 End 1520

Sampling method BAIL Bailer Type _____

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum

Describe color: 2 (colorless) black brown 1 (orange) red — (1) INITIAL (2) FINAL

Describe appearance: 1 (turbid) silty sand clay floaters sheen — (1) INITIAL (2) FINAL
2 (clear) multiphased foaming slimy algae

Organic Layer? X Length? X Samples preserved? ICE

Comments Bailer started deep orange color, 3 well volumes it turned clear. Samples were clear

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 001.09-0018 Samplers K. Arena + J. Feinstein

Well ID MW-12-01 Date Sampled 10/8/91 Time: Start 750 End _____

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 2.02 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 19.7 (19.7) ft.

Feet of standing water 17.68 (h) ft. Standing water (gal.) = ~~2.88~~

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.0

Purging method Bailer Purge: Time Start 750 End _____

		pH	Conductivity	Temperature, (C)
1 well volume =	2.8 gal.	7.2 (6.01)	120 (320)	11.5
2 well volume =	5.6 gal.	6.08	150	10.5
3 well volume =	8.4 gal.	5.96	120	11.2
	Final =	6.09	120	10.6

Final water level = 2.88 (from T.O. PVC)

Sample Collection: Time Start 815 End 842

Sampling method Bailer Bailer Type _____

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum sulfide

Describe color: colorless black brown (orange) red orange

Describe appearance: turbid (silty) sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? _____ Length? _____ Samples preserved? YES

Comments Noted sheen (clumpy) on water surface after bucket was poured out on ground after purging

Refer to page 47 of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 001609-0018 Samplers K. Arena + J. Fenstermacher

Well ID MW-12-02 Date Sampled 10/8/91 Time: Start 850 End 920

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 2.78 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 45.2 (45.23) ft.

Feet of standing water 42.42 (h) ft. Standing water (gal.) = 7.0

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.0

Purging method Bailer Purge: Time Start 750 End

			(6.4) pH	(140) Conductivity	Temperature, (C)
1 well volume =	7.0	gal.	6.04	380	12.2
2 well volume =	14.0	gal.	5.8	400	11.8
3 well volume =	21.0	gal.	5.85	440	11.7
		Final =	6.54 (after 1 min)	420	13.0

Final water level = 2.02 (from T.O. PVC)

Sample Collection: Time Start 850 End 920

Sampling method Bailer Bailer Type

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum — SulFide

Describe color: colorless black brown orange red — GRAY

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae — SILTY

Organic Layer? _____ Length? _____ Samples preserved? YES - VOAs at site

Comments Sample Duplicate taken from this well MW-12-02 - FD-319-2

Refer to page 47 of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Jim

Job Name ROSE HILL Job No. 00-1109-0018 Samplers K. Arcan, S. O'Brien, J. Fee

Well ID MW-13-01 Date Sampled 10/8/91 Time: Start 1145 End 1200

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from .O.C. N.M. ft. Depth of water from T.O. PVC 8.94 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 20.20 (20.28) ft.

Feet of standing water 11.26 (h) ft. Standing water (gal.) = 1.8

Standing Water Volume	= π [(d)^2 ÷ 4] (h)
	= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)

Breathing 0.0 ppm

Well 7.4 ppm

Purging method BAILER Purge: Time Start 1130 End 11

		pH (6.05)	Conductivity (310)	Temperature, (C)
1 well volume = 1.8	gal.	6.2	180	12.8
2 well volume = 3.6	gal.	6.86	190	12.5
3 well volume = 5.4	gal.	6.84	175	12.7
	Final =	7.01	175	13.0

Final water level = 9.0 (from T.O. PVC)

Sample Collection: Time Start 1145 End 1200

Sampling method BAILER Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum NONE

Describe color: colorless black brown orange red lt. gray

Describe appearance: turbid silty sand clay floaters sheen

clear multiphased foaming slimy algae

slightly turbid

Organic Layer? ____ Length? ____ Samples preserved? ____

Comments ____

Refer to page 48 of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

SEAW

Job Name ROSE HILL _____ Job No. 001609-0018 Samplers K. Arena, J. Feuttermacher, S. O'Brien

Well ID MW-13-02 Date Sampled 10/8/91 Time: Start ~~1100~~ 1125 End 123

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 9.17 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 29.9 ft.

Feet of standing water 17.73 (h) ft. Standing water (gal.) = ~~17.73~~ (29.9) 2.9

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 11.7

Purging method BAILER Purge: Time Start 11:25 End 12:00

			(6.36) pH	(295) Conductivity	Temperature, (C)
1 well volume =	2.9	gal.	6.4	290	11.3
2 well volume =	5.8	gal.	6.82	340	11.1
3 well volume =	8.7	gal.	6.87	335	10.6
Final =			6.43	330	11.0

Final water level = 9.20 (from T.O. PVC)

Sample Collection: Time Start 1200 End 1215

Sampling method BAILER Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum NONE

Describe color: colorless black brown orange red gray

Describe appearance: (turbid) (silty) sand clay floaters sheen
clear multiphased foaming slimy algae turbid to silty

Organic Layer? X Length? X Samples preserved? _____

Comments _____

Refer to page 48 of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

Job Name ROSE HILL Job No. 001609-0018 Samplers BA, JF

Well ID MW-14-01 Date Sampled 10/1/91 Time: Start 1530 End 1600

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 27.7 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 34.8 (34.8) ft.

Feet of standing water 7.0 (h) ft. Standing water (gal.) = 1.1

Standing Water Volume = π[(d)^2÷4](h)
= 3.14 [(___ ft)^2÷4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0 ppm
Well 7.5 ppm

Purging method BAILER Purge: Time Start 1505 End 1530

		(7.3) pH	(1800) Conductivity	Temperature, (C)
1 well volume =	1.1 gal.	5.9	2200	14.0
2 well volume =	2.2 gal.	6.1	2200	13.8
3 well volume =	3.4 gal.	6.1	2100	13.0
Final =		6.3	2150	13.0

Final water level = _____ (from T.O. PVC)

Sample Collection: Time Start 1530 End 1600

Sampling method Bailer Bailer Type TEFLON

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum Garbage- landfill

Describe color: colorless black brown orange red Grey/GREEN TIN

Describe appearance: (turbid) (silty) sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? NO Length? — Samples preserved? —

Comments UPON FILTRATION UNDER N_2 PUMP FOAMS UP.

Refer to page 34 of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers LB, SP & SC

Well ID MW-02-01 Date Sampled 10/8/91 Time: Start 1122hrs End 1305h

Well Diameter 2 inches ÷ 12 = — (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 23.9 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 35.8 (35.6) ft.

Feet of standing water 11.9 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π[(d)²÷4] (h)
= 3.14 [(___ ft)² ÷ 4] (___ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method 2" Bailer Purge: Time Start 1140 hrs End 1204hrs

		pH (6.11)	Conductivity (200)	Temperature, (C)
1 well volume =	2 gal.	7.55	140	11°
2 well volume =	4 gal.	6.10	100	11°
3 well volume =	6 gal.	6.02	95	11°
Final =		6.64	50	11°

Final water level = 23.9' (from T.O. PVC)

Sample Collection: Time Start 1210hrs End 1305hrs

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? None Length? — Samples preserved? ✓

Comments NMW-02-01-NX-G-183-2
Field Dup NMW-02-01-FD-G-318-2

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers LB, SP, & SC

Well ID MW-02-02 Date Sampled 10/8/91 Time: Start 1122 hrs End 1240

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 23.55 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 71.2 (70.27) ft.

Feet of standing water 47.65 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(___ ft)² ÷ 4] (___ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method 2" Bailer Purge: Time Start 1140 hrs End 1300 hrs

			pH (6.16)	Conductivity (160)	Temperature, (C)
1 well volume =	7.7	gal.	6.12	95	11°
2 well volume =	15.4	gal.	8.45	120	10°
3 well volume =	23.1	gal.	7.58	80	10°
	20.8	Purge	7.26	80	10°
Final water level =	23.6	(from T.O. PVC)	6.52	80	10°

Sample Collection: Time Start 1310 hrs End 1325

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? None Length? — Samples preserved? ✓

Comments MWFLDQC-10-08-E-294-2
Use Bailer from Eq Blank 294
NMW-02-02-NX-G-184-2

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers LB+SC

Well ID MW-05-01 Date Sampled 10/7/91 Time: Start 12:35 End

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 6.45 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 17.95 (18.7) ft.

Feet of standing water 11.5 (h) ft. Standing water (gal.) = ~~[illegible]~~ 1.9

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = 1.9 gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Bailer - 2" Purge: Time Start 12:40 End 1301

			(6.11) pH	(65) Conductivity	Temperature, (C)
1 well volume =	2	gal.	~~5.35~~	~~77~~	~~10~~ sc no readings taken
2 well volume =	2	gal.	5.35	77	10
3 well volume =	2	gal.	5.95	74	10
4 well vol =	2	g=1.	5.98	73	10
		Final =	6.20	72	10

Final water level = 6.5 (from T.O. PVC)

Sample Collection: Time Start 1305 End 13:24

Sampling method Bailer 2" Bailer Type 2" Teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum

Describe color: colorless black (tan) brown orange red — tan

Describe appearance: turbid (silty) sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? No Length? Samples preserved? Yes

Comments

20, 21 2 pictures ♀

Refer to page ___ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers LB + SC

Well ID MW-05-02 Date Sampled 10-7-91 Time: Start 1150 hrs End 1430

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y) N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 6.95 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 29.05 (29.2) ft.

Feet of standing water 22.1 (h) ft. Standing water (gal.) = 3.6

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = 3.6 gals.

PID Readings (ppm)
Breathing 0
Well 0
LEL = 2 Background in well

Purging method Bailer Purge: Time Start 1331 hrs (1331 hrs) End 1348 hrs

		pH	Conductivity	Temperature, (C)
1 well volume =	(3.6) 3.6 gal.	(6.3) 6.61	(75) 84	11°
2 well volume =	7.2 gal.	6.50	81	
3 well volume =	10.8 gal.	6.10	82	9°
Final =		6.25	84	11°

Final water level = 6.75 (from T.O. PVC)

Sample Collection: Time Start 1350 hrs End 1420 hrs

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red tan

Describe appearance: turbid (silty) sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? NONE Length? — Samples preserved? ✓

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

N M - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004109-008 Samplers LB + SC

Well ID MW-07-01 Date Sampled 10/4/91 Time: Start 1340 hrs End 1450 hrs

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 20.1 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 33.15 (34.3) ft.

Feet of standing water 13.05 (h) ft. Standing water (gal.) = _____

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method 2" Bailer Purge: Time Start 1350 hrs End 1611 hrs

		(606) pH	(850) Conductivity	Temperature, (C)
1 well volume = 2	gal.	7.50	640	14°
2 well volume = 4	gal.	6.35	625	13°
3 well volume = 6	gal.	6.32	595	13°
	Final =	6.35	590	13°

Final water level = 20.0 (from T.O. PVC)

Sample Collection: Time Start 1415 hrs End 1430 hrs

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black-grey brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? — Length? — Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING FORM

Job Name ROSE HILL Job No. 001109-0018 Samplers LB + SC

Well ID MW-07-02 Date Sampled 10/4/91 Time: Start 1300 hrs End _____

Well Diameter 4 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 22.1 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 72.35 (73.0) ft.

Feet of standing water 50.25 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π[(d)²÷4](h)
= 3.14[(___ ft)²÷4](___ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0
Well initially 31.0 ppm steady @ 5 ppm
LEL=0

Purging method Brainard-Kilman Pump Purge: Time Start 1515 hrs End _____

		pH	Conductivity	Temperature, (C)
1 well volume =	~~32.6~~ 33 gal.	(12.1) 11.2	(8200) 3600	12°
2 well volume =	_____ gal.	_____	_____	_____
3 well volume =	_____ gal.	_____	_____	_____
Final =		_____	_____	_____

½ into next well volume, well ran dry. Stopped Effort → see 10/7 NMW-07 sheet

Final water level = _____ (from T.O. PVC)

Sample Collection: Time Start _____ End _____

Sampling method _____ Bailer Type _____

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? _____

Comments _____

Refer to page (very last) of this book of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELLS

Job Name ROSE HILL Job No. 001109-0018 Samplers LB+KA

Well ID MW-09-01 Date Sampled 10/9/91 Time: Start 0730 End 0930

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC ~~18.1~~ 17.5 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 35.3 (35.3) ft.

Feet of standing water 17.8 (h) ft. Standing water (gal.) = ____

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Bailer Purge: Time Start 0755 hrs End 0812 hrs

		pH (8.1)	Conductivity (80)	Temperature, (C)	
1 well volume =	3 gal.	8.10	280	8°	Low Bat
2 well volume =	6 gal.	7.17	130	8.5°	
3 well volume =	9 gal.	6.65	120	8.5°	
Final =		6.76	90	9°	

Final water level = 17.5 (from T.O. PVC)

Sample Collection: Time Start 0815 hrs End 0920 hrs

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red tan

Describe appearance: turbid (silty) sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? ____ Length? ____ Samples preserved? ✓

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

N M. - NOT MEASURED

Job Name ROSE HILL Job No. 001109-0018 Samplers LB, SC & SP

Well ID MW-10-01 Date Sampled 10/8/91 Time: Start 1430 End 1545

Well Diameter 2 inches ÷ 12 = .__ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 8.5 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 37.5 (37.6) ft.

Feet of standing water 29 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π[(d)² ÷ 4] (h)
= 3.14 [(__ ft)² ÷ 4] (__ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm) CG1=0
Breathing 0
Well 300=max
was properly calibrated 100-107
low battery signal on

Purging method Bailer Purge: Time Start 1500 End 1520

			(6.24) pH	(75) Conductivity	Temperature, (C)
1 well volume =	4.7	gal.	8.80	115	10°
2 well volume =	9.4	gal.	8.38	150	10°
3 well volume =	14.1 / 18.8	gal.	8.06	50	10
			7.95	50	10°
		Final =	6.6	50	10

Final water level = 8.55 (from T.O. PVC)

Sample Collection: Time Start 1530 End 1545

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? None Length? — Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

N M. - NOT MEASURED

Job Name ROSE HILL Job No. 00-1109-0016 Samplers LB + SC

Well ID MW-11-01 Date Sampled 10/3/91 Time: Start 1420 hrs End 1545 hr

Well Diameter 2 inches ÷ 12 = ___ (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 8.2' ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 22.3' (23.1) ft.

Feet of standing water 14.1 (h) ft. Standing water (gal.) = ___

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(___ ft)²÷4] (___ ft) x 7.48 gal/ft³ = ___ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method 2" bailer Purge: Time Start 1430 hrs End 1445 hrs

			(6.47) pH	(668) Conductivity	Temperature, (C)
1 well volume =	2.3	gal.	6.50	110	—
2 well volume =	4.6	gal.	6.44	105	—
3 well volume =	6.9	gal.	6.37	100	—
		Final =	6.60	100	—

Final water level = 8.45 (from T.O. PVC)

Sample Collection: Time Start 1450 hrs End 1530

Sampling method bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ish

Describe color: colorless black brown orange red

Describe appearance: turbid very fine silty sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? ___ Length? ___ Samples preserved? ✓

Comments ___

Refer to page ___ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING LOG

Job Name ROSE HILL Job No. 001109-0018 Samplers LB & SC

Well ID MW-11-02 Date Sampled 10/4/91 Time: Start 0855hrs End 0955hrs

Well Diameter 2 inches ÷ 12 = . (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 7.1 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 44.7 (45.17) ft.

Feet of standing water 37.6 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(___ ft)² ÷ 4] (___ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method 2" bailer Purge: Time Start 0915 hrs End 0948hrs

			pH (6.56)	Conductivity (1380)	Temperature, (C)
1 well volume =	6 gals	gal.	6.97	1250	11°
2 well volume =	12.0	gal.	6.69	1200	11°
3 well volume =	18.0	gal.	6.71	1200	11°
		Final =	6.75	1150	11°

Final water level = 7.15 (from T.O. PVC)

Sample Collection: Time Start 0950 hrs End 1005 hrs

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty faint petroleum _____

Describe color: colorless black brown orange red grey

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 8/16/91

N M. - NOT MEASURED

Job Name ROSE HILL Job No. 001109-0018 Samplers LB + SC

Well ID MW-11-03 Date Sampled 10/4/91 Time: Start 0705 hrs End 1030 hrs

Well Diameter 4 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 5.1 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 78.2 (78.3) ft.

Feet of standing water 73.1 (h) ft. Standing water (gal.) = ____

Standing Water Volume = π[(d)² ÷ 4] (h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = ____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Brainard-Kilman Purge: Time Start 0745 hrs End 1030 hrs

		pH	Conductivity	Temperature, (C)
		(9.4)	(690)	
1 well volume =	47.6 gal.	7.42	360	10°
2 well volume =	95.2 gal.	7.59	360	11°
3 well volume =	142.8 gal.	7.42	360	11°
	Final =	7.86	295	11°

Final water level = 40.35 (from T.O. PVC)

Sample Collection: Time Start 1050 hrs End 1115 hrs

Sampling method bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red pale yellow

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae ____

Organic Layer? — Length? — Samples preserved? ✓

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

N.M. - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 00469-D018 Samplers LB + SC

Well ID MW-01-00 (MW-I) Date Sampled 10-01-91 Time: Start 1300 hrs End 1600

Well Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 11.2 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 26.7 (26.4) ft.

Feet of standing water 15.5 (h) ft. Standing water (gal.) = _____

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Wattera Purge: Time Start 1500 hrs End 1530 hrs

			(6.13) pH	(21) Conductivity	Temperature, (C)
1 well volume =	1.5	gal.	8.08	185	14°
2 well volume =	3.0	gal.	7.36	25	13.5°
3 well volume =	4.5 / 6.0	gal.	7.99 / 8.09	110 / 120	12.5 / 13°
Final =			8.25	120	13°

Final water level = 11.2' (from T.O. PVC)

Sample Collection: Time Start 1531 hrs End 1550 hrs

Sampling method bailer / wattera Bailer Type HDPE 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red tan/grey appears due to silt

Describe appearance: (turbid) (silty) sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

NM - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004409-D018 Samplers LB + SC

Well ID MW-02-00 (MW-II) Date Sampled 10/01/91 Time: Start 0735 hrs End 0834 h

Well Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 21.3 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 28.45 (29.9) ft.

Feet of standing water 7.15 (h) ft. Standing water (gal.) = [illegible]

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Wattera Purge: Time Start 0755 hrs End 0805 hrs

			pH (6.50)	Conductivity (260)	Temperature, (C)
1 well volume =	0.6	gal.	6.75	415	12°
2 well volume =	1.2	gal.	6.53	290	12°
3 well volume =	1.8	gal.	6.50	270	12°
		Final =	6.48	230	12°

Final water level = 21.3 (from T.O. PVC)

Sample Collection: Time Start 0815 hrs End 0834 hrs

Sampling method Bailer / Wattera Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum matches

Describe color: colorless black brown orange red grey

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? none Length? _____ Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

NM - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-D018 Samplers LB-SC

Well ID MW-03-00 (MW-III) Date Sampled 10/2/91 Time: Start 0900 End 1000hr

Well Diameter 1.5 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 11.25 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 19.4 (19.6) ft.

Feet of standing water 8.15 (h) ft. Standing water (gal.) = ____

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Wattera Purge: Time Start 0910 hrs End 0918 hrs

		(7.25) pH	(72) Conductivity	Temperature, (C)
1 well volume =	0.7 gal.	7.79	32	13.5
2 well volume =	1.4 gal.	7.51	27	13
well volume =	2.1 gal.	7.24	20	13
Final =		6.80	26	13

Final water level = 11.25 (from T.O. PVC)

Sample Collection: Time Start 0920 hrs End 0945 hrs

Sampling method WATERRA/BAILER Bailer Type Teflon 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? NO Length? ____ Samples preserved? ✓

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

NM - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-D018 Samplers LB + SC

Well ID MW-04-00 (MW-IV) Date Sampled 10/2/91 Time: Start 1020 hrs End ~~1050~~ 1150

Well Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y) N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 14.55 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 19.8 (19.3) ft.

Feet of standing water 4.25 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(____ ft)²÷4] (____ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0
Well low O_2 19.6 for 5 secs.

Purging method Wattera Purge: Time Start 1025 hrs End 1045 hrs

			pH (6.2)	Conductivity (210)	Temperature, (C)
1 well volume =	0.5	gal.	6.84	300	13.5°
2 well volume =	~~0.8~~ 1.0	gal.	6.62	240	13°
3 well volume =	1.5	gal.	6.54	245	13°
Final =			6.65	260	13°

Final water level = 14.55 (from T.O. PVC)

Sample Collection: Time Start 1050 hrs End 1115 hrs

Sampling method Bailer / Wattera Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? — Length? _____ Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

NM - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-D018 Samplers LB+SC

Well ID MW-05-00 (MW-V) Date Sampled 10-2-91 Time: Start 1315 hrs End 1430

Well Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 23 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 29.2 (28.7) ft.

Feet of standing water 6.2 (h) ft. Standing water (gal.) = _____

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Wattera Purge: Time Start 1320 hrs End 1340 hrs

		(7.11) pH	(140) Conductivity	Temperature, (C)
1 well volume =	0.6 gal.	8.83	~~755~~ 200	14°
2 well volume =	1.2 gal.	7.67	50	14°
3 well volume =	1.8 gal.	7.15	56	14° – replaced 1 battery
	Final =	5.85	40	14°

Final water level = 23 (from T.O. PVC)

Sample Collection: Time Start 1355 hrs End 1415 hrs

Sampling method Bailer / Wattera Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red light grey

Describe appearance: (turbid) (silty) sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? – Length? – Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

NM – NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers LB+SC

Well ID DW-27 Date Sampled 10-22-91 Time: Start 1450hrs End 1555

Well Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 15.9 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 17.55 (17.6) ft.

Feet of standing water 1.65 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 1.4 ppm

Purging method Wattera Purge: Time Start 1500 hrs End 1507 hrs

		(6.58) pH	(810) Conductivity	Temperature, (C)
1 well volume =	0.1 gal.	6.11	380	17°
2 well volume =	0.2 gal.	6.14	470	14°
3 well volume =	0.3 gal.	6.17	460	14°
	Final =	6.39	420	14°

Final water level = 15.9 (from T.O. PVC)

Sample Collection: Time Start 1513 hrs End 1530 hrs

Sampling method Bailer / Wattera Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum _____

Describe color: colorless black brown orange red grey

Describe appearance: turbid (silty) sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? ✓

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

NM - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-D018 Samplers LB + SC

Well ID OW-30 Date Sampled 10/03/91 Time: Start 0730 End 0830 hrs

Well Diameter 1.5 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 6.05 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 15.9 (w) ft.

Feet of standing water 9.85 (h) ft. Standing water (gal.) = _____

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Wattera Purge: Time Start 0740 hrs End 0757 hrs

		(6.8) pH	(750) Conductivity	Temperature, (C)
1 well volume =	1.0 gal.	6.32	745	15°
2 well volume =	2.0 gal.	6.40	810	15°
3 well volume =	3.0 gal.	6.47	820	15°
	Final =	6.62	860	15.5°

Final water level = 6.25' (from T.O. PVC)

Sample Collection: Time Start 0800 hrs End 0825 hrs

Sampling method Bailer/Wattera Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red grey

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? — Length? — Samples preserved? _____

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

NM - NOT MEASURED

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-0018 Samplers LB + SC

Well ID NMW-07-02 Date Sampled 10-7-91 Time: Start 1000hrs End 1020 hrs 10/8

Well Diameter 4 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 22.3 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 72.3 ft.

Feet of standing water 50 (h) ft. Standing water (gal.) = _____

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing LEL 0-1, PID 0
Well LEL 1, PID 0

Purging method B-K Purge: Time Start 1030 hrs End _____

		pH	Conductivity	Temperature, (C)
1110 hrs 10/7 1 well volume =	33 gal.	12.70	2300	10.5
10/8 2 well volume =	20 gal.	11.36	1130	10°
3 well volume =	_____ gal.	12.54	1200	10°
Final =				

Depth to H_2O 52.3 → 20 ft (13x...)

Final water level = 55.25 (from T.O. PVC)

Sample Collection: Time Start 0950 hrs 10/8 End 1018 hrs

Sampling method Bailer Bailer Type 2"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? None Length? — Samples preserved? ✓

Comments
1451 Depth to H_2O 44.8', 4.1 gallons/220 minutes = .022 gpm
1649 Depth to H_2O 41.6', 2 gallons/2 hrs = .017 gpm

Refer to page _____ of the corresponding field log book.

revised 9/16/91

WELL SAMPLING WORKSHEETS - JANUARY/FEBRUARY 1992

MONITORING WELL SAMPLING WORKSHEET

Job Name Rosehill Job No. 004609-0018 Samplers L. Spence / S. Page

Well ID MW-01-01 Date Sampled 2/4/92 Time: Start 1100 End 1200 hrs

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 2.7 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 17.7 (19.7) ft.

Feet of standing water 17.0 (h) ft. Standing water (gal.) = 2.8

B/B

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(____ ft)²÷4] (____ ft) x 7.48 gal/ft³ = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 1.5

Purging method bailer Purge: Time Start 1110 hrs End 1130 hrs

		pH	Conductivity	Temperature, (C)
		(5.93)	(145)	
1 well volume = 2.8	gal.	6.32	88	3°C
2 well volume = 5.6	gal.	5.67	71	2.5°C
3 well volume = 8.4	gal.	5.86	68	3°C
	Final =	6.25	68	2.5°C

Final water level = 2.7 ft. (from T.O. PVC)

Sample Collection: Time Start 1130 hrs End 1150 hrs

Sampling method bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen ____
clear multiphased foaming slimy algae

Organic Layer? no Length? — Samples preserved? yes

Comments

Refer to page ____ of the corresponding field log book.

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N.M. - not measured

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers L. Smith / S. Rao

Well ID MW-03-01 Date Sampled 3/4/92 Time: Start 1300 End 1335

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 2.2 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC (14.6) (14.6) ft.

Feet of standing water 12.4 (h) ft. Standing water (gal.) = ____

B/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 8.2

Purging method bailer Purge: Time Start 1315 End 1330

		(6.35) pH	(480) Conductivity	Temperature, (C)
1 well volume =	2.0 gal.	5.62	100	7°C
2 well volume =	4.0 gal.	5.24	150	8°C
3 well volume =	6.0 gal.	5.34	190	7.5°C
	Final =	6.2	359	

Final water level = 2.35 (from T.O. PVC)

Sample Collection: Time Start 1330 End 1350

Sampling method bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? no Length? — Samples preserved? yes

Comments Due to silty nature of sample inline bailer was clogging. Allowed sample to settle for 45 minutes then filtered using same bailer and inline setup.

Refer to page ____ of the corresponding field log book.

revised 9/15/91

MONITORING WELL ...

Job Name ROSEHILL Job No. 004609-0018 Samplers L. Spence/S. Pi...

Well ID MW-03-02 Date Sampled 3/4/92 Time: Start 1400 End 1420

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC ____ ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC (47.7) ft.

Feet of standing water ____ (h) ft. Standing water (gal.) = ____

B/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.2

Purging method Bailer Purge: Time Start ____ End ____

		(9.48) pH	(250) Conductivity	Temperature, (C)
1 well volume =	____ gal.	____	____	____
2 well volume =	____ gal.	____	____	____
3 well volume =	____ gal.	____	____	____
Final =		____	____	____

Final water level = ____ (from T.O. PVC)

Sample Collection: Time Start ____ End ____

Sampling method Bailer Bailer Type ____

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae ____

Organic Layer? ____ Length? ____ Samples preserved? ____

Comments FROZEN SOLID about 8" below the outside casing. Frozen H_2O between PVC and outside casing. Used bailer to try to break ice

Refer to page ____ of the corresponding field log book.

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No luck.

MONITORING WELL [illegible]

004609-

Job Name ROSEHILL Job No. 0018 Samplers SC

Well ID MW-03-03 Date Sampled 2/5/92 Time: Start 10^45 End 15^25

Well Diameter 6 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC .5 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 143.4 (143.4) ft.

Feet of standing water 143 (h) ft. Standing water (gal.) = 210

S/B

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = ____ gal.

PID Readings (ppm)
Breathing ____
Well ____

Purging method Submersible Purge: Time Start 11^15 End 14^35

		(6.95) pH	(150) Conductivity	Temperature, (C)
1 well volume =	~210 gal.	7.39	130	12
2 well volume =	~210 gal.	7.13	130	11
3 well volume =	~210 gal.	7.29	130	10.5
Final =		6.98	130	9

Final water level = 1.9' (from T.O. PVC)

Sample Collection: Time Start 15^00 End 15^25

Sampling method Bailer Bailer Type 2" Teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: (colorless) black brown orange red ____

Describe appearance: turbid silty sand clay floaters (sheen) clear multiphased foaming slimy algae

rust particles

Organic Layer? Yes Length? too small Samples preserved? yes

Comments while purging @ 120' - water became clear
sampled ~60'

Refer to page ____ of the corresponding field log book.

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers LS/SP

Well ID MW-04-03 Date Sampled 2/5/92 Time: Start 730 End

Well Diameter 6 inches ÷ 12 = (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC (140) ft.

Feet of standing water (h) ft. Standing water (gal.) =

S/B

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(ft)² ÷ 4] (ft) x 7.48 gal/ft³ = gal.

PID Readings (ppm)

Breathing

Well

Purging method Submersible Purge: Time Start 2/4/92 End

		(9.21) pH	(220) Conductivity	Temperature, (C)
1 well volume =	gal.			
2 well volume =	gal.			
3 well volume =	gal.			
Final =		10.2	225	25

Final water level = (from T.O. PVC)

Sample Collection: Time Start 930 End 1015

Sampling method Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black brown orange red

Describe appearance: turbid (silty) sand clay floaters sheen
sometimes
clear multiphased foaming slimy algae

Organic Layer? no Length? – Samples preserved? Yes

Comments See logbook purged with submersible

Refer to page of the corresponding field log book.

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MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers Sean C / Peter B

Well ID MW-07-02 Date Sampled Purged 1/30/92 Time: Start Purge 1357 End 1439

Well Diameter 4 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 20.55 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 72.40 (73.0) ft.

Feet of standing water 51.85 (h) ft. Standing water (gal.) = ~~51.85 sc~~

BK/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gal.

PID Readings (ppm)
Breathing 0
Well 1.4

Purging method Bennard K. Iron Purge: Time Start 1425 End 1439

		(12.1) pH	(8200) Conductivity	Temperature, (C)
@ 50.5' depth to water ~~1 well volume~~ =	gal.	11.90	8000	10
2 well volume =	gal.			
3 well volume =	gal.			
Final =				

Final water level = ____ (from T.O. PVC)

Sample Collection: Time Start ____ End ____

Sampling method ____ Bailer Type ____

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? ____ Length? ____ Samples preserved? ____

Comments ____

Refer to page ____ of the corresponding field log book.

* See other book of well sheets

R 011691

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers SC, RM, PB

Well ID MW-11-01 Date Sampled 1/31/92 Time: Start 8:00 End _____

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 7.16 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 22.3 (23.9) ft.

Feet of standing water 14.7 (h) ft. Standing water (gal.) = 8.4

B/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gal.

PID Readings (ppm)
Breathing 0
Well 1.2

Purging method Bailer Purge: Time Start 10:16 End 10:36

			(6.4) pH	(665) Conductivity	Temperature, (C)
1 well volume =	2.5	gal.	6.4	1300	10
2 well volume =	2.5	gal.	6.3	1300	9
3 well volume =	2.5	gal.	6.3	1300	10
		Final =	6.0	1300	10

Final water level = 7.75 (from T.O. PVC)

Sample Collection: Time Start 10:40 End 11:04

Sampling method Bailer Bailer Type 2" Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty (petroleum) _____

Describe color: colorless black brown orange red grey

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? No Length? — Samples preserved? Yes

Comments Sample had natural bubbles - was
will probably have bubbles

Refer to page 44 of the corresponding field log book. (Book 29)

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MONITORING ...

Job Name ROSEHILL Job No. 004609-0018 Samplers SC, RM, PB

Well ID MW-11-02 Date Sampled 1/31/92 Time: Start 8:00 End 1005

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y/N)

Depth of water from T.O. PVC 6.45 ft.

Depth of well from T.O.C. NM ft. Depth of well from T.O. PVC 44.7 (45.2) ft.

Depth of water from T.O.C. NM ft. Standing water (gal.) = 6.2

~~14.70~~ 6.45 Feet of standing water 35.25 (h) ft.

B/B

Standing Water Volume = π[(d)²÷4](h)
= 3.14[(____ ft)²÷4](____ ft) x 7.48 gal/ft³ = ____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method Bailer Purge: Time Start 0902 End 0936

		(6.56) pH	(1380) Conductivity	Temperature, (C)
1 well volume =	6.2 gal.	6.43.4	1800 micro mhos/cm	9°C
2 well volume =	12.4 gal.	6.0	1750	8.6
3 well volume =	18.6 gal.	6.5	1775	8.9
Final =		6.4	1800	8.9

Final water level = 6.45 (from T.O. PVC)

Sample Collection: Time Start 0940 End 1000

Sampling method Bailer/In-line Filter Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty (petroleum) ____

Describe color: colorless black brown orange red gray

Describe appearance: turbid silty sand clay floaters sheen ____
(clear) multiphased foaming slimy algae

Organic Layer? no Length? — Samples preserved? VOAs-yes

Comments Foam in sample
Foam on water surface when final water level taken

Refer to page 42 of the corresponding field log book. (Book 29)

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers JC, KM, RB

Well ID MW-11-03 Date Sampled 1/31/92 Time: Start 8:00 End 12 40

Well Diameter 4 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 4.4 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 78.2 (78.3) ft.

Feet of standing water 73.3 (h) ft. Standing water (gal.) = 45.3

BK/B

Standing Water Volume = π [(d)² ÷ 4] (h) .25 .25 .0625 .0625 .0625 .05

= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = ____ gal.

PID Readings (ppm)

Breathing 0

Well 0

Purging method Bailer and Kibbe Purge: Time Start 8:45 End 11:46

			(9.4) pH	(690) Conductivity	Temperature, (C)	Depth
1 well volume =	49	gal.	10.5	600 micro mhos/cm	9°C	50.5'
2 well volume =	49	gal.	8.6	550	10	52.8
3 well volume =	49	gal.	7.9	510	10	
Final =			8.0	550	9.5	

Final water level = 19.8 (from T.O. PVC)

Sample Collection: Time Start 12 10 End 12 40

Sampling method Bailer Bailer Type 2" Teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: (colorless) black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen

(clear) multiphased foaming slimy algae ____

Organic Layer? NO Length? ____ Samples preserved? YES

Comments ____

Refer to page ____ of the corresponding field log book.

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MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers LS / SP

Well ID MW-14-01 Date Sampled 2/4/92 Time: Start 350 End 1010

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 27.00 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC (34.8) (34.8) ft.

Feet of standing water 7.8 (h) ft. Standing water (gal.) = 1.2

B/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gal.

PID Readings (ppm)
Breathing Ø
Well A
2 in the readings on PID

Purging method Bailer Purge: Time Start 900 End 1010

			pH (7.3)	Conductivity (1800)	Temperature, (C)
1 well volume =	1.2	gal.	6.9	1600	12
2 well volume =	2.4	gal.	6.5	1600	10
3 well volume =	4.3	gal.	6.6	1600	10
		Final =	6.7	1600	11

Final water level = 31.90 (from T.O. PVC)

Sample Collection: Time Start 1000 End 1010

Sampling method Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty (petroleum) ____

Describe color: colorless black brown orange red grey

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased (foaming) slimy algae ____

Organic Layer? no Length? – Samples preserved? yes

Comments ____

Refer to page ____ of the corresponding field log book.

revised 8/16/91

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers SC+SP

Well ID CG Date Sampled 7/3/92 Time: Start 1310 End 1350

Resident's Name C. Griswold

Water Collected from: outside spigot (spigot) (i.e. spigot/hose)

Purging method spigot (spigot)

Purge Flow Rate: 3 (3) (gpm)

Purge: Time Start 1310 End 1325

collected MS/MSD

	Time	(7.93) pH	(120) Conductivity	Temperature, (C)
1 volume =	5 minutes	NO READINGS BATTERY LOW	175	9°
2 volume =	10 minutes		175	9°
3 volume =	15 minutes		175	9
Final =			175	8

Sample Collection: Time Start 1325 End 1340

Sampling Method Spigot

Sample Collection Flow Rate 3 gpm

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black brown orange red

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae

Organic Layer? No Length? — Samples preserved? yes

Collection Area Description: Spigot near horses. Outside of fence.

(water pump spigot away from house, by dog house)

Comments

Refer to page _____ of the corresponding field log book.

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RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609 - 0018 Samplers SP / SC

Well ID DC Date Sampled 2/3/92 Time: Start 1350 End 1430

Resident's Name D. Cox

Water Collected from: Spigot (spigot) (i.e. spigot/hose)

Purging method Spigot (spigot)

Purge Flow Rate: 3 (3) (gpm)

Purge: Time Start 1400 End 1410

	Time	pH	Conductivity	Temperature, (C)
1 volume =	1400	5.6	160	7
2 volume =	1405	5.4	155	7
3 volume =	1410	6.3	155	7
Final =		6.1	165	8.0

Sample Collection: Time Start 1415 End 1425

Sampling Method Spigot

Sample Collection Flow Rate 2 gpm

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black brown orange red

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae

Organic Layer? no Length? — Samples preserved? 1 gal. Filtered

Collection Area Description: (spigot on the right side of the house)

Comments

Refer to page _____ of the corresponding field log book.

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RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers SP / SC

Well ID W Date Sampled 2/3/92 Time: Start 1430 End 1505

Resident's Name Webster

Water Collected from: Spigot by garden - to left of driveway & house when facing S.
(i.e. spigot/hose)

Purging method (spigot) Spigot

Purge Flow Rate: 3 (gpm)
(3)

Purge: Time Start 1430 End 1445

	Time	pH	Conductivity	Temperature, (C)
1 volume =	1435	7.9	700	6
2 volume =	1440	8.1	720	7°
3 volume =	1445	8.2	720	7°
Final =		8.3	770	8

Sample Collection: Time Start 1450 End 1500

Sampling Method Spigot

Sample Collection Flow Rate

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? no Length? — Samples preserved? yes

Collection Area Description:

Comments

Refer to page _____ of the corresponding field log book.

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MONITORING WELL SAMPLING WORKSHEET

Job Name Rosehill Job No. 004609-0015 Samplers SC

Well ID MW-01-02 Date Sampled Purge 2/4/92 + 2/5 Time: Start 1310 + 7[illegible] End

Well Diameter 6 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 3 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 81.1 ft.

Feet of standing water 78 (h) ft. Standing water (gal.) = ~~~107~~ (81.2) ~ 114

S/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing ____
Well ____

Purging method Submers. Purge: Time Start 1330 & 730 End 1718 & 845

			(9.6) pH	(150) Conductivity	Temperature, (C)
1 well volume =	~114	gal.	7.82	220	6
2 well volume =	~114	gal.	7.94	230	7
3 well volume =	~114	gal.	7.80	190	6
		Final =	7.00	150	3.5

Final water level = ____ (from T.O. PVC)

Sample Collection: Time Start 1200 End 1210

Sampling method Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? No Length? – Samples preserved? yes

Comments
Slight odor

Refer to page ____ of the corresponding field log book.

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MONITORING WELL SAMPLING WORKSHEET

Duplicate collected here

Name ROSEHILL Job No. 004609-0018 Samplers SP/KA

Well ID MW-02-01 Date Sampled 1/30/92 Time: Start 945 End 1010

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. N.M. ft. Depth of water from T.O. PVC 23.4 ft.

Depth of water from T.O.C. N.M. ft. Depth of well from T.O. PVC 35.6 (35.6) ft.

Feet of standing water 12.2 (h) ft. Standing water (gal.) = 12.2 ft.

B/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(2 ft)^2 ÷ 4] (12.2 ft) x 7.48 gal/ft^3 = 230 gal.

PID Readings (ppm)
Breathing Ø
Well Ø

O_2 = 21.0 LEL = 13 dropped to 0

Purging method BAILER Purge: Time Start 945 End 1010

		(6.11) pH	(200) Conductivity	Temperature, (C) 11.8
1 well volume = 2.0	gal.	6.3	200	12 (11.6)
2 well volume = 4.0	gal.	5.4	240	12.0
3 well volume = 6.0	gal.	5.5	250	11.7
Final =		6.3	28[illegible]	11.4

Final water level = 23.4 (from T.O. PVC)

Sample Collection: Time Start 1010 End 1010

Sampling method Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black (brown) (orange) red

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased (foaming) slimy algae

Organic Layer? No Length? — Samples preserved? [illegible]

Comments Initial pH: 7.02 Duplicate
Cond 2200 collected here
Temp - 11.8

Refer to page ____ of the corresponding field log book.

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MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers KA/SC/LS

Well ID MW-04-01 Date Sampled 1/29/92 Time: Start 10:10 End 11:10

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 15.05 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 3.25 (15.0) ft.

Feet of standing water ____ (h) ft. Standing water (gal.) = 2.0

B/B NMW-04-01-NX-6-511-3

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gal.

PID Readings (ppm)
Breathing 0.1
Well 9.0

Purging method bailer Purge: Time Start 10:10 End 10:25

		(6.44) pH	(230) Conductivity	Temperature, (C)
1 well volume =	2.0 gal.	6.15	1050	15.3
2 well volume =	4.0 gal.	6.36	900	15.4
3 well volume =	6.0 gal.	6.55	900	15.5
Final =		6.77	780	15.3

Final water level = 3.25 (from T.O. PVC)

Sample Collection: Time Start 10:30 End 11:10

Sampling method bailer Bailer Type 1 3/4" teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum ____

Describe color: colorless black (brown) orange red ____

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? ND Length? — Samples preserved? Yes

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

Job Name ROSEHILL Job No. 004609-0018 Samplers LS/SC

Well ID MW-04-02 Date Sampled 1/29/92 Time: Start 11:15 End 11:50

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 31.98 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 3.15 (31.9) ft.

Feet of standing water ____ (h) ft. Standing water (gal.) = 4.7

B/B NMW-04-02-NX-G-512-3

Standing Water Volume = π[(d)²÷4](h)
= 3.14[(____ ft)²÷4](____ ft) x 7.48 gal/ft³ = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 0.1

Purging method bailer Purge: Time Start 11:15 End 11:30

			(6.51) pH	(550) Conductivity	Temperature, (C)
1 well volume =	4.7	gal.	6.73	1600	11
2 well volume =	9.4	gal.	6.75	1700	10.5
3 well volume =	14.1	gal.	6.82	1700	10.5
		Final =	6.91	1700	11

Final water level = 3.15 (from T.O. PVC)

Sample Collection: Time Start 11:30 End 11:50

Sampling method bailer Bailer Type 1 3/4" bailer

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum ____

Describe color: (colorless) black brown orange red ____

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? NO Length? — Samples preserved? yes

Comments ____

Refer to page ____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name: ROSEHILL Job No. 004609-0018 Samplers: KH/SF

Well ID: MW-07-01 Date Sampled: 1/31/92 Time: Start 945 End 1100

Well Diameter: 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C.: NM ft. Depth of water from T.O. PVC: 18.2 ft.

Depth of water from T.O.C.: NM ft. Depth of well from T.O. PVC: 33.6 ft. (31.3)

Feet of standing water: 15.4 (h) ft. Standing water (gal.) = 2.4

B/B

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = ____ gals.

PID Readings (ppm)
Breathing: —
Well: 16

Purging method: Bailer Purge: Time Start 10:00 End 10:30

			(6.06) pH	(850) Conductivity	Temperature, (C)
Initial ~~1 well volume~~ =	~~2.4~~ Initial Reading	gal.	6.8	620	12.5
1 ~~2~~ well volume =	~~4.8~~ 2.4	gal.	6.5	580	12.0
2 ~~3~~ well volume =	4.8	gal.	6.4	620	12
3	7.2		6.3	5[illegible]	12
		Final =	~~6.4~~	600	

Final water level = 8.21' (from T.O. PVC)

Sample Collection: Time Start 10:30 End 1100

Sampling method: Bailer Bailer Type: Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty (petroleum) — LandFill leachate odor, petroleum

Describe color: colorless black brown orange red — brown

Describe appearance: turbid silty sand clay floaters sheen clear multiphased foaming slimy algae — silty

Organic Layer? no Length? — Samples preserved? YES

Comments

Refer to page ____ of the corresponding field log book.

mds 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers KA/SP

Well ID MW-07-02 Date Sampled 1/31/92 Time: Start 745 End 10:00

Well Diameter 4 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 31.00 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 75.0 (73.0) ft.

Feet of standing water 44.0 (h) ft. Standing water (gal.) = counted as 15' = 9.8 gal

BK/B

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(4 ft)²÷4] (____ ft) x 7.48 gal/ft³ = ____ gal.

PID Readings (ppm)
Breathing ____
Well 0.8

Purging method BK/B Purge: Time Start 1/30/92 1/31/92 745 End ____

		(12.1) pH	(8200) Conductivity	Temperature, (C)
1 well volume =	____ gal.	____	____	____
2 well volume =	____ gal.	____	____	____
3 well volume =	Before sampling ____ gal.	11.8	2000	20
	Final =	11.2	1500	25

Final water level = ____ (from T.O. PVC)

Sample Collection: Time Start 900 End 10:00

Sampling method Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red ____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae

SILTY

Organic Layer? NO Length? ____ Samples preserved? ____

Comments BK'd by SC/PB on 1/30/92
Bailed out last 15 ft on 1/31/92
then sampled
MS/MSD collected here

Refer to page ____ of the corresponding field log book.

revised 9/16/91

* See other book of well sheets

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers KA/SP

Well ID MW-10-01 Date Sampled 1/30/92 Time: Start 1330 End 1430

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 7.00 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 38.48 ft.

Feet of standing water ~31 (h) ft. Standing water (gal.) = 5.9 (37.6)

B/R

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing —
Well 3.2

Purging method Teflon Bailer Purge: Time Start 1330 End 1430

			(6.24) pH	(75) Conductivity	Temperature, (C)
1 well volume =	5.1	gal.	6.6	120	7.0
2 well volume =	10.2	gal.	6.2	120	7.1
3 well volume =	12.	gal.	6.1	120	8.0
		Final =	6.6	125	[illegible]

Final water level = 7.1 (from T.O. PVC)

Sample Collection: Time Start 1400 End 1415

Sampling method Teflon Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum NONE

Describe color: colorless black brown orange red lt. brown

Describe appearance: turbid (silty) sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? no Length? ____ Samples preserved? yes

Comments Initial pH 7.8
COND 160
Temp 7.5

Refer to page ____ of the corresponding field log book.

rw
9/16/91

Job Name ROSEHILL Job No. 004609-0018 Samplers KA + SP

Well ID MW-13-02 Date Sampled 1/30/92. Time: Start 1050 End 1150

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 7.64 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 29.9 (29.9) ft.

Feet of standing water 22.3 (h) ft. Standing water (gal.) = 3.6

B/B

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(2 ft)^2 ÷ 4] (22 ft) x 7.48 gal/ft^3 = 3.6 gal.

PID Readings (ppm)
Breathing 0.0
Well 15

Purging method Bailer Purge: Time Start 1100 End 1125

			pH (6.36)	Conductivity (295)	Temperature, (C)
1 well volume =	3.6	gal.	6.4	650	12.4
2 well volume =	7.2	gal.	6.6	550	10.4
3 well volume =	10.8	gal.	6.4	550	10.0
		Final =	6.7	550	10.2

Final water level = ____ (from T.O. PVC)

Sample Collection: Time Start 1125 End 1150

Sampling method Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum organic

Describe color: colorless black brown orange red

Describe appearance: turbid silty sand clay floaters, sheen
clear multiphased foaming slimy algae

Organic Layer? No Length? — Samples preserved? Yes HCl, Teflon

Comments Initial pH 6.29
Cond ~~[illegible]~~ 600
Temp. 10.3

Refer to page ____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL

Job Name ROSEHILL Job No. 004609-0018 Samplers SP/KM

Well ID OW-27 Date Sampled 1/31/92 Time: Start 1305 End 1340

Well Diameter 1.5 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 14.5 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 17.5 (17.6) ft.

Feet of standing water .3 (h) ft. Standing water (gal.) = 0.3

W/WB

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0.0
Well 2.3

Purging method Wattera Purge: Time Start 1305 End 1315

		(6.59) pH	(810) Conductivity	Temperature, (C)	PID
1 well volume =	0.3 gal.	6.1	900	14	2.3
2 well volume =	0.6 gal.	6.1	800	14.5	
3 well volume =	0.9 gal.	6.1	720	14.5	
	Final =	6.4	700	14.5	

Final water level = 14.6 (from T.O. PVC)

Sample Collection: Time Start 1305 End 1330

Sampling method Wattera/Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum Fish/leachate

Describe color: colorless black brown orange red black

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae silty foaming

Organic Layer? no Length? ____ Samples preserved? YES

Comments Initial pH - 6.1
cond = 600
Temp = 14

Refer to page ____ of the corresponding field log book.

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSEHILL Job No. 004609-0018 Samplers KA/SP

Well ID OW-30 Date Sampled 1/31/92 Time: Start 1230 End 1390

Well Diameter 1.5 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. NM ft. Depth of water from T.O. PVC 4.5 ft.

Depth of water from T.O.C. NM ft. Depth of well from T.O. PVC 15.5 ft.

Feet of standing water 11.0 (h) ft. Standing water (gal.) = 1.0 (16)

W/WB

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing ~~0.7~~ SP
Well 2.7

Purging method Waterra Purge: Time Start 1230 End 1240

			(6.3) pH	(750) Conductivity	Temperature, (C)
1 well volume =	1	gal.	7.0	150	9.5
2 well volume =	2	gal.	6.9	170	10
3 well volume =	3	gal.	6.9	180	10
		Final =	6.9	175	10

Final water level = 4.5 (from T.O. PVC)

Sample Collection: Time Start 1240 End 1255

Sampling method Waterra / Bailer Bailer Type Teflon

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) (fishy) musty petroleum — musty/bacinic

Describe color: colorless black brown (orange) red — [illegible]

Describe appearance: turbid (silty) sand clay floaters sheen
(clear) multiphased foaming slimy algae

Organic Layer? — Length? — Samples preserved? yes

Comments Initial pH 7.5 Sample taken with equipment
Cond 140 blank bailer
Temp 7.5

Refer to page ____ of the corresponding field log book.

revised 9/16/91

WELL SAMPLING WORKSHEETS - APRIL 1992

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 46C9-18 -10-3 Samplers SC + JB

Well ID NMW-01-01 Date Sampled 4/8/92 Time: Start 8:45 End 11:15

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. 19.4 ft. Depth of water from T.O. PVC _____ ft.

Depth of water from T.O.C. 2.7 ft. Depth of well from T.O. PVC _____ ft.

Feet of standing water 16.7 (h) ft. Standing water (gal.) = 2.8 ~~gal~~ gal

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 1.9-0.5 = 1.4

Purging method Bailer Purge: Time Start 9.20 End 9:45

			pH	Conductivity	Temperature, (C)
1 well volume =	2.8	gal.	7.60	100	8.6
2 well volume =	2.8	gal.	6.90	99	7.9
3 well volume =	2.8	gal.	6.69	103	8.0
4th vol =	2.8	gal	6.56	100	8.0
Final =			7.70	100	~~8.0~~ sc 9.2

Final water level = _____ (from T.O. PVC)

Sample Collection: Time Start _____ End _____

Sampling method Bailer Bailer Type 2" Teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red grey

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? No Length? _____ Samples preserved? _____

Comments Sample time differents along with final temp due to having to wait for nitrogen for filtered metals. Only 2 filtered metals bottles collected

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 -10-3 Samplers SC + JB

Well ID NMW-01-02 Date Sampled 4/8/92 Time: Start 8:45 End 4:35

Well Diameter 6 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. 81 ft. Depth of water from T.O. PVC _____ ft.

Depth of water from T.O.C. 2.94 ft. Depth of well from T.O. PVC _____ ft.

Feet of standing water 78 (h) ft. Standing water (gal.) = 114 gal

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 1.2 - 0.5 = 0.7

Purging method Submersible Pump Purge: Time Start 9:05 → 12:05 13:05-16:00 End _____

See logbook

		pH	Conductivity	Temperature, (C)
1 well volume =	~115 gal.	7.69	165	10.8
2 well volume =	" gal.	8.10	150	16.3
3 well volume =	" gal.	7.85	150	14.6
Final =		8.35	150	10.3

Final water level = 30.7 (from T.O. PVC)

Sample Collection: Time Start 4:15 End 4:35

Sampling method Bailer Bailer Type 2" Teflon

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black brown (orange) red _____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? No Length? _____ Samples preserved? _____

Comments Length of hose in the sun altered the temperature and possibly other readings

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers JB+SC

Well ID MW-05-01 Date Sampled 4/10/92 Time: Start 1:45 End 3:10

Well Diameter 2" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 5.84 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 17.94 (~19) ft.

Feet of standing water 12.10 (h) ft. Standing water (gal.) = 2

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 14.4

Purging method bailer Purge: Time Start 2:35 End 2:45

			pH	Conductivity	Temperature, (C)
1 well volume =	2	gal.	6.10	79	10.5
2 well volume =	2	gal.	6.16	79	10.5
3 well volume =	2	gal.	6.14	81	10
		Final =	5.87	78	10.5

Final water level = 5.92 (from T.O. PVC)

Sample Collection: Time Start 2:50 End 305

Sampling method bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black (brown) orange red _____

Describe appearance: (turbid) (silty) sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? N Length? _____ Samples preserved? N

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers JB + SC

Well ID MW-05-02 Date Sampled 4/10/92 Time: Start 1:45 End 2:35

Well Diameter 2" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 5.96 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 28.84 (~30) ft.

Feet of standing water 22.88 (h) ft. 28.84 − 5.96 = 22.88 Standing water (gal.) = 3.8

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 66, but not right

Purging method bailer Purge: Time Start 2:00 End 2:15

			pH	Conductivity	Temperature, (C)
1 well volume =	3.8	gal.	8.87	83	11.5
2 well volume =	3.8	gal.	8.25	83	11.0
3 well volume =	3.8 / 5.8	gal.	7.35	80	11.0
			7.13	79	11.0
		Final =	6.25	77	11.0

Final water level = 6.13 (from T.O. PVC)

Sample Collection: Time Start 2:20 End 2:30

Sampling method bailer Bailer Type 1-3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? N Length? _____ Samples preserved? N

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers SC+JB

Well ID MW-07-01 Date Sampled 4/9/92 Time: Start 7:55 End 9:15

Well Diameter 2 inches ÷ 12 = ____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. 34.06 ft. Depth of water from T.O. PVC 33.19 ft.

Depth of water from T.O.C. 19.35 ft. Depth of well from T.O. PVC 13.48 ft.

Feet of standing water 14.71 (h) ft. Standing water (gal.) = 2.4

Standing Water Volume = π[(d)^2÷4](h)
= 3.14 [(____ ft)^2÷4] (____ ft) x 7.48 gal/ft^3 = ____ gals.

PID Readings (ppm)
Breathing 0
Well 4.2

Purging method bailer Purge: Time Start 8:15 End 8:35

		pH	Conductivity	Temperature, (C)
1 well volume =	2.4 gal.	6.02	625	10
2 well volume =	2.4 gal.	6.06	570	10
3 well volume =	2.4 gal.	6.06	590	10
	Final =	6.45	585	10.5

Final water level = 18.48 (from T.O. PVC)

Sample Collection: Time Start 8:45 End 9:10

Sampling method bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum ____

Describe color: colorless black brown orange red grey

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae ____

Organic Layer? No Length? ____ Samples preserved? ____

Comments Field Dup also

Refer to page ____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers SC + JB

Well ID MW-07-02 Date Sampled 4/9 ~~'92~~ 4/10/92 Time: Start 7:55 End 750

Well Diameter 4" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well ~~from T.O.C.~~ _____ ft. 4/10 27.79 Depth of water from T.O. PVC 20.82 4/9 ft.

Depth of water ~~from T.O.C.~~ _____ ft. Depth of well from T.O. PVC 72.43 (2-73) ft.

Feet of standing water _____ (h) ft. Standing water (gal.) = _____

4/10 ~~over~~ 20 feet

97
99 .08 .25
.35 .32
.33 .10

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(___ ft)² ÷ 4] (___ ft) x 7.48 gal/ft³ = 13 gals.

PID Readings (ppm)
Breathing 0
Well 0

.8 .03 4/9 4/10 7:05 7:30

Purging method Bailer - Killman Purge: Time Start 9:30 End 9:50

			pH	Conductivity	Temperature, (C)
Initial ~~1 well volume =~~	0	gal.	11.69	1200	10.5
2 well volume =		gal.	11.80	1300	11 (53.5)
3 well volume = 4/10	7	gal.	~~10.70~~ 11.34	1050	10
4/10	13	gal	11.32	1050	10
Final =			~~11.93~~	~~1050~~	~~10~~

53.7 after BK rm

Final water level = 50.74 (from T.O. PVC)

Sample Collection: Time Start 7:35 End 7:50

Sampling method bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen

(clear) multiphased foaming slimy algae _____

Organic Layer? No Length? _____ Samples preserved? _____

Comments _____

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name MW-08-01 Job No. 4609-18 Samplers SC+LB

Well ID Rose Hill Date Sampled 4/10/92 Time: Start 10:30 End 11:15

Well Diameter 2" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 7.38 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 14.70 ft.

Feet of standing water 7.32 (h) ft. Standing water (gal.) = (x 15) 1.2

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0

Purging method bailer Purge: Time Start 10:40 End 10:53

			pH	Conductivity	Temperature, (C)
1 well volume =	1.25	gal.	8.34	110	8
2 well volume =	1.25	gal.	8.21	120	8
3 well volume =	1.25	gal.	7.90	120	7
	1.25		7.65	120	7
		Final =	6.74	120	7

Final water level = 6.76 (from T.O. PVC)

Sample Collection: Time Start 10:55 End 11:10

Sampling method bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black brown (orange) red _____

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? _____

Comments Began w/tran flock - flock left, but remained orange

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers SC + LB

Well ID MW-08-02 Date Sampled 4/10/92 Time: Start 1030 End 1210

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 7.48 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 27.62 (~28) ft.

Feet of standing water 20.14 (h) ft. Standing water (gal.) = 3.3

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(___ ft)² ÷ 4] (___ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0 CGF-0
Well 0

Purging method bailer Purge: Time Start 11:20 End 11:45

		pH	Conductivity	Temperature, (C)
1 well volume = 3.5	gal.	8.60	210	8.5
2 well volume = 3.5	gal.	8.61	200	9.0
3 well volume = 3.5	gal.	7.97	200	9.0
3.5		7.70	210	9.0
	Final =	7.13	200	9.0

Final water level = 7.48 (from T.O. PVC)

Sample Collection: Time Start 11:50 End 12:05

Sampling method bailer Bailer Type 1-3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? N Length? _____ Samples preserved? N

Comments pulled up transducer @ 11:15
Started clear, got darker, got clear again

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers JB+SC

Well ID MW-12-01 Date Sampled 4/9/92 Time: Start 10:45 End 11:30

Well Diameter 2" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 1.33 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 19.47 ft.

Feet of standing water 18.14 (h) ft. 19.47 − 1.33 = 18.14 Standing water (gal.) = (~20) 3

Standing Water Volume = π [(d)² ÷ 4] (h)
= 3.14 [(____ ft)² ÷ 4] (____ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0
Well 5

Purging method bailer Purge: Time Start 11:00 End 11:15

		pH	Conductivity	Temperature, (C)
1 well volume =	3 gal.	6.49	470	9
2 well volume =	3 gal.	6.22	440	9
3 well volume =	3 gal.	6.06	410	9
Final =		6.38	400	9

Final water level = 1.33 (from T.O. PVC)

Sample Collection: Time Start 11:15 End 11:30

Sampling method bailer Bailer Type 1-5/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty (petroleum) _____

Describe color: colorless black brown orange red Orange tint

Describe appearance: (turbid) silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? NO Length? _____ Samples preserved? _____

Comments Removed data logger first

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers JB+SC

Well ID MW-12-02 Date Sampled 4/9/92 Time: Start 10:45 End 12:15

Well Diameter 2 inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y/N)

Depth of well from ~~T.O.C.~~ _____ ft. Depth of water from T.O. PVC ~~1.33~~ 1.84 ft.

Depth of water ~~from~~ T.O.C. _____ ft. Depth of well from T.O. PVC ~~44.47~~ 45.00 (~45) ft.

Feet of standing water 42.16 (h) ft. Standing water (gal.) = 7

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(____ ft)^2 ÷ 4] (____ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0
Well 0.8

Purging method bailer Purge: Time Start 11:30 End 11:55

		pH	Conductivity	Temperature, (C)
1 well volume = 7	gal.	6.33	120	10
2 well volume = 7	gal.	6.55	110	10
3 well volume = 7	gal.	6.48	120	10
	Final =	6.65	105	10

Final water level = 1.91 (from T.O. PVC)

Sample Collection: Time Start 12:00 End 12:15

Sampling method bailer Bailer Type 1-3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red green

Describe appearance: turbid silty sand clay floaters sheen
(clear) by the end multiphased foaming slimy algae _____

Organic Layer? _____ Length? _____ Samples preserved? _____

Comments Began light green, got darker, cleared up to light green by second well volume

Refer to page _____ of the corresponding field log book.

revised 9/16/91

29.58
19.62

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers JB+SC

Well ID MW-00-02 (MW-II) Date Sampled 4/9/92 Time: Start 2:30 End 3:10

Well Diameter 1.5" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 19.62 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 29.58 ft.

Feet of standing water 9.96 (h) ft. Standing water (gal.) = (~30) 7.7

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(____ ft)²÷4] (____ ft) x 7.48 gal/ft³ = _____ gals.

PID Readings (ppm)
Breathing 0
Well 49

Purging method Water pump Purge: Time Start 2:40 End 2:45

		pH	Conductivity	Temperature, (C)
1 well volume =	1 gal.	6.95	430	11.0
2 well volume =	1 gal.	6.80	450	11.0
well volume =	1 gal.	6.56	450	11.0
Final =		6.63	460	11.0

Final water level = 19.62 (from T.O. PVC)

Sample Collection: Time Start 2:45 End 3:10

Sampling method Water + bailer (VOAs + WGOs) Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum _____

Describe color: colorless black brown orange red grey

Describe appearance: turbid (silty) sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? N Length? _____ Samples preserved? N

Comments Sampled
RINSEM Ammonia

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18 Samplers JB

Well ID OW-27 Date Sampled 4/10/92 Time: Start 8:45 End 9:45

Well Diameter 1.5" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? (Y)N

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 14.86 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 17.62 ft.

17.62
14.86
2.76

Feet of standing water 2.76 (h) ft. Standing water (gal.) = 0.25 (~7.5)

7.5
.033
.225
.225
.225
.075
.033

Standing Water Volume = π [(d)^2 ÷ 4] (h)
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = 0.25 gals.

PID Readings (ppm)
Breathing 0
Well 15.2 - 3.2 = 12

Purging method Waterra Purge: Time Start 8:55 End 9:00

		pH	Conductivity	Temperature, (C)
1 well volume = 0.25	gal.	6.60	1100	8.5
2 well volume = .25	gal.	6.54	960	8.5
3 well volume = .25	gal.	6.46	860	8.0
4		6.38	780	8.0
5 ~~Final~~ =		6.40	740	8.0
Final		6.36	640	8.5

Final water level = 14.93 (from T.O. PVC)

Sample Collection: Time Start 9:10 End 9:35

Sampling method Waterra + bailer (VOAs + WSOCs) Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum _____

Describe color: colorless (black) brown orange red _____

Describe appearance: turbid (silty) sand clay floaters (sheen)
clear multiphased foaming slimy algae _____

Organic Layer? N Length? _____ Samples preserved? N

Comments FDup on this well

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

ob Name Rose Hill Job No. 4609-18 Samplers JB+SC

Well ID OW-30 Date Sampled 4/9/92 Time: Start 1:30 End 2:15

Well Diameter 1.5" inches ÷ 12 = .12 (d) ft. Well secured upon arrival? (Y)/N

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 5.02 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 15.88 ft.

Feet of standing water 10.86 (h) ft. Standing water (gal.) = 0.75 (~16)

Standing Water Volume = π[(d)²÷4](h)
= 3.14 [(.12 ft)² ÷ 4] (___ ft) x 7.48 gal/ft³ = 0.75 gals.

PID Readings (ppm)
Breathing 0
Well 12.8

Purging method Waterra Purge: Time Start 1:45 End 2:00

		pH	Conductivity	Temperature, (C)
1 well volume =	1 gal.	7.10	250	7
2 well volume =	1 gal.	6.60	290	7.5
well volume =	1 gal.	6.39	280	7.5
	Final =	6.64	295	7.5

Final water level = 5.07" (from T.O. PVC)

Sample Collection: Time Start 2:00 End 2:15

Sampling method Waterra + bailer (VOAs + WSQ) Bailer Type 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none (sulfide) fishy musty petroleum _____

Describe color: colorless black brown orange red grey

Describe appearance: (turbid) silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? N Length? _____ Samples preserved? N

Comments Equipment blank used at this well

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 004609-18 Samplers LB + LS

Well ID MW-06-01 Date Sampled 4/8/92 Time: Start 1010 hrs End 1045 hrs

Well Diameter 2" inches ÷ 12 = _____ (d) ft. Well secured upon arrival? Y/N

Depth of well from T.O.C. _____ ft. Depth of water from T.O. PVC 4.68 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 20 ft.

Feet of standing water ~15.5 (h) ft. Standing water (gal.) = _____

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing 0.0
Well 7.5

Purging method Bailer Purge: Time Start 1020 hrs End 1045 hrs

		pH	Conductivity	Temperature, (C)
1 well volume =	2.6 gal.	6.40	84	7°C
2 well volume =	5.2 gal.	6.60	220	8°C
3 well volume =	7.8 gal.	6.37*	2500*	8°C
Final =				

Final water level = 4.80' (from T.O. PVC)

Sample Collection: Time Start 1020 hrs End 1045 hrs

Sampling method Bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum _____

Describe color: colorless black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae _____

Organic Layer? None Length? _____ Samples preserved? Yes

Comments * Visible Drift on Conductivity Meter
Low Bat. on pH Meter

Refer to page _____ of the corresponding field log book.

revised 9/16/91

MONITORING WELL SAMPLING WORKSHEET

Job Name ROSE HILL Job No. 004609-18 Samplers LB + LS

Well ID MW-06-02 Date Sampled 4/8/92 Time: Start 0840 hrs End 1000 hrs

Well Diameter ~~2"~~ 2" inches ÷ 12 = 2 (d) ft. Well secured upon arrival? (Y) N

Depth of well from T.O.C. 3 ft. Depth of water from T.O. PVC ~~33.65~~ 4.75 ft.

Depth of water from T.O.C. _____ ft. Depth of well from T.O. PVC 33.65 ft.

Feet of standing water ~29 (h) ft. Standing water (gal.) = _____

Standing Water Volume = $\pi[(d)^2 \div 4](h)$
= 3.14 [(___ ft)^2 ÷ 4] (___ ft) x 7.48 gal/ft^3 = _____ gals.

PID Readings (ppm)
Breathing Ø
Well 4 ppm

Purging method Bailer Purge: Time Start 0910 hrs End 0945 hrs

			pH	Conductivity	Temperature, (C)
1 well volume =	4.7	gal.	6.65	720	10°C
2 well volume =	9.4	gal.	6.64	725	9°C
3 well volume =	14.1	gal.	6.63	730	10°C
* Low Bat. on pH meter Final =					

Final water level = 4.75' (from T.O. PVC)

Sample Collection: Time Start 0950 hrs End 1000 hrs

Sampling method Bailer Bailer Type 1 3/4"

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: colorless black brown orange (red) _____

Describe appearance: turbid (mildly silty) sand clay floaters sheen

(clear) multiphased foaming slimy algae _____

Organic Layer? None Length? _____ Samples preserved? Yes

Comments Bailer was used for Equipment Blank 4/7/92

Refer to page _____ of the corresponding field log book.

revised 9/16/91

WELL SAMPLING WORKSHEETS - SEPTEMBER 1993

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4601-18-10-3 Samplers S. Czarnecki + N. Ber.

Well ID RKJ Date Sampled 9/22/93 Time: Start 10:00 End

Resident's Name Kathleen James

Water Collected from: Front spigot
(i.e. spigot/hose)

Purging method spigot

Purge Flow Rate: ~3 (gpm)

Purge: Time Start 10:02 End 10:34

	Time	pH	Conductivity (µF)	Temperature, (C)
1 volume =	10:07	6.05	~~90~~ 100	56°F
2 volume =	10:12	5.90	66	56°F
3 volume =	10:17	—	66	56°F
pH low but ↑	10:26	6.00	68	56°F
	10:32		66	58°F
Final =	11:15	bead bottom		

Sample Collection: Time Start 10:35 End 11:15

Sampling Method Spigot

Sample Collection Flow Rate ~.5gpm for voc's ~1gpm for the rest

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? _____ Length? _____ Samples preserved? _____

Collection Area Description: _____

Comments _____

Refer to page _____ of the corresponding field log book.

revised 8/13/9

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4609-18-10-3 Samplers S. Czarnecki + N. Bri

Well ID RDW Date Sampled 9/21/93 Time: Start 11:10 End 11:35

Resident's Name Webster

Water Collected from: Spigot in ~~hose~~ yard
(i.e. spigot/hose)

Purging method spigot

Purge Flow Rate: ~3 (gpm)

Purge: Time Start 11:10 End 11:27

	Time	pH	Conductivity	Temperature, (C)
1 volume =	11:15	8.20	150	55°F
2 volume =	1120	8.09	150	55°F
3 volume =	11:25	8.16	160	54.5°F
	11:30 Final =	8.14	150	54.0°F

Sample Collection: Time Start 11:28 End 11:31

Sampling Method Spigot

Sample Collection Flow Rate ~3gpm

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum _____

Describe color: (colorless) black brown orange red _____

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae _____

Organic Layer? No Length? _____ Samples preserved? _____

Collection Area Description: Scenic yard

Comments _____

Refer to page _____ of the corresponding field log book.

revised 8/13/91

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 460-1840-3 Samplers S. Czarniecki & N. Bergeron

Well ID RTK (Keefe) Date Sampled 9/21/93 Time: Start 10:25 End 10:51

Resident's Name Thomas Keefe

Water Collected from: spigot under Kitchen window
(i.e. spigot/hose)

Purging method hose from spigot

Purge Flow Rate: 3 (gpm)

Purge: Time Start 10:26 End 10:40

	Time	pH	Conductivity	Temperature, (C)
1 volume =	10:30	5.85	120	61.5°F
2 volume =	10:35	5.79	100	60.5°F
3 volume =	10:40	5.72	110	60.0°F
	10:46 Final =	5.70	100	60.0°F

Sample Collection: Time Start 10:42 End 10:45

Sampling Method spigot

Sample Collection Flow Rate 1 gpm

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum

Describe color: (colorless) black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae

Organic Layer? No Length? Samples preserved?

Collection Area Description: spigot ~ 8" above ground

Comments

Refer to page of the corresponding field log book.

revised 8/13/91

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4601-18-10-3 Samplers S. Czarniecki + N. Bergre

Well ID RET Date Sampled 9/21/93 Time: Start 13:12 End 13:30

Resident's Name Timpson

Water Collected from: Spigot on South of House
(i.e. spigot/hose)

Purging method Spigot

Purge Flow Rate: ~3 (gpm)

Purge: Time Start 13:12 End 13:30

	Time	pH	Conductivity	Temperature, (C)
1 volume =	13:17	5.87	100	62°F
2 volume =	13:22	5.76	90	60°F
3 volume =	13:27	5.74	90	60°F
	13:32 Final =	5.73	90	60°F

Sample Collection: Time Start 13:30 End 13:32

Sampling Method Spigot

Sample Collection Flow Rate ~3 gpm

Sample Characteristics (Circle all applicable)

Describe odor: none sulfide fishy musty petroleum

Describe color: colorless black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
clear multiphased foaming slimy algae

Organic Layer? No Length? Samples preserved?

Collection Area Description: Spigot - plastic attachment ~2" long - since we are sampling for metals - no worry

Comments

Refer to page of the corresponding field log book.

revised 8/13/91

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name Rosehill Job No. 4609-18-10-3 Samplers S. Czarniecki & N. Burgess

Well ID RJM Date Sampled 9-23-93 Time: Start 10:52 End 11:20

Resident's Name Jeanne McDonald

Water Collected from: spigot back
(i.e. spigot/hose)

Purging method spigot + hose

Purge Flow Rate: ~3 (gpm)

Purge: Time Start 10:52 End 11:05

	Time	pH	Conductivity	Temperature, (C)
1 volume =	10:55	6.16	100	54°F
2 volume =	11:00	6.08	100	54°F
3 volume =	11:05	(same as previous)		
	11:18 Final =	6.01	100	54°F

Sample Collection: Time Start 11:08 End 11:17

Sampling Method spigot

Sample Collection Flow Rate ~1 gpm (~½ gpm for VOC's)

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum

Describe color: (colorless) black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae

Organic Layer? No Length? Samples preserved?

Collection Area Description:

Comments

Refer to page of the corresponding field log book.

revised 8/13/91

RESIDENTIAL WELL SAMPLING WORKSHEET

RJM-09 805

Job Name Rosehill Job No. 4609-18-10-3 Samplers S. Czarnieckis + N. Ber

Well ID RJM Date Sampled 9-23-93 Time: Start 9 (10:00) End 10:34

Resident's Name Jeanne McDonald

Water Collected from: Spigot front side left
(i.e. spigot/hose)

Purging method spigot + hose

Purge Flow Rate: ~3 (gpm)

Purge: Time Start 10:00 End 10:20

	Time	pH	Conductivity	Temperature, (C)
1 volume =	10:05	6.37	120	53°F
2 volume =	10:10	6.29	120	53°F
3 volume =	10:15 (10:20)	6.08 (6.07)	120 (118)	53°F (53°F)
	10:34 Final =	6.07	110	54°F

Sample Collection: Time Start 10:21 End 10:32

Sampling Method spigot

Sample Collection Flow Rate ~1 gpm (~½ gpm for VOCs)

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum

Describe color: (colorless) black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae

Organic Layer? No Length? Samples preserved?

Collection Area Description:

Comments

Refer to page of the corresponding field log book.

revised 8/13/91

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name Rose Hill Job No. 4601-1810-3 Samplers S. Czarnecki + N. Bergman

Well ID RCG Date Sampled 9/23/93 Time: Start 915 End 950

Resident's Name Carolyn Griswold

Water Collected from: Spigot near Stable
(i.e. spigot/hose)

Purging method Spigot

Purge Flow Rate: ~3 (gpm)

Purge: Time Start 915 End 940

	Time	pH	Conductivity	Temperature, (°C)
1 volume =	920		180	56°F
2 volume =	925	8.55	170	55°F
3 volume =	930	8.62	160	54°F
Final =	935	8.60	160	54°F
Final	945	8.24	150	55°F

Sample Collection: Time Start 940 End 945

Sampling Method Spigot

Sample Collection Flow Rate ~1gpm ~½ for voc's

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum

Describe color: (colorless) black brown orange red

Describe appearance: turbid silty sand clay floaters sheen
(clear) multiphased foaming slimy algae

Organic Layer? No Length? Samples preserved?

Collection Area Description:

Comments

Refer to page of the corresponding field log book.

revised 8/13/91

RESIDENTIAL WELL SAMPLING WORKSHEET

Job Name: Rose Hill Job No. 4609-18-10-3 Samplers: S. Czarnecki + N. Berger

Well ID: RDC Date Sampled: 9/22/93 Time: Start 16^58 End 16--

Resident's Name: Cox

Water Collected from: Spigot (i.e. spigot/hose)

Purging method: Spigot → hose

Purge Flow Rate: ~3 (gpm)

Purge: Time Start 16^00 End 16^16

	Time	pH	Conductivity	Temperature, ~~(C)~~
1 volume =	16^05	6.80	100	55°F
2 volume =	16^10	6.78	100	54°F
3 volume =	16^15	6.76	100	54°F
	16^23 Final =	6.65	100	54°F

Sample Collection: Time Start 16^16 End 16^22

Sampling Method: Spigot

Sample Collection Flow Rate: ~1gpm

Sample Characteristics (Circle all applicable)

Describe odor: (none) sulfide fishy musty petroleum

Describe color: (colorless) black brown orange red

Describe appearance: turbid silty sand clay floaters sheen (clear) multiphased foaming slimy algae

Organic Layer? No Length? ____ Samples preserved? ____

Collection Area Description: back of house - spigot

Comments

Refer to page ____ of the corresponding field log book.

revised 8/13/91

D-4 DATA FLAG NOTES

NOTES FOR ROSE HILL ANALYTICAL DATA, REMEDIAL INVESTIGATION, NOVEMBER 1992

IDL - Instrument Detection Limit

CRQL - Contract Required Quantitation Limit

CRDL - Contract Required Detection Limit

QL - Quantitation Limit

U - Value reported is the sample detection limit

J - Quantitation is approximate due to limitations identified during laboratory analysis or in the quality control review

UJ - Sample detection limit is approximate due to limitations identified in the quality control review

R - Value is rejected

D-5 M&E SAMPLE IDs CROSS-REFERENCED TO CLP NUMBERS

ROSE HILL ANALYTICAL DATA

M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SURFACE SOILS			
SS-01-0.0-0.5-NX-S-239-2	SUBCONTRACT	2	
SS-01-0.0-0.5-NX-S-239-2	CLP-ORGANIC	2	AZ454
SS-01-0.0-0.5-NX-S-239-2	CLP-INORGTOT	2	MAX331
SS-02-0.0-0.5-NX-S-240-2	SUBCONTRACT	2	
SS-02-0.0-0.5-NX-S-240-2	CLP-ORGANIC	2	AZ455
SS-02-0.0-0.5-NX-S-240-2	CLP-INORGTOT	2	MAX332
SS-03-0.0-0.5-NX-S-241-2	SUBCONTRACT	2	
SS-03-0.0-0.5-NX-S-241-2	CLP-ORGANIC	2	AZ468
SS-03-0.0-0.5-NX-S-241-2	CLP-INORGTOT	2	MAX339
SS-04-0.0-0.5-NX-S-242-2	SUBCONTRACT	2	
SS-04-0.0-0.5-NX-S-242-2	CLP-ORGANIC	2	AZ466
SS-04-0.0-0.5-NX-S-242-2	CLP-INORGTOT	2	MAX337
SS-05-0.0-0.5-NX-S-243-2	SUBCONTRACT	2	
SS-05-0.0-0.5-NX-S-243-2	CLP-ORGANIC	2	AZ469
SS-05-0.0-0.5-NX-S-243-2	CLP-INORGTOT	2	MAX340
SS-06-0.0-0.5-NX-S-244-2	SUBCONTRACT	2	
SS-06-0.0-0.5-NX-S-244-2	CLP-ORGANIC	2	AZ470
SS-06-0.0-0.5-NX-S-244-2	CLP-INORGTOT	2	MAX341
SS-07-0.0-0.5-FD-S-326-2	SUBCONTRACT	2	
SS-07-0.0-0.5-FD-S-326-2	CLP-ORGANIC	2	AZ461
SS-07-0.0-0.5-FD-S-326-2	CLP-INORGTOT	2	MAX602
SS-07-0.0-0.5-NX-S-245-2	SUBCONTRACT	2	
SS-07-0.0-0.5-NX-S-245-2	CLP-ORGANIC	2	AZ459
SS-07-0.0-0.5-NX-S-245-2	CLP-INORGTOT	2	MAX600
SS-08-0.0-0.5-NX-S-246-2	SUBCONTRACT	2	
SS-08-0.0-0.5-NX-S-246-2	CLP-ORGANIC	2	AZ460
SS-08-0.0-0.5-NX-S-246-2	CLP-INORGTOT	2	MAX601
SS-09-0.0-0.5-FD-S-325-2	SUBCONTRACT	2	
SS-09-0.0-0.5-FD-S-325-2	CLP-ORGANIC	2	AZ474
SS-09-0.0-0.5-FD-S-325-2	CLP-INORGTOT	2	MAX345
SS-09-0.0-0.5-NX-S-247-2	SUBCONTRACT	2	
SS-09-0.0-0.5-NX-S-247-2	CLP-ORGANIC	2	AZ473
SS-09-0.0-0.5-NX-S-247-2	CLP-INORGTOT	2	MAX344
SS-10-0.0-0.5-NX-S-248-2	SUBCONTRACT	2	
SS-10-0.0-0.5-NX-S-248-2	CLP-ORGANIC	2	AZ465
SS-10-0.0-0.5-NX-S-248-2	CLP-INORGTOT	2	MAX606
SS-11-0.0-0.5-NX-S-249-2	SUBCONTRACT	2	
SS-11-0.0-0.5-NX-S-249-2	CLP-ORGANIC	2	AZ463
SS-11-0.0-0.5-NX-S-249-2	CLP-INORGTOT	2	MAX605
SS-12-0.0-0.5-NX-S-250-2	SUBCONTRACT	2	
SS-12-0.0-0.5-NX-S-250-2	CLP-ORGANIC	2	AZ464
SS-12-0.0-0.5-NX-S-250-2	CLP-INORGTOT	2	MAX604
SS-13-0.0-0.5-NX-S-338-2	SUBCONTRACT	2	
SS-13-0.0-0.5-NX-S-338-2	CLP-ORGANIC	2	AZ467
SS-13-0.0-0.5-NX-S-338-2	CLP-INORGTOT	2	MAX338
SS-14-0.0-1.0-NX-S-623-4	CLP-ORGANIC	4	ABJ47
SS-14-0.0-1.0-NX-S-623-4	CLP-ORGANIC	4	ABJ47RE
SS-14-0.0-1.0-NX-S-623-4	CLP-INORGTOT	4	MAAA75
SS-15-0.0-1.0-NX-S-624-4	CLP-ORGANIC	4	ABJ52
SS-15-0.0-1.0-NX-S-624-4	CLP-INORGTOT	4	MAAA80
SS-16-0.0-0.5-NX-S-625-4	CLP-ORGANIC	4	ABJ44
SS-16-0.0-0.5-NX-S-625-4	CLP-INORGTOT	4	MAAA73
SS-17-0.0-1.0-NX-S-626-4	CLP-ORGANIC	4	ABJ45
SS-17-0.0-1.0-NX-S-626-4	CLP-INORGTOT	4	MAAA74
SS-18-0.0-1.0-NX-S-627-4	CLP-ORGANIC	4	ABJ53
SS-18-0.0-1.0-NX-S-627-4	CLP-ORGANIC	4	ABJ53RE
SS-18-0.0-1.0-NX-S-627-4	CLP-INORGTOT	4	MAAA81

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SS-19-0.0-1.0-NX-S-628-4	CLP-ORGANIC	4	ABJ41
SS-19-0.0-1.0-NX-S-628-4	CLP-ORGANIC	4	ABJ41RE
SS-19-0.0-1.0-NX-S-628-4	CLP-INORGTOT	4	MAAA70
SS-20-0.0-1.0-NX-S-629-4	CLP-ORGANIC	4	ABJ42
SS-20-0.0-1.0-NX-S-629-4	CLP-ORGANIC	4	ABJ42RE
SS-20-0.0-1.0-NX-S-629-4	CLP-INORGTOT	4	MAAA71
SS-21-0.0-1.0-NX-S-630-4	CLP-ORGANIC	4	ABJ43
SS-21-0.0-1.0-NX-S-630-4	CLP-INORGTOT	4	MAAA72
SS-22-0.0-1.0-FD-S-673-4	CLP-ORGANIC	4	ABJ50
SS-22-0.0-1.0-FD-S-673-4	CLP-INORGTOT	4	MAAA78
SS-22-0.0-1.0-NX-S-631-4	CLP-ORGANIC	4	ABJ49
SS-22-0.0-1.0-NX-S-631-4	CLP-ORGANIC	4	ABJ49RE
SS-22-0.0-1.0-NX-S-631-4	CLP-INORGTOT	4	MAAA77
SS-23-0.0-0.5-NX-S-632-4	CLP-ORGANIC	4	ABJ48
SS-23-0.0-0.5-NX-S-632-4	CLP-ORGANIC	4	ABJ48RE
SS-23-0.0-0.5-NX-S-632-4	CLP-INORGTOT	4	MAAA76
SS-24-0.0-1.0-NX-S-677-4	CLP-ORGANIC	4	ABJ51
SS-24-0.0-1.0-NX-S-677-4	CLP-INORGTOT	4	MAAA79
SUBSURFACE SOILS			
BH-01-02-08-NX-B-125-2	SUBCONTRACT	2	
BH-01-02-08-NX-B-125-2	CLP-ORGANIC	2	AAJ30
BH-01-02-08-NX-B-125-2	CLP-INORGTOT	2	MAW572
BH-01-04-06-NX-B-125-2	CLP-ORGANIC	2	AAJ31
BH-01-08-12-NX-B-126-2	CLP-INORGTOT	2	MAW571
BH-01-8-12-NX-B-126-2	CLP-ORGANIC	2	AAJ29
BH-02-08-10-NX-B-127-2	CLP-ORGANIC	2	AAJ26
BH-02-08-10-NX-B-127-2	CLP-INORGTOT	2	MAW568
BH-02-16-18-FD-B-154-2	CLP-ORGANIC	2	AAJ28
BH-02-16-18-FD-B-154-2	CLP-INORGTOT	2	MAW570
BH-02-16-18-NX-B-128-2	CLP-ORGANIC	2	AAJ27
BH-02-16-18-NX-B-128-2	CLP-INORGTOT	2	MAW569
BH-03-02-04-NX-B-129-2	CLP-ORGANIC	2	AAJ32
BH-03-02-04-NX-B-129-2	CLP-INORGTOT	2	MAW573
BH-03-16-18-NX-B-130-2	CLP-INORGTOT	2	MAW574
BH-03-16-20-NX-B-130-2	SUBCONTRACT	2	
BH-03-16-20-NX-B-130-2	CLP-ORGANIC	2	AAJ34
BH-03-18-20-NX-B-130-2	CLP-ORGANIC	2	AAJ33
BH-04-04-06-NX-B-131-2	CLP-ORGANIC	2	AAJ37
BH-04-04-06-NX-B-131-2	CLP-INORGTOT	2	MAW577
BH-04-08-10-NX-B-132-2	CLP-ORGANIC	2	AAJ38
BH-04-08-10-NX-B-132-2	CLP-INORGTOT	2	MAW578
BH-05-00-02-NX-B-133-2	CLP-ORGANIC	2	AAJ39
BH-05-00-02-NX-B-133-2	CLP-ORGANIC	2	AAJ40
BH-05-00-04-NX-B-133-2	CLP-INORGTOT	2	MAW579
BH-05-10-16-FD-B-153-2	SUBCONTRACT	2	
BH-05-10-16-FD-B-153-2	CLP-ORGANIC	2	AAJ44
BH-05-10-16-FD-B-153-2	CLP-INORGTOT	2	MAW581
BH-05-10-16-NX-B-134-2	SUBCONTRACT	2	
BH-05-10-16-NX-B-134-2	CLP-ORGANIC	2	AAJ42
BH-05-10-16-NX-B-134-2	CLP-INORGTOT	2	MAW580
BH-05-12-14-FD-B-153-2	CLP-ORGANIC	2	AAJ43
BH-05-12-14-NX-B-134-2	CLP-ORGANIC	2	AAJ41
BH-06-02-04-NX-B-135-2	CLP-ORGANIC	2	AAJ46
BH-06-02-04-NX-B-135-2	CLP-INORGTOT	2	MAW582
BH-06-06-10-NX-B-136-2	SUBCONTRACT	2	
BH-06-06-10-NX-B-136-2	CLP-ORGANIC	2	AAJ48
BH-06-06-10-NX-B-136-2	CLP-INORGTOT	2	MAW583

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
BH-06-08-10-NX-B-136-2	CLP-ORGANIC	2	AAJ47
BH-07-04-06-NX-B-138-2	CLP-ORGANIC	2	AAK01
BH-07-04-08-NX-B-138-2	CLP-ORGANIC	2	AAK02
BH-07-04-08-NX-B-138-2	CLP-INORGTOT	2	MAW584
BH-07-04-14-NX-B-138-2	SUBCONTRACT	2	
BH-07-14-16-NX-B-137-2	CLP-ORGANIC	2	AAK03
BH-07-14-18-NX-B-137-2	CLP-ORGANIC	2	AAK04
BH-07-14-18-NX-B-137-2	CLP-INORGTOT	2	MAW585
BH-08-0-02-NX-B-139-2	SUBCONTRACT	2	
BH-08-0-04-NX-B-139-2	SUBCONTRACT	2	
BH-09-0-02-NX-B-141-2	SUBCONTRACT	2	
BH-09-0-04-NX-B-141-2	SUBCONTRACT	2	
BH-10-0-02-NX-B-143-2	SUBCONTRACT	2	
BH-10-0-04-NX-B-143-2	SUBCONTRACT	2	
BH-11-0-02-NX-B-155-2	SUBCONTRACT	2	
BH-11-0-04-NX-B-155-2	SUBCONTRACT	2	
BH-12-0-02-FD-B-144-2	SUBCONTRACT	2	
BH-12-0-02-NX-B-156-2	SUBCONTRACT	2	
BH-12-0-04-FD-B-144-2	SUBCONTRACT	2	
BH-12-0-04-NX-B-156-2	SUBCONTRACT	2	
LEACHATE			
LE-01-0.8-1.0-NX-06-24-L-075	SAS-BOD/TOC	1	6240A-018
LE-01-0.8-1.0-NX-06-24-L-075	CLP-ORGANIC	1	AY029
LE-01-0.8-1.0-NX-06-24-L-075	CLP-INORGTOT	1	MAW526
LE-01-0.8-1.0-NX-06-24-L-075	CLP-METALDIS	1	MAW527
LE-01-0.8-1.0-NX-06-28-L-75A	SAS-BOD/TOC	1	6240A-047
LE-02-0.8-1.0-NX-06-25-L-076	SAS-BOD/TOC	1	6240A-027
LE-02-0.8-1.0-NX-06-25-L-076	CLP-ORGANIC	1	AY043
LE-02-0.8-1.0-NX-06-25-L-076	CLP-INORGTOT	1	MAT036
LE-02-0.8-1.0-NX-06-25-L-076	CLP-METALDIS	1	MAT037
LE-03-0.8-1.0-NX-06-24-L-077	SAS-BOD/TOC	1	6240A-020
LE-03-0.8-1.0-NX-06-24-L-077	CLP-ORGANIC	1	AY032
LE-03-0.8-1.0-NX-06-24-L-077	CLP-INORGTOT	1	MAW531
LE-03-0.8-1.0-NX-06-24-L-077	CLP-METALDIS	1	MAW532
LE-03-0.8-1.0-NX-06-28-L-077	SAS-BOD/TOC	1	6240A-048
LE-04-0-0-FD-06-24-L-086	SAS-BOD/TOC	1	6240A-021
LE-04-0-0-FD-06-24-L-086	CLP-ORGANIC	1	AY034
LE-04-0-0-FD-06-24-L-086	CLP-INORGTOT	1	MAW533
LE-04-0-0-FD-06-24-L-086	CLP-METALDIS	1	MAW534
LE-04-0-0-NX-06-24-L-078	SAS-BOD/TOC	1	6240A-022
LE-04-0-0-NX-06-24-L-078	CLP-ORGANIC	1	AY035
LE-04-0-0-NX-06-24-L-078	CLP-INORGTOT	1	MAW535
LE-04-0-0-NX-06-24-L-078	CLP-METALDIS	1	MAW536
LE-04-0.3-0.8-FD-06-28-W-086	SAS-BOD/TOC	1	6240A-053
LE-04-0.8-1.0-NX-06-28-L-086	SAS-BOD/TOC	1	6240A-049
LE-05-0.0-0.3-FD-L-687-4	CLP-ORGANIC	4	ABJ31
LE-05-0.0-0.3-FD-L-687-4	CLP-INORGTOT	4	MAAA53
LE-05-0.0-0.3-FD-L-687-4	CLP-METALDIS	4	MAAA54
LE-05-0.0-0.3-FD-L-687-4	SAS-BOD/TOC	4	SA0430
LE-05-0.0-0.3-NX-L-685-4	CLP-ORGANIC	4	ABJ11
LE-05-0.0-0.3-NX-L-685-4	CLP-INORGTOT	4	MAAA17
LE-05-0.0-0.3-NX-L-685-4	CLP-METALDIS	4	MAAA18
LE-05-0.0-0.3-NX-L-685-4	SAS-BOD/TOC	4	SA0412
LE-05-0.0-0.3-NX-L-686-4	CLP-ORGANIC	4	ABJ32
LE-05-0.0-0.3-NX-L-686-4	CLP-INORGTOT	4	MAAA55
LE-05-0.0-0.3-NX-L-686-4	CLP-METALDIS	4	MAAA56
LE-05-0.0-0.3-NX-L-686-4	SAS-BOD/TOC	4	SA0431

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
LE-05-0.0-0.5-NX-L-684-4	CLP-ORGANIC	4	ABJ05
LE-05-0.0-0.5-NX-L-684-4	CLP-INORGTOT	4	MAAA07
LE-05-0.0-0.5-NX-L-684-4	CLP-METALDIS	4	MAAA08
LE-05-0.0-0.5-NX-L-684-4	SAS-BOD/TOC	4	SA0407
LE-05-0.8-1.0-NX-06-24-L-079	SAS-BOD/TOC	1	6240A-023
LE-05-0.8-1.0-NX-06-24-L-079	CLP-ORGANIC	1	AY036
LE-05-0.8-1.0-NX-06-24-L-079	CLP-INORGTOT	1	MAW537
LE-05-0.8-1.0-NX-06-24-L-079	CLP-METALDIS	1	MAW538
LE-05-0.8-1.0-NX-06-28-L-079	SAS-BOD/TOC	1	6240A-050
LE-06-0-0.5-NX-06-25-L-080	SAS-BOD/TOC	1	6240A-029
LE-06-0-0.5-NX-06-25-L-080	CLP-ORGANIC	1	AY046
LE-06-0-0.5-NX-06-25-L-080	CLP-ORGANIC	1	AY046RE
LE-06-0-0.5-NX-06-25-L-080	CLP-INORGTOT	1	MAT042
LE-06-0-0.5-NX-06-25-L-080	CLP-METALDIS	1	MAT0443
GROUNDWATER			
EMW-01-0-NX-06-20-G-004	SAS-SULFIDE	1	6206A-012
EMW-01-0-NX-06-20-G-004	SAS-BOD/TOC	1	6240A-009
EMW-01-0-NX-06-20-G-004	CLP-ORGANIC	1	AY013
EMW-01-0-NX-06-20-G-004	CLP-INORGTOT	1	MAW548
EMW-01-0-NX-06-20-G-004	CLP-METALDIS	1	MAW549
EMW-01-00-NX-G-176-2	SAS-BOD/TOC	2	6699A-021
EMW-01-00-NX-G-176-2	SAS-WSO	2	6746A-021
EMW-01-00-NX-G-176-2	CLP-ORGANIC	2	AZ487
EMW-01-00-NX-G-176-2	CLP-INORGTOT	2	MAX367
EMW-01-00-NX-G-176-2	CLP-METALDIS	2	MAX368
EMW-02-0-NX-06-20-G-005	SAS-SULFIDE	1	6206A-013
EMW-02-0-NX-06-20-G-005	SAS-BOD/TOC	1	6240A-010
EMW-02-0-NX-06-20-G-005	CLP-ORGANIC	1	AY014
EMW-02-0-NX-06-20-G-005	CLP-INORGTOT	1	MAT020
EMW-02-0-NX-06-20-G-005	CLP-METALDIS	1	MAT021
EMW-02-00-NX-G-177-2	SAS-BOD/TOC	2	6699A-022
EMW-02-00-NX-G-177-2	SAS-SULFIDE	2	6719A-027
EMW-02-00-NX-G-177-2	SAS-WSO	2	6746A-022
EMW-02-00-NX-G-177-2	CLP-ORGANIC	2	AZ489
EMW-02-00-NX-G-177-2	CLP-INORGTOT	2	MAX369
EMW-02-00-NX-G-177-2	CLP-METALDIS	2	MAX370
EMW-02-00-NX-G-604-4	CLP-ORGANIC	4	ABJ29
EMW-03-0-FD-06-26-G-018	SAS-SULFIDE	1	6206A-049
EMW-03-0-FD-06-26-G-018	SAS-BOD/TOC	1	6240A-039
EMW-03-0-FD-06-26-G-018	CLP-ORGANIC	1	AAJ13
EMW-03-0-FD-06-26-G-018	CLP-INORGTOT	1	MAT069
EMW-03-0-FD-06-26-G-018	CLP-METALDIS	1	MAW550
EMW-03-0-NX-06-26-G-006	SAS-SULFIDE	1	6206A-048
EMW-03-0-NX-06-26-G-006	SAS-BOD/TOC	1	6240A-038
EMW-03-0-NX-06-26-G-006	CLP-ORGANIC	1	AAJ12
EMW-03-0-NX-06-26-G-006	CLP-INORGTOT	1	MAT067
EMW-03-0-NX-06-26-G-006	CLP-METALDIS	1	MAT068
EMW-03-00-NX-G-178-2	SAS-BOD/TOC	2	6699A-024
EMW-03-00-NX-G-178-2	SAS-SULFIDE	2	6719A-029
EMW-03-00-NX-G-178-2	SAS-WSO	2	6746A-024
EMW-03-00-NX-G-178-2	CLP-ORGANIC	2	AZ491
EMW-03-00-NX-G-178-2	CLP-INORGTOT	2	MAX373
EMW-03-00-NX-G-178-2	CLP-METALDIS	2	MAX374
EMW-04-0-NX-06-26-G-007	SAS-SULFIDE	1	6206A-051
EMW-04-0-NX-06-26-G-007	SAS-BOD/TOC	1	6240A-041
EMW-04-0-NX-06-26-G-007	CLP-ORGANIC	1	AAJ15
EMW-04-0-NX-06-26-G-007	CLP-INORGTOT	1	MAW553

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
EMW-04-0-NX-06-26-G-007	CLP-METALDIS	1	MAW554
EMW-04-00-NX-G-179-2	SAS-BOD/TOC	2	6699A-025
EMW-04-00-NX-G-179-2	SAS-SULFIDE	2	6719A-030
EMW-04-00-NX-G-179-2	SAS-WSO	2	6746A-025
EMW-04-00-NX-G-179-2	CLP-ORGANIC	2	AZ492
EMW-04-00-NX-G-179-2	CLP-INORGTOT	2	MAX375
EMW-04-00-NX-G-179-2	CLP-METALDIS	2	MAX376
EMW-05-0-NX-06-27-G-008	SAS-SULFIDE	1	6206A-054
EMW-05-0-NX-06-27-G-008	SAS-BOD/TOC	1	6240A-044
EMW-05-0-NX-06-27-G-008	CLP-ORGANIC	1	AAJ19
EMW-05-0-NX-06-27-G-008	CLP-INORGTOT	1	MAW559
EMW-05-0-NX-06-27-G-008	CLP-METALDIS	1	MAW560
EMW-05-00-NX-G-180-2	SAS-BOD/TOC	2	6699A-030
EMW-05-00-NX-G-180-2	SAS-SULFIDE	2	6719A-038
EMW-05-00-NX-G-180-2	SAS-WSO	2	6746A-030
EMW-05-00-NX-G-180-2	CLP-ORGANIC	2	AAK50
EMW-05-00-NX-G-180-2	CLP-INORGTOT	2	MAX388
EMW-05-00-NX-G-180-2	CLP-METALDIS	2	MAX389
EMW-14-01-00-NX-G-176-2	SAS-SULFIDE	2	6719A-026
EOW-02-00-NX-G-604-4	CLP-INORGTOT	4	MAAA49
EOW-02-00-NX-G-604-4	CLP-METALDIS	4	MAAA50
EOW-02-00-NX-G-604-4	SAS-BOD/TOC	4	SA0428
EOW-25-0-NX-06-27-G-001	SAS-SULFIDE	1	6206A-057
EOW-25-0-NX-06-27-G-001	CLP-ORGANIC	1	AAJ23
EOW-25-0-NX-06-27-G-001	CLP-INORGTOT	1	MAW566
EOW-25-0-NX-06-27-G-001	CLP-METALDIS	1	MAW567
EOW-27-0-NX-06-27-G-002	SAS-SULFIDE	1	6206A-055
EOW-27-0-NX-06-27-G-002	SAS-BOD/TOC	1	6240A-045
EOW-27-0-NX-06-27-G-002	CLP-ORGANIC	1	AAJ21
EOW-27-0-NX-06-27-G-002	CLP-INORGTOT	1	MAW561
EOW-27-0-NX-06-27-G-002	CLP-METALDIS	1	MAW562
EOW-27-00-FD-G-667-4	CLP-ORGANIC	4	ABJ35
EOW-27-00-FD-G-667-4	CLP-INORGTOT	4	MAAA59
EOW-27-00-FD-G-667-4	CLP-METALDIS	4	MAAA60
EOW-27-00-FD-G-667-4	SAS-BOD/TOC	4	SA0433
EOW-27-00-NX-G-174-2	SAS-BOD/TOC	2	6699A-029
EOW-27-00-NX-G-174-2	SAS-SULFIDE	2	6719A-037
EOW-27-00-NX-G-174-2	SAS-WSO	2	6746A-029
EOW-27-00-NX-G-174-2	CLP-ORGANIC	2	AZ499
EOW-27-00-NX-G-174-2	CLP-INORGTOT	2	MAX386
EOW-27-00-NX-G-174-2	CLP-METALDIS	2	MAX387
EOW-27-00-NX-G-503-3	SAS-BOD/TOC	3	7012A-025
EOW-27-00-NX-G-503-3	CLP-ORGANIC	3	ABH70
EOW-27-00-NX-G-503-3	CLP-INORGTOT	3	MAZ054
EOW-27-00-NX-G-503-3	CLP-METALDIS	3	MAZ055
EOW-27-00-NX-G-600-4	CLP-ORGANIC	4	ABJ34
EOW-27-00-NX-G-600-4	CLP-INORGTOT	4	MAAA57
EOW-27-00-NX-G-600-4	CLP-METALDIS	4	MAAA58
EOW-27-00-NX-G-600-4	SAS-BOD/TOC	4	SA0432
EOW-30-0-NX-06-27-G-003	SAS-SULFIDE	1	6206A-056
EOW-30-0-NX-06-27-G-003	SAS-BOD/TOC	1	6240A-046
EOW-30-0-NX-06-27-G-003	CLP-ORGANIC	1	AAJ22
EOW-30-0-NX-06-27-G-003	CLP-INORGTOT	1	MAW563
EOW-30-0-NX-06-27-G-003	CLP-METALDIS	1	MAW564
EOW-30-00-FD-G-315-2	SAS-BOD/TOC	2	6699A-035
EOW-30-00-FD-G-315-2	SAS-SULFIDE	2	6719A-045
EOW-30-00-FD-G-315-2	SAS-WSO	2	6746A-035
EOW-30-00-FD-G-315-2	CLP-ORGANIC	2	AAK58
EOW-30-00-FD-G-315-2	CLP-INORGTOT	2	MAX607

ROSE HILL ANALYTICAL DATA
M&E SAMPLE ID: CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
EOW-30-00-FD-G-315-2	CLP-METALDIS	2	MAX608
EOW-30-00-NX-G-175-2	SAS-BOD/TOC	2	6699A-038
EOW-30-00-NX-G-175-2	SAS-SULFIDE	2	6719A-049
EOW-30-00-NX-G-175-2	SAS-WSO	2	6746A-038
EOW-30-00-NX-G-175-2	CLP-ORGANIC	2	AAK62
EOW-30-00-NX-G-175-2	CLP-INORGTOT	2	MAX615
EOW-30-00-NX-G-175-2	CLP-METALDIS	2	MAX616
EOW-30-00-NX-G-504-3	SAS-BOD/TOC	3	7012A-026
EOW-30-00-NX-G-504-3	CLP-ORGANIC	3	ABH71
EOW-30-00-NX-G-504-3	CLP-INORGTOT	3	MAZ056
EOW-30-00-NX-G-504-3	CLP-METALDIS	3	MAZ057
EOW-30-00-NX-G-601-4	CLP-ORGANIC	4	ABJ28
EOW-30-00-NX-G-601-4	CLP-INORGTOT	4	MAAA47
EOW-30-00-NX-G-601-4	CLP-METALDIS	4	MAAA48
EOW-30-00-NX-G-601-4	SAS-BOD/TOC	4	SA0427
NMW-01-01-NX-G-181-2	SAS-BOD/TOC	2	6699A-015
NMW-01-01-NX-G-181-2	SAS-SULFIDE	2	6719A-016
NMW-01-01-NX-G-181-2	SAS-WSO	2	6746A-015
NMW-01-01-NX-G-181-2	CLP-ORGANIC	2	AZ477
NMW-01-01-NX-G-181-2	CLP-INORGTOT	2	MAX350
NMW-01-01-NX-G-181-2	CLP-METALDIS	2	MAX351
NMW-01-01-NX-G-505-3	SAS-SULFIDE	3	7012A-030
NMW-01-01-NX-G-505-3	SAS-BOD/TOC	3	7012A-031
NMW-01-01-NX-G-505-3	CLP-ORGANIC	3	ABH77
NMW-01-01-NX-G-505-3	CLP-INORGTOT	3	MAZ066
NMW-01-01-NX-G-505-3	CLP-METALDIS	3	MAZ067
NMW-01-01-NX-G-602-4	CLP-ORGANIC	4	ABJ12
NMW-01-01-NX-G-602-4	CLP-INORGTOT	4	MAAA19
NMW-01-01-NX-G-602-4	CLP-METALDIS	4	MAAA20
NMW-01-01-NX-G-602-4	SAS-BOD/TOC	4	SA0413
NMW-01-02-NX-G-182-2	SAS-BOD/TOC	2	6699A-023
NMW-01-02-NX-G-182-2	SAS-SULFIDE	2	6719A-028
NMW-01-02-NX-G-182-2	SAS-WSO	2	6746A-023
NMW-01-02-NX-G-182-2	CLP-ORGANIC	2	AZ490
NMW-01-02-NX-G-182-2	CLP-INORGTOT	2	MAX371
NMW-01-02-NX-G-182-2	CLP-METALDIS	2	MAX372
NMW-01-02-NX-G-506-3	SAS-BOD/TOC	3	7012A-034
NMW-01-02-NX-G-506-3	CLP-ORGANIC	3	ABH81
NMW-01-02-NX-G-506-3	CLP-INORGTOT	3	MAZ072
NMW-01-02-NX-G-506-3	CLP-METALDIS	3	MAZ073
NMW-01-02-NX-G-603-4	CLP-ORGANIC	4	ABJ17
NMW-01-02-NX-G-603-4	CLP-INORGTOT	4	MAAA29
NMW-01-02-NX-G-603-4	CLP-METALDIS	4	MAAA30
NMW-01-02-NX-G-603-4	SAS-BOD/TOC	4	SA0418
NMW-02-01-FD-G-318-2	SAS-BOD/TOC	2	6699A-068
NMW-02-01-FD-G-318-2	SAS-SULFIDE	2	6719A-089
NMW-02-01-FD-G-318-2	SAS-WSO	2	6746A-069
NMW-02-01-FD-G-318-2	CLP-ORGANIC	2	AAK13
NMW-02-01-FD-G-318-2	CLP-INORGTOT	2	MAX686
NMW-02-01-FD-G-318-2	CLP-METALDIS	2	MAX687
NMW-02-01-FD-G-565-3	SAS-BOD/TOC	3	7012A-014
NMW-02-01-FD-G-565-3	CLP-ORGANIC	3	ABH47
NMW-02-01-FD-G-565-3	CLP-INORGTOT	3	MAZ032
NMW-02-01-FD-G-565-3	CLP-METALDIS	3	MAZ033
NMW-02-01-NX-G-183-2	SAS-BOD/TOC	2	6699A-070
NMW-02-01-NX-G-183-2	SAS-SULFIDE	2	6719A-091
NMW-02-01-NX-G-183-2	SAS-WSO	2	6746A-071
NMW-02-01-NX-G-183-2	CLP-ORGANIC	2	AAK15
NMW-02-01-NX-G-183-2	CLP-INORGTOT	2	MAX690

ROSE HILL ANALYTICAL DATA
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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
NMW-02-01-NX-G-183-2	CLP-METALDIS	2	MAX691
NMW-02-01-NX-G-507-3	SAS-BOD/TOC	3	7012A-013
NMW-02-01-NX-G-507-3	CLP-ORGANIC	3	ABH46
NMW-02-01-NX-G-507-3	CLP-INORGTOT	3	MAZ030
NMW-02-01-NX-G-507-3	CLP-METALDIS	3	MAZ031
NMW-02-02-NX-G-184-2	SAS-BOD/TOC	2	6699A-069
NMW-02-02-NX-G-184-2	SAS-SULFIDE	2	6719A-090
NMW-02-02-NX-G-184-2	SAS-WSO	2	6746A-070
NMW-02-02-NX-G-184-2	CLP-ORGANIC	2	AAK14
NMW-02-02-NX-G-184-2	CLP-INORGTOT	2	MAX688
NMW-02-02-NX-G-184-2	CLP-METALDIS	2	MAX689
NMW-03-01-NX-G-185-2	SAS-BOD/TOC	2	6699A-032
NMW-03-01-NX-G-185-2	SAS-SULFIDE	2	6719A-040
NMW-03-01-NX-G-185-2	SAS-WSO	2	6746A-032
NMW-03-01-NX-G-185-2	CLP-ORGANIC	2	AAK53
NMW-03-01-NX-G-185-2	CLP-INORGTOT	2	MAX392
NMW-03-01-NX-G-185-2	CLP-METALDIS	2	MAX393
NMW-03-01-NX-G-508-3	SAS-SULFIDE	3	7012A-031
NMW-03-01-NX-G-508-3	SAS-BOD/TOC	3	7012A-032
NMW-03-01-NX-G-508-3	CLP-ORGANIC	3	ABH78
NMW-03-01-NX-G-508-3	CLP-INORGTOT	3	MAZ068
NMW-03-01-NX-G-508-3	CLP-METALDIS	3	MAZ069
NMW-03-02-NX-G-186-2	SAS-BOD/TOC	2	6699A-031
NMW-03-02-NX-G-186-2	SAS-SULFIDE	2	6719A-039
NMW-03-02-NX-G-186-2	SAS-WSO	2	6746A-031
NMW-03-02-NX-G-186-2	CLP-ORGANIC	2	AAK52
NMW-03-02-NX-G-186-2	CLP-INORGTOT	2	MAX390
NMW-03-02-NX-G-186-2	CLP-METALDIS	2	MAX391
NMW-03-03-FD-G-320-2	SAS-BOD/TOC	2	6699A-037
NMW-03-03-FD-G-320-2	SAS-SULFIDE	2	6719A-047
NMW-03-03-FD-G-320-2	SAS-WSO	2	6746A-037
NMW-03-03-FD-G-320-2	CLP-ORGANIC	2	AAK60
NMW-03-03-FD-G-320-2	CLP-INORGTOT	2	MAX611
NMW-03-03-FD-G-320-2	CLP-METALDIS	2	MAX612
NMW-03-03-NX-G-187-2	SAS-BOD/TOC	2	6699A-036
NMW-03-03-NX-G-187-2	SAS-SULFIDE	2	6719A-046
NMW-03-03-NX-G-187-2	SAS-WSO	2	6746A-036
NMW-03-03-NX-G-187-2	CLP-ORGANIC	2	AAK59
NMW-03-03-NX-G-187-2	CLP-INORGTOT	2	MAX609
NMW-03-03-NX-G-187-2	CLP-METALDIS	2	MAX610
NMW-03-03-NX-G-510-3	SAS-BOD/TOC	3	7012A-035
NMW-03-03-NX-G-510-3	CLP-ORGANIC	3	ABH82
NMW-03-03-NX-G-510-3	CLP-INORGTOT	3	MAZ074
NMW-03-03-NX-G-510-3	CLP-METALDIS	3	MAZ075
NMW-04-01-NX-G-188-2	SAS-BOD/TOC	2	6699A-042
NMW-04-01-NX-G-188-2	SAS-SULFIDE	2	6719A-057
NMW-04-01-NX-G-188-2	SAS-WSO	2	6746A-043
NMW-04-01-NX-G-188-2	CLP-ORGANIC	2	AAK70
NMW-04-01-NX-G-188-2	CLP-INORGTOT	2	MAX628
NMW-04-01-NX-G-188-2	CLP-METALDIS	2	MAX629
NMW-04-01-NX-G-511-3	SAS-SULFIDE	3	7012A-003
NMW-04-01-NX-G-511-3	SAS-BOD/TOC	3	7012A-006
NMW-04-01-NX-G-511-3	SAS-WSO	3	7012A-007
NMW-04-01-NX-G-511-3	CLP-ORGANIC	3	ABH38
NMW-04-01-NX-G-511-3	CLP-INORGTOT	3	MAZ013
NMW-04-01-NX-G-511-3	CLP-METALDIS	3	MAZ014
NMW-04-02-NX-G-189-2	SAS-BOD/TOC	2	6699A-041
NMW-04-02-NX-G-189-2	SAS-SULFIDE	2	6719A-055
NMW-04-02-NX-G-189-2	SAS-WSO	2	6746A-041

ROSE HILL ANALYTICAL DATA
M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
NMW-04-02-NX-G-189-2	CLP-ORGANIC	2	AAK68
NMW-04-02-NX-G-189-2	CLP-METALDIS	2	MAX624
NMW-04-02-NX-G-189-2	CLP-INORGTOT	2	MAX625
NMW-04-02-NX-G-512-3	SAS-SULFIDE	3	7012A-005
NMW-04-02-NX-G-512-3	SAS-BOD/TOC	3	7012A-008
NMW-04-02-NX-G-512-3	CLP-ORGANIC	3	ABH39
NMW-04-02-NX-G-512-3	CLP-INORGTOT	3	MAZ015
NMW-04-02-NX-G-512-3	CLP-METALDIS	3	MAZ016
NMW-04-03-NX-G-190-2	SAS-BOD/TOC	2	6699A-054
NMW-04-03-NX-G-190-2	SAS-SULFIDE	2	6719A-075
NMW-04-03-NX-G-190-2	SAS-WSO	2	6746A-055
NMW-04-03-NX-G-190-2	CLP-ORGANIC	2	AAK90
NMW-04-03-NX-G-190-2	CLP-INORGTOT	2	MAX658
NMW-04-03-NX-G-190-2	CLP-METALDIS	2	MAX659
NMW-04-03-NX-G-513-3	SAS-BOD/TOC	3	7012A-033
NMW-04-03-NX-G-513-3	CLP-ORGANIC	3	ABH80
NMW-04-03-NX-G-513-3	CLP-INORGTOT	3	MAZ070
NMW-04-03-NX-G-513-3	CLP-METALDIS	3	MAZ071
NMW-05-01-NX-G-191-2	SAS-BOD/TOC	2	6699A-058
NMW-05-01-NX-G-191-2	SAS-SULFIDE	2	6719A-079
NMW-05-01-NX-G-191-2	SAS-WSO	2	6746A-059
NMW-05-01-NX-G-191-2	CLP-ORGANIC	2	AAK94
NMW-05-01-NX-G-191-2	CLP-INORGTOT	2	MAX666
NMW-05-01-NX-G-191-2	CLP-METALDIS	2	MAX667
NMW-05-01-NX-G-605-4	CLP-ORGANIC	4	ABJ38
NMW-05-01-NX-G-605-4	CLP-INORGTOT	4	MAAA65
NMW-05-01-NX-G-605-4	CLP-METALDIS	4	MAAA66
NMW-05-01-NX-G-605-4	SAS-BOD/TOC	4	SA0436
NMW-05-02-NX-G-192-2	SAS-BOD/TOC	2	6699A-057
NMW-05-02-NX-G-192-2	SAS-SULFIDE	2	6719A-078
NMW-05-02-NX-G-192-2	SAS-WSO	2	6746A-058
NMW-05-02-NX-G-192-2	CLP-ORGANIC	2	AAK93
NMW-05-02-NX-G-192-2	CLP-INORGTOT	2	MAX664
NMW-05-02-NX-G-192-2	CLP-METALDIS	2	MAX665
NMW-05-02-NX-G-606-4	CLP-ORGANIC	4	ABJ39
NMW-05-02-NX-G-606-4	CLP-INORGTOT	4	MAAA67
NMW-05-02-NX-G-606-4	CLP-METALDIS	4	MAAA68
NMW-05-02-NX-G-606-4	SAS-BOD/TOC	4	SA0437
NMW-06-01-NX-G-193-2	SAS-BOD/TOC	2	6699A-050
NMW-06-01-NX-G-193-2	SAS-SULFIDE	2	6719A-067
NMW-06-01-NX-G-193-2	SAS-WSO	2	6746A-051
NMW-06-01-NX-G-193-2	CLP-ORGANIC	2	AAK82
NMW-06-01-NX-G-193-2	CLP-INORGTOT	2	MAX647
NMW-06-01-NX-G-193-2	CLP-METALDIS	2	MAX648
NMW-06-01-NX-G-607-4	CLP-ORGANIC	4	ABJ14
NMW-06-01-NX-G-607-4	CLP-METALDIS	4	MAAA23
NMW-06-01-NX-G-607-4	CLP-INORGTOT	4	MAAA24
NMW-06-01-NX-G-607-4	SAS-BOD/TOC	4	SA0415
NMW-06-02-NX-G-194-2	SAS-BOD/TOC	2	6699A-049
NMW-06-02-NX-G-194-2	SAS-SULFIDE	2	6719A-070
NMW-06-02-NX-G-194-2	SAS-WSO	2	6746A-050
NMW-06-02-NX-G-194-2	CLP-ORGANIC	2	AAK81
NMW-06-02-NX-G-194-2	CLP-INORGTOT	2	MAX645
NMW-06-02-NX-G-194-2	CLP-METALDIS	2	MAX646
NMW-06-02-NX-G-608-4	CLP-ORGANIC	4	ABJ13
NMW-06-02-NX-G-608-4	CLP-INORGTOT	4	MAAA21
NMW-06-02-NX-G-608-4	CLP-METALDIS	4	MAAA22
NMW-06-02-NX-G-608-4	SAS-BOD/TOC	4	SA0414
NMW-07-01-FD-G-669-4	CLP-ORGANIC	4	ABJ20

ROSE HILL ANALYTICAL DATA

M&E SAMPLE ID: CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
NMW-07-01-FD-G-669-4	CLP-INORGTOT	4	MAAA33
NMW-07-01-FD-G-669-4	CLP-METALDIS	4	MAAA34
NMW-07-01-FD-G-669-4	SAS-BOD/TOC	4	SA0420
NMW-07-01-NX-G-192-2	CLP-ORGANIC	2	AAK86
NMW-07-01-NX-G-195-2	SAS-BOD/TOC	2	6699A-052
NMW-07-01-NX-G-195-2	SAS-SULFIDE	2	6719A-071
NMW-07-01-NX-G-195-2	SAS-WSO	2	6746A-053
NMW-07-01-NX-G-195-2	CLP-INORGTOT	2	MAX652
NMW-07-01-NX-G-195-2	CLP-METALDIS	2	MAX653
NMW-07-01-NX-G-514-3	SAS-BOD/TOC	3	7012A-023
NMW-07-01-NX-G-514-3	CLP-ORGANIC	3	ABH68
NMW-07-01-NX-G-514-3	CLP-INORGTOT	3	MAZ050
NMW-07-01-NX-G-514-3	CLP-METALDIS	3	MAZ051
NMW-07-01-NX-G-609-4	CLP-ORGANIC	4	ABJ19
NMW-07-01-NX-G-609-4	CLP-INORGTOT	4	MAAA31
NMW-07-01-NX-G-609-4	CLP-METALDIS	4	MAAA32
NMW-07-01-NX-G-609-4	SAS-BOD/TOC	4	SA0419
NMW-07-02-NX-G-196-2	SAS-BOD/TOC	2	6699A-065
NMW-07-02-NX-G-196-2	SAS-SULFIDE	2	6719A-086
NMW-07-02-NX-G-196-2	SAS-WSO	2	6746A-066
NMW-07-02-NX-G-196-2	CLP-ORGANIC	2	AAK10
NMW-07-02-NX-G-196-2	CLP-INORGTOT	2	MAX680
NMW-07-02-NX-G-196-2	CLP-METALDIS	2	MAX681
NMW-07-02-NX-G-515-3	SAS-BOD/TOC	3	7012A-020
NMW-07-02-NX-G-515-3	CLP-ORGANIC	3	ABH65
NMW-07-02-NX-G-515-3	CLP-INORGTOT	3	MAZ044
NMW-07-02-NX-G-515-3	CLP-METALDIS	3	MAZ045
NMW-07-02-NX-G-610-4	CLP-ORGANIC	4	ABJ30
NMW-07-02-NX-G-610-4	CLP-INORGTOT	4	MAAA51
NMW-07-02-NX-G-610-4	CLP-METALDIS	4	MAAA52
NMW-07-02-NX-G-610-4	SAS-BOD/TOC	4	SA0429
NMW-08-01-NX-G-197-2	SAS-BOD/TOC	2	6699A-059
NMW-08-01-NX-G-197-2	SAS-SULFIDE	2	6719A-080
NMW-08-01-NX-G-197-2	SAS-WSO	2	6746A-060
NMW-08-01-NX-G-197-2	CLP-ORGANIC	2	AAK95
NMW-08-01-NX-G-197-2	CLP-INORGTOT	2	MAX668
NMW-08-01-NX-G-197-2	CLP-METALDIS	2	MAX669
NMW-08-01-NX-G-611-4	CLP-ORGANIC	4	ABJ36
NMW-08-01-NX-G-611-4	CLP-INORGTOT	4	MAAA61
NMW-08-01-NX-G-611-4	CLP-METALDIS	4	MAAA62
NMW-08-01-NX-G-611-4	SAS-BOD/TOC	4	SA0434
NMW-08-02-NX-G-198-2	SAS-BOD/TOC	2	6699A-060
NMW-08-02-NX-G-198-2	SAS-SULFIDE	2	6719A-081
NMW-08-02-NX-G-198-2	SAS-WSO	2	6746A-061
NMW-08-02-NX-G-198-2	CLP-ORGANIC	2	AAK96
NMW-08-02-NX-G-198-2	CLP-INORGTOT	2	MAX670
NMW-08-02-NX-G-198-2	CLP-METALDIS	2	MAX671
NMW-08-02-NX-G-612-4	CLP-ORGANIC	4	ABJ37
NMW-08-02-NX-G-612-4	CLP-INORGTOT	4	MAAA63
NMW-08-02-NX-G-612-4	CLP-METALDIS	4	MAAA64
NMW-08-02-NX-G-612-4	SAS-BOD/TOC	4	SA0435
NMW-09-01-NX-G-199-2	SAS-BOD/TOC	2	6699A-072
NMW-09-01-NX-G-199-2	SAS-SULFIDE	2	6719A-093
NMW-09-01-NX-G-199-2	SAS-WSO	2	6746A-073
NMW-09-01-NX-G-199-2	CLP-ORGANIC	2	AAK17
NMW-09-01-NX-G-199-2	CLP-INORGTOT	2	MAX694
NMW-09-01-NX-G-199-2	CLP-METALDIS	2	MAX695
NMW-10-01-NX-G-200-2	SAS-BOD/TOC	2	6699A-071
NMW-10-01-NX-G-200-2	SAS-SULFIDE	2	6719A-092

ROSE HILL ANALYTICAL DATA
M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
NMW-10-01-NX-G-200-2	SAS-WSO	2	6746A-072
NMW-10-01-NX-G-200-2	CLP-ORGANIC	2	AAK16
NMW-10-01-NX-G-200-2	CLP-INORGTOT	2	MAX692
NMW-10-01-NX-G-200-2	CLP-METALDIS	2	MAX693
NMW-10-01-NX-G-516-3	SAS-BOD/TOC	3	7012A-019
NMW-10-01-NX-G-516-3	CLP-ORGANIC	3	ABH64
NMW-10-01-NX-G-516-3	CLP-INORGTOT	3	MAZ042
NMW-10-01-NX-G-516-3	CLP-METALDIS	3	MAZ043
NMW-11-01-NX-G-201-2	SAS-BOD/TOC	2	6699A-043
NMW-11-01-NX-G-201-2	SAS-SULFIDE	2	6719A-058
NMW-11-01-NX-G-201-2	SAS-WSO	2	6746A-044
NMW-11-01-NX-G-201-2	CLP-ORGANIC	2	AAK71
NMW-11-01-NX-G-201-2	CLP-INORGTOT	2	MAX630
NMW-11-01-NX-G-517-3	SAS-BOD/TOC	3	7012A-021
NMW-11-01-NX-G-517-3	CLP-ORGANIC	3	ABH66
NMW-11-01-NX-G-517-3	CLP-INORGTOT	3	MAZ046
NMW-11-01-NX-G-517-3	CLP-METALDIS	3	MAZ047
NMW-11-02-NX-G-202-2	SAS-BOD/TOC	2	6699A-047
NMW-11-02-NX-G-202-2	SAS-SULFIDE	2	6719A-064
NMW-11-02-NX-G-202-2	SAS-WSO	2	6746A-048
NMW-11-02-NX-G-202-2	CLP-ORGANIC	2	AAK78
NMW-11-02-NX-G-202-2	CLP-INORGTOT	2	MAX640
NMW-11-02-NX-G-202-2	CLP-METALDIS	2	MAX641
NMW-11-02-NX-G-518-3	SAS-BOD/TOC	3	7012A-022
NMW-11-02-NX-G-518-3	CLP-ORGANIC	3	ABH67
NMW-11-02-NX-G-518-3	CLP-INORGTOT	3	MAZ048
NMW-11-02-NX-G-518-3	CLP-METALDIS	3	MAZ049
NMW-11-03-NX-G-203-2	SAS-BOD/TOC	2	6699A-046
NMW-11-03-NX-G-203-2	SAS-SULFIDE	2	6719A-063
NMW-11-03-NX-G-203-2	SAS-WSO	2	6746A-047
NMW-11-03-NX-G-203-2	CLP-ORGANIC	2	AAK77
NMW-11-03-NX-G-203-2	CLP-INORGTOT	2	MAX638
NMW-11-03-NX-G-203-2	CLP-METALDIS	2	MAX639
NMW-11-03-NX-G-519-3	SAS-BOD/TOC	3	7012A-024
NMW-11-03-NX-G-519-3	CLP-ORGANIC	3	ABH69
NMW-11-03-NX-G-519-3	CLP-INORGTOT	3	MAZ052
NMW-11-03-NX-G-519-3	CLP-METALDIS	3	MAZ053
NMW-12-01-NX-G-204-2	SAS-BOD/TOC	2	6699A-064
NMW-12-01-NX-G-204-2	SAS-SULFIDE	2	6719A-085
NMW-12-01-NX-G-204-2	SAS-WSO	2	6746A-065
NMW-12-01-NX-G-204-2	CLP-ORGANIC	2	AAK09
NMW-12-01-NX-G-204-2	CLP-INORGTOT	2	MAX678
NMW-12-01-NX-G-204-2	CLP-METALDIS	2	MAX679
NMW-12-01-NX-G-613-4	CLP-ORGANIC	4	ABJ25
NMW-12-01-NX-G-613-4	CLP-INORGTOT	4	MAAA43
NMW-12-01-NX-G-613-4	CLP-METALDIS	4	MAAA44
NMW-12-01-NX-G-613-4	SAS-BOD/TOC	4	SA0425
NMW-12-02-FD-G-319-2	SAS-BOD/TOC	2	6699A-063
NMW-12-02-FD-G-319-2	SAS-SULFIDE	2	6719A-084
NMW-12-02-FD-G-319-2	SAS-WSO	2	6746A-064
NMW-12-02-FD-G-319-2	CLP-ORGANIC	2	AAK08
NMW-12-02-FD-G-319-2	CLP-INORGTOT	2	MAX676
NMW-12-02-FD-G-319-2	CLP-METALDIS	2	MAX677
NMW-12-02-NX-G-205-2	SAS-BOD/TOC	2	6699A-062
NMW-12-02-NX-G-205-2	SAS-SULFIDE	2	6719A-083
NMW-12-02-NX-G-205-2	SAS-WSO	2	6746A-063
NMW-12-02-NX-G-205-2	CLP-ORGANIC	2	AAK07
NMW-12-02-NX-G-205-2	CLP-INORGTOT	2	MAX674
NMW-12-02-NX-G-205-2	CLP-METALDIS	2	MAX675

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M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
NMW-12-02-NX-G-614-4	CLP-ORGANIC	4	ABJ24
NMW-12-02-NX-G-614-4	CLP-INORGTOT	4	MAAA41
NMW-12-02-NX-G-614-4	CLP-METALDIS	4	MAAA42
NMW-12-02-NX-G-614-4	SAS-BOD/TOC	4	SA0424
NMW-13-01-NX-G-206-2	SAS-BOD/TOC	2	6699A-066
NMW-13-01-NX-G-206-2	SAS-SULFIDE	2	6719A-087
NMW-13-01-NX-G-206-2	SAS-WSO	2	6746A-067
NMW-13-01-NX-G-206-2	CLP-ORGANIC	2	AAK11
NMW-13-01-NX-G-206-2	CLP-INORGTOT	2	MAX682
NMW-13-01-NX-G-206-2	CLP-METALDIS	2	MAX683
NMW-13-02-FD-G-567-3	SAS-BOD/TOC	3	7012A-016
NMW-13-02-FD-G-567-3	CLP-ORGANIC	3	ABH49
NMW-13-02-FD-G-567-3	CLP-INORGTOT	3	MAZ036
NMW-13-02-FD-G-567-3	CLP-METALDIS	3	MAZ037
NMW-13-02-NX-G-207-2	SAS-BOD/TOC	2	6699A-067
NMW-13-02-NX-G-207-2	SAS-SULFIDE	2	6719A-088
NMW-13-02-NX-G-207-2	SAS-WSO	2	6746A-068
NMW-13-02-NX-G-207-2	CLP-ORGANIC	2	AAK12
NMW-13-02-NX-G-207-2	CLP-INORGTOT	2	MAX684
NMW-13-02-NX-G-207-2	CLP-METALDIS	2	MAX685
NMW-13-02-NX-G-520-3	SAS-BOD/TOC	3	7012A-015
NMW-13-02-NX-G-520-3	CLP-ORGANIC	3	ABH48
NMW-13-02-NX-G-520-3	CLP-INORGTOT	3	MAZ034
NMW-13-02-NX-G-520-3	CLP-METALDIS	3	MAZ035
NMW-14-01-NX-G-208-2	SAS-BOD/TOC	2	6699A-020
NMW-14-01-NX-G-208-2	SAS-SULFIDE	2	6719A-025
NMW-14-01-NX-G-208-2	SAS-WSO	2	6746A-020
NMW-14-01-NX-G-208-2	CLP-ORGANIC	2	AZ486
NMW-14-01-NX-G-208-2	CLP-INORGTOT	2	MAX365
NMW-14-01-NX-G-208-2	CLP-METALDIS	2	MAX366
NMW-14-01-NX-G-521-3	SAS-BOD/TOC	3	7012A-030
NMW-14-01-NX-G-521-3	SAS-SULFIDE	3	7012A-032
NMW-14-01-NX-G-521-3	CLP-ORGANIC	3	ABH76
NMW-14-01-NX-G-521-3	CLP-INORGTOT	3	MAZ064
NMW-14-01-NX-G-521-3	CLP-METALDIS	3	MAZ065
NWM-11-01-NX-G-201-2	CLP-METALDIS	2	MAX631
RCG-02-0-NX-06-21-G-010	SAS-SULFIDE	1	6206A-025
RCG-02-0-NX-06-21-G-010	SAS-BOD/TOC	1	6240A-017
RCG-02-0-NX-06-21-G-010	SAS-524.2	1	6320A-008
RCG-02-0-NX-06-21-G-010	CLP-ORGANIC	1	AY028
RCG-02-0-NX-06-21-G-010	CLP-ORGANIC	1	AYO28
RCG-02-0-NX-06-21-G-010	CLP-INORGTOT	1	MAW524
RCG-02-0-NX-06-21-G-010	CLP-METALDIS	1	MAW525
RCG-02-00-NX-G-166-2	SAS-524.2	2	6699A-001
RCG-02-00-NX-G-166-2	SAS-SULFIDE	2	6719A-001
RCG-02-00-NX-G-166-2	SAS-WSO	2	6746A-001
RCG-02-00-NX-G-166-2	CLP-ORGANIC	2	AZ442
RCG-02-00-NX-G-166-2	CLP-METALDIS	2	MAX301
RCG-02-00-NX-G-166-2	CLP-INORGTOT	2	MAX300
RCG-02-00-NX-G-501-3	SAS-524.2	3	7009A-003
RCG-02-00-NX-G-501-3	SAS-BOD/TOC	3	7012A-027
RCG-02-00-NX-G-501-3	CLP-ORGANIC	3	ABH73
RCG-02-00-NX-G-501-3	CLP-INORGTOT	3	MAZ058
RCG-02-00-NX-G-501-3	CLP-METALDIS	3	MAZ059
RDC-01-0-NX-06-21-G-009	SAS-SULFIDE	1	6206A-024
RDC-01-0-NX-06-21-G-009	SAS-BOD/TOC	1	6240A-016
RDC-01-0-NX-06-21-G-009	SAS-524.2	1	6320A-007
RDC-01-0-NX-06-21-G-009	CLP-ORGANIC	1	AY027
RDC-01-0-NX-06-21-G-009	CLP-ORGANIC	1	AYO27

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
RDC-01-0-NX-06-21-G-009	CLP-INORGTOT	1	MAW522
RDC-01-0-NX-06-21-G-009	CLP-METALDIS	1	MAW523
RDC-01-00-FD-G-313-2	SAS-BOD/TOC	2	6699A-003
RDC-01-00-FD-G-313-2	SAS-524.2	2	6699A-004
RDC-01-00-FD-G-313-2	SAS-SULFIDE	2	6719A-003
RDC-01-00-FD-G-313-2	SAS-WSO	2	6746A-003
RDC-01-00-FD-G-313-2	CLP-ORGANIC	2	AZ444
RDC-01-00-FD-G-313-2	CLP-INORGTOT	2	MAX313
RDC-01-00-FD-G-313-2	CLP-METALDIS	2	MAX318
RDC-01-00-NX-G-165-2	SAS-BOD/TOC	2	6699A-002
RDC-01-00-NX-G-165-2	SAS-524.2	2	6699A-003
RDC-01-00-NX-G-165-2	SAS-SULFIDE	2	6719A-002
RDC-01-00-NX-G-165-2	SAS-WSO	2	6746A-002
RDC-01-00-NX-G-165-2	CLP-ORGANIC	2	AZ443
RDC-01-00-NX-G-165-2	CLP-INORGTOT	2	MAX302
RDC-01-00-NX-G-165-2	CLP-METALDIS	2	MAX312
RDC-01-00-NX-G-500-3	SAS-524.2	3	7009A-005
RDC-01-00-NX-G-500-3	SAS-BOD/TOC	3	7012A-029
RDC-01-00-NX-G-500-3	CLP-ORGANIC	3	ABH74
RDC-01-00-NX-G-500-3	CLP-INORGTOT	3	MAZ060
RDC-01-00-NX-G-500-3	CLP-METALDIS	3	MAZ061
RDW-10-00-NX-G-502-3	SAS-524.2	3	7009A-004
RDW-10-00-NX-G-502-3	SAS-BOD/TOC	3	7012A-028
RDW-10-00-NX-G-502-3	CLP-ORGANIC	3	ABH75
RDW-10-00-NX-G-502-3	CLP-INORGTOT	3	MAZ062
RDW-10-00-NX-G-502-3	CLP-METALDIS	3	MAZ063
RET-05-0-NX-06-26-G-013	SAS-SULFIDE	1	6206A-044
RET-05-0-NX-06-26-G-013	SAS-BOD/TOC	1	6240A-034
RET-05-0-NX-06-26-G-013	SAS-524.2	1	6320A-011
RET-05-0-NX-06-26-G-013	CLP-ORGANIC	1	AAJ08
RET-05-0-NX-06-26-G-013	CLP-INORGTOT	1	MAT059
RET-05-0-NX-06-26-G-013	CLP-METALDIS	1	MAT060
RET-05-00-NX-G-169-2	SAS-BOD/TOC	2	6699A-007
RET-05-00-NX-G-169-2	SAS-524.2	2	6699A-008
RET-05-00-NX-G-169-2	SAS-SULFIDE	2	6719A-007
RET-05-00-NX-G-169-2	SAS-WSO	2	6746A-007
RET-05-00-NX-G-169-2	CLP-ORGANIC	2	AZ450
RET-05-00-NX-G-169-2	CLP-INORGTOT	2	MAX325
RET-05-00-NX-G-169-2	CLP-METALDIS	2	MAX326
RFJ-04-0-FD-06-26-G-019	SAS-SULFIDE	1	6206A-047
RFJ-04-0-FD-06-26-G-019	SAS-BOD/TOC	1	6240A-037
RFJ-04-0-FD-06-26-G-019	SAS-524.2	1	6320A-014
RFJ-04-0-FD-06-26-G-019	CLP-ORGANIC	1	AAJ11
RFJ-04-0-FD-06-26-G-019	CLP-INORGTOT	1	MAT065
RFJ-04-0-FD-06-26-G-019	CLP-METALDIS	1	MAT066
RFJ-04-0-NX-06-26-G-012	SAS-SULFIDE	1	6206A-046
RFJ-04-0-NX-06-26-G-012	SAS-BOD/TOC	1	6240A-036
RFJ-04-0-NX-06-26-G-012	SAS-524.2	1	6320A-013
RFJ-04-0-NX-06-26-G-012	CLP-ORGANIC	1	AAJ10
RFJ-04-0-NX-06-26-G-012	CLP-INORGTOT	1	MAT063
RFJ-04-0-NX-06-26-G-012	CLP-METALDIS	1	MAT064
RFJ-04-00-NX-G-168-2	SAS-BOD/TOC	2	6699A-006
RFJ-04-00-NX-G-168-2	SAS-524.2	2	6699A-007
RFJ-04-00-NX-G-168-2	SAS-SULFIDE	2	6719A-006
RFJ-04-00-NX-G-168-2	SAS-WSO	2	6746A-006
RFJ-04-00-NX-G-168-2	CLP-ORGANIC	2	AZ449
RFJ-04-00-NX-G-168-2	CLP-INORGTOT	2	MAX323
RFJ-04-00-NX-G-168-2	CLP-METALDIS	2	MAX324
RFJ-06-0-NX-06-27-G-014	SAS-BOD/TOC	1	6240A-043

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
RFJ-06-0-NX-06-27-G-014	SAS-524.2	1	6320A-018
RFS-03-0-NX-06-26-G-011	SAS-SULFIDE	1	6206A-052
RFS-03-0-NX-06-26-G-011	SAS-BOD/TOC	1	6240A-042
RFS-03-0-NX-06-26-G-011	SAS-524.2	1	6320A-017
RFS-03-0-NX-06-26-G-011	CLP-ORGANIC	1	AAJ17
RFS-03-0-NX-06-26-G-011	CLP-INORGTOT	1	MAW555
RFS-03-0-NX-06-26-G-011	CLP-METALDIS	1	MAW556
RFS-03-00-NX-G-167-2	SAS-BOD/TOC	2	6699A-010
RFS-03-00-NX-G-167-2	SAS-524.2	2	6699A-014
RFS-03-00-NX-G-167-2	SAS-SULFIDE	2	6719A-010
RFS-03-00-NX-G-167-2	SAS-WSO	2	6746A-010
RFS-03-00-NX-G-167-2	CLP-ORGANIC	2	AZ456
RFS-03-00-NX-G-167-2	CLP-INORGTOT	2	MAX333
RFS-03-00-NX-G-167-2	CLP-METALDIS	2	MAX334
RJF-06-0-NX-06-27-G-014	SAS-SULFIDE	1	6206A-053
RJF-06-0-NX-06-27-G-014	CLP-ORGANIC	1	AAJ18
RJF-06-0-NX-06-27-G-014	CLP-INORGTOT	1	MAW557
RJF-06-0-NX-06-27-G-014	CLP-METALDIS	1	MAW558
RJF-06-00-NX-G-170-2	SAS-BOD/TOC	2	6699A-017
RJF-06-00-NX-G-170-2	SAS-524.2	2	6699A-019
RJF-06-00-NX-G-170-2	SAS-SULFIDE	2	6719A-019
RJF-06-00-NX-G-170-2	SAS-WSO	2	6746A-017
RJF-06-00-NX-G-170-2	CLP-ORGANIC	2	AZ480
RJF-06-00-NX-G-170-2	CLP-INORGTOT	2	MAX355
RJF-06-00-NX-G-170-2	CLP-METALDIS	2	MAX356
RJM-08-0-NX-06-25-G-016	SAS-SULFIDE	1	6206A-038
RJM-08-0-NX-06-25-G-016	SAS-BOD/TOC	1	6240A-031
RJM-08-0-NX-06-25-G-016	SAS-524.2	1	6320A-010
RJM-08-0-NX-06-25-G-016	CLP-ORGANIC	1	AY050
RJM-08-0-NX-06-25-G-016	CLP-INORGTOT	1	MAT047
RJM-08-0-NX-06-25-G-016	CLP-METALDIS	1	MAT048
RJM-08-00-NX-G-172-2	SAS-BOD/TOC	2	6699A-004
RJM-08-00-NX-G-172-2	SAS-524.2	2	6699A-005
RJM-08-00-NX-G-172-2	SAS-SULFIDE	2	6719A-004
RJM-08-00-NX-G-172-2	SAS-WSO	2	6746A-004
RJM-08-00-NX-G-172-2	CLP-ORGANIC	2	AZ445
RJM-08-00-NX-G-172-2	CLP-INORGTOT	2	MAX315
RJM-08-00-NX-G-172-2	CLP-METALDIS	2	MAX316
RNG-07-0-NX-06-26-G-015	SAS-SULFIDE	1	6206A-050
RNG-07-0-NX-06-26-G-015	SAS-BOD/TOC	1	6240A-040
RNG-07-0-NX-06-26-G-015	SAS-524.2	1	6320A-015
RNG-07-0-NX-06-26-G-015	CLP-ORGANIC	1	AAJ14
RNG-07-0-NX-06-26-G-015	CLP-INORGTOT	1	MAW551
RNG-07-0-NX-06-26-G-015	CLP-METALDIS	1	MAW552
RNG-07-00-NX-G-171-2	SAS-BOD/TOC	2	6699A-012
RNG-07-00-NX-G-171-2	SAS-524.2	2	6699A-017
RNG-07-00-NX-G-171-2	SAS-SULFIDE	2	6719A-013
RNG-07-00-NX-G-171-2	SAS-WSO	2	6746A-012
RNG-07-00-NX-G-171-2	CLP-ORGANIC	2	AZ471
RNG-07-00-NX-G-171-2	CLP-INORGTOT	2	MAX342
RNG-07-00-NX-G-171-2	CLP-METALDIS	2	MAX343
RTK-09-0-NX-06-26-G-017	SAS-SULFIDE	1	6206A-045
RTK-09-0-NX-06-26-G-017	SAS-BOD/TOC	1	6240A-035
RTK-09-0-NX-06-26-G-017	SAS-524.2	1	6320A-012
RTK-09-0-NX-06-26-G-017	CLP-ORGANIC	1	AAJ09
RTK-09-0-NX-06-26-G-017	CLP-INORGTOT	1	MAT061
RTK-09-0-NX-06-26-G-017	CLP-METALDIS	1	MAT062
RTK-09-00-NX-G-173-2	SAS-BOD/TOC	2	6699A-008
RTK-09-00-NX-G-173-2	SAS-524.2	2	6699A-009

ROSE HILL ANALYTICAL DATA
M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
RTK-09-00-NX-G-173-2	SAS-SULFIDE	2	6719A-008
RTK-09-00-NX-G-173-2	SAS-WSO	2	6746A-008
RTK-09-00-NX-G-173-2	CLP-ORGANIC	2	AZ451
RTK-09-00-NX-G-173-2	CLP-INORGTOT	2	MAX327
RTK-09-00-NX-G-173-2	CLP-METALDIS	2	MAX328
SURFACE WATER			
SW-01-0-0.5-NX-06-20-W-024	SAS-SULFIDE	1	6206A-018
SW-01-0-0.5-NX-06-20-W-024	SAS-BOD/TOC	1	6240A-013
SW-01-0-0.5-NX-06-20-W-024	CLP-ORGANIC	1	AY020
SW-01-0-0.5-NX-06-20-W-024	CLP-INORGTOT	1	MAW513
SW-01-0-0.5-NX-06-20-W-024	CLP-METALDIS	1	MAW514
SW-01-0.0-0.3-NX-W-209-2	SAS-BOD/TOC	2	6699A-016
SW-01-0.0-0.3-NX-W-209-2	SAS-SULFIDE	2	6719A-017
SW-01-0.0-0.3-NX-W-209-2	SAS-WSO	2	6746A-016
SW-01-0.0-0.3-NX-W-209-2	CLP-ORGANIC	2	AZ478
SW-01-0.0-0.3-NX-W-209-2	CLP-INORGTOT	2	MAX352
SW-01-0.0-0.3-NX-W-209-2	CLP-METALDIS	2	MAX353
SW-02-0-0.3-NX-06-25-W-025	SAS-SULFIDE	1	6206A-034
SW-02-0-0.3-NX-06-25-W-025	SAS-BOD/TOC	1	6240A-028
SW-02-0-0.3-NX-06-25-W-025	CLP-ORGANIC	1	AY044
SW-02-0-0.3-NX-06-25-W-025	CLP-INORGTOT	1	MAT039
SW-02-0-0.3-NX-06-25-W-025	CLP-METALDIS	1	MAT040
SW-02-0.0-0.3-NX-W-210-2	SAS-BOD/TOC	2	6699A-018
SW-02-0.0-0.3-NX-W-210-2	SAS-SULFIDE	2	6719A-021
SW-02-0.0-0.3-NX-W-210-2	SAS-WSO	2	6746A-018
SW-02-0.0-0.3-NX-W-210-2	CLP-ORGANIC	2	AZ482
SW-02-0.0-0.3-NX-W-210-2	CLP-INORGTOT	2	MAX358
SW-02-0.0-0.3-NX-W-210-2	CLP-METALDIS	2	MAX359
SW-02-0.0-0.3-NX-W-620-4	CLP-ORGANIC	4	ABJ10
SW-02-0.0-0.3-NX-W-620-4	CLP-INORGTOT	4	MAAA15
SW-02-0.0-0.3-NX-W-620-4	CLP-METALDIS	4	MAAA16
SW-02-0.0-0.3-NX-W-620-4	SAS-BOD/TOC	4	SA0411
SW-02-0.0-0.3-NX-W-700-5	CLP-ORGANIC	5	ABY24
SW-02-0.0-0.3-NX-W-700-5	CLP-INORGTOT	5	MAAB13
SW-02-0.0-0.3-NX-W-700-5	CLP-METALDIS	5	MAAB14
SW-02-0.0-0.3-NX-W-700-5	SAS-AMMONIA	5	SA1439
SW-03-0-0.3-NX-06-24-W-026	SAS-SULFIDE	1	6206A-027
SW-03-0-0.3-NX-06-24-W-026	SAS-BOD/TOC	1	6240A-019
SW-03-0-0.3-NX-06-24-W-026	CLP-ORGANIC	1	AY030
SW-03-0-0.3-NX-06-24-W-026	CLP-INORGTOT	1	MAW528
SW-03-0-0.3-NX-06-24-W-026	CLP-METALDIS	1	MAW529
SW-03-0-0.3-NX-06-28-W-026	SAS-BOD/TOC	1	6240A-051
SW-03-0.0-0.3-NX-W-211-2	SAS-BOD/TOC	2	6699A-019
SW-03-0.0-0.3-NX-W-211-2	SAS-WSO	2	6746A-019
SW-03-0.0-0.3-NX-W-211-2	CLP-ORGANIC	2	AZ485
SW-03-0.0-0.3-NX-W-211-2	CLP-INORGTOT	2	MAX363
SW-03-0.0-0.5-NX-W-211-2	SAS-SULFIDE	2	6719A-024
SW-03-0.0-0.5-NX-W-211-2	CLP-METALDIS	2	MAX364
SW-04-0-0.3-NX-06-24-W-027	SAS-SULFIDE	1	6206A-028
SW-04-0-0.3-NX-06-24-W-027	SAS-BOD/TOC	1	6240A-024
SW-04-0-0.3-NX-06-24-W-027	CLP-ORGANIC	1	AY037
SW-04-0-0.3-NX-06-24-W-027	CLP-INORGTOT	1	MAW539
SW-04-0-0.3-NX-06-24-W-027	CLP-METALDIS	1	MAW540
SW-04-0-0.3-NX-06-28-W-027	SAS-BOD/TOC	1	6240A-052
SW-04-0.0-0.3-FD-W-671-4	CLP-ORGANIC	4	ABJ16
SW-04-0.0-0.3-FD-W-671-4	CLP-INORGTOT	4	MAAA27
SW-04-0.0-0.3-FD-W-671-4	CLP-METALDIS	4	MAAA28

ROSE HILL ANALYTICAL DATA

M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SW-04-0.0-0.3-FD-W-671-4	SAS-BOD/TOC	4	SA0417
SW-04-0.0-0.3-NX-W-212-2	SAS-BOD/TOC	2	6699A-027
SW-04-0.0-0.3-NX-W-212-2	SAS-SULFIDE	2	6719A-034
SW-04-0.0-0.3-NX-W-212-2	SAS-WSO	2	6746A-027
SW-04-0.0-0.3-NX-W-212-2	CLP-ORGANIC	2	AZ496
SW-04-0.0-0.3-NX-W-212-2	CLP-INORGTOT	2	MAX381
SW-04-0.0-0.3-NX-W-212-2	CLP-METALDIS	2	MAX382
SW-04-0.0-0.3-NX-W-522-3	SAS-BOD/TOC	3	7012A-003
SW-04-0.0-0.3-NX-W-522-3	SAS-SULFIDE	3	7012A-012
SW-04-0.0-0.3-NX-W-522-3	CLP-ORGANIC	3	ABH34
SW-04-0.0-0.3-NX-W-522-3	CLP-INORGTOT	3	MAZ006
SW-04-0.0-0.3-NX-W-522-3	CLP-METALDIS	3	MAZ007
SW-04-0.0-0.3-NX-W-522-3	CLP-INORGTOT	3	MAZ027
SW-04-0.0-0.3-NX-W-615-4	CLP-ORGANIC	4	ABJ15
SW-04-0.0-0.3-NX-W-615-4	CLP-INORGTOT	4	MAAA25
SW-04-0.0-0.3-NX-W-615-4	CLP-METALDIS	4	MAAA26
SW-04-0.0-0.3-NX-W-615-4	SAS-BOD/TOC	4	SA0416
SW-04-0.0-0.3-NX-W-701-5	CLP-ORGANIC	5	ABY20
SW-04-0.0-0.3-NX-W-701-5	CLP-INORGTOT	5	MAAB07
SW-04-0.0-0.3-NX-W-701-5	CLP-METALDIS	5	MAAB08
SW-04-0.0-0.3-NX-W-701-5	SAS-AMMONIA	5	SA1437
SW-04-0.1-0.3-NX-W-212-2	CLP-ORGANIC	2	AZ496
SW-05-0-0.3-NX-06-24-W-028	SAS-SULFIDE	1	6206A-030
SW-05-0-0.3-NX-06-24-W-028	SAS-BOD/TOC	1	6240A-025
SW-05-0-0.3-NX-06-24-W-028	CLP-ORGANIC	1	AY039
SW-05-0-0.3-NX-06-24-W-028	CLP-METALDIS	1	MAT030
SW-05-0-0.3-NX-06-24-W-028	CLP-INORGTOT	1	MAT031
SW-05-0.0-0.3-NX-W-213-2	SAS-BOD/TOC	2	6699A-026
SW-05-0.0-0.3-NX-W-213-2	SAS-SULFIDE	2	6719A-032
SW-05-0.0-0.3-NX-W-213-2	SAS-WSO	2	6746A-026
SW-05-0.0-0.3-NX-W-213-2	CLP-ORGANIC	2	AZ494
SW-05-0.0-0.3-NX-W-213-2	CLP-INORGTOT	2	MAX378
SW-05-0.0-0.3-NX-W-213-2	CLP-METALDIS	2	MAX379
SW-05-0.0-0.3-NX-W-523-3	SAS-BOD/TOC	3	7012A-018
SW-05-0.0-0.3-NX-W-523-3	CLP-ORGANIC	3	ABH63
SW-05-0.0-0.3-NX-W-523-3	CLP-INORGTOT	3	MAZ040
SW-05-0.0-0.3-NX-W-523-3	CLP-METALDIS	3	MAZ041
SW-05-0.0-0.3-NX-W-616-4	CLP-ORGANIC	4	ABJ22
SW-05-0.0-0.3-NX-W-616-4	CLP-INORGTOT	4	MAAA37
SW-05-0.0-0.3-NX-W-616-4	CLP-METALDIS	4	MAAA38
SW-05-0.0-0.3-NX-W-616-4	SAS-BOD/TOC	4	SA0422
SW-05-0.0-0.3-NX-W-702-5	CLP-ORGANIC	5	ABY22
SW-05-0.0-0.3-NX-W-702-5	CLP-INORGTOT	5	MAAB10
SW-05-0.0-0.3-NX-W-702-5	CLP-METALDIS	5	MAAB11
SW-05-0.0-0.3-NX-W-702-5	SAS-AMMONIA	5	SA1438
SW-06-0-0.3-FD-06-21-W-047	SAS-SULFIDE	1	6206A-022
SW-06-0-0.3-FD-06-21-W-047	SAS-BOD/TOC	1	6240A-015
SW-06-0-0.3-FD-06-21-W-047	CLP-ORGANIC	1	AY025
SW-06-0-0.3-FD-06-21-W-047	CLP-ORGANIC	1	AYO25
SW-06-0-0.3-FD-06-21-W-047	CLP-INORGTOT	1	MAW519
SW-06-0-0.3-NX-06-21-W-029	SAS-SULFIDE	1	6206A-021
SW-06-0-0.3-NX-06-21-W-029	SAS-BOD/TOC	1	6240A-014
SW-06-0-0.3-NX-06-21-W-029	CLP-ORGANIC	1	AY024
SW-06-0-0.3-NX-06-21-W-029	CLP-METALDIS	1	MAW518
SW-06-0.0-0.3-NX-W-214-2	SAS-BOD/TOC	2	6699A-028
SW-06-0.0-0.3-NX-W-214-2	SAS-SULFIDE	2	6719A-036
SW-06-0.0-0.3-NX-W-214-2	SAS-WSO	2	6746A-028
SW-06-0.0-0.3-NX-W-214-2	CLP-ORGANIC	2	AZ498
SW-06-0.0-0.3-NX-W-214-2	CLP-INORGTOT	2	MAX384

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SW-06-0.0-0.3-NX-W-214-2	CLP-METALDIS	2	MAX385
SW-06-0.0-0.3-NX-W-524-3	SAS-BOD/TOC	3	7012A-017
SW-06-0.0-0.3-NX-W-524-3	CLP-ORGANIC	3	ABH50
SW-06-0.0-0.3-NX-W-524-3	CLP-INORGTOT	3	MAZ038
SW-06-0.0-0.3-NX-W-524-3	CLP-METALDIS	3	MAZ039
SW-06-0.0-0.3-NX-W-617-4	CLP-ORGANIC	4	ABJ23
SW-06-0.0-0.3-NX-W-617-4	CLP-INORGTOT	4	MAAA39
SW-06-0.0-0.3-NX-W-617-4	CLP-METALDIS	4	MAAA40
SW-06-0.0-0.3-NX-W-617-4	SAS-BOD/TOC	4	SA0423
SW-06-0.0-0.3-NX-W-703-5	CLP-ORGANIC	5	ABY16
SW-06-0.0-0.3-NX-W-703-5	CLP-INORGTOT	5	MAAB03
SW-06-0.0-0.3-NX-W-703-5	CLP-METALDIS	5	MAAB04
SW-06-0.0-0.3-NX-W-703-5	SAS-AMMONIA	5	SA1434
SW-07-0-0.3-NX-06-25-W-030	SAS-SULFIDE	1	6206A-032
SW-07-0-0.3-NX-06-25-W-030	SAS-BOD/TOC	1	6240A-026
SW-07-0-0.3-NX-06-25-W-030	CLP-ORGANIC	1	AY041
SW-07-0-0.3-NX-06-25-W-030	CLP-INORGTOT	1	MAT033
SW-07-0-0.3-NX-06-25-W-030	CLP-METALDIS	1	MAT034
SW-07-0.0-0.3-NX-W-215-2	SAS-BOD/TOC	2	6699A-045
SW-07-0.0-0.3-NX-W-215-2	SAS-SULFIDE	2	6719A-062
SW-07-0.0-0.3-NX-W-215-2	SAS-WSO	2	6746A-046
SW-07-0.0-0.3-NX-W-215-2	CLP-ORGANIC	2	AAE76
SW-07-0.0-0.3-NX-W-215-2	CLP-INORGTOT	2	MAX636
SW-07-0.0-0.3-NX-W-215-2	CLP-METALDIS	2	MAX637
SW-07-0.0-0.3-NX-W-525-3	SAS-SULFIDE	3	7012A-009
SW-07-0.0-0.3-NX-W-525-3	SAS-BOD/TOC	3	7012A-012
SW-07-0.0-0.3-NX-W-525-3	CLP-ORGANIC	3	ABH44
SW-07-0.0-0.3-NX-W-525-3	CLP-INORGTOT	3	MAZ023
SW-07-0.0-0.3-NX-W-525-3	CLP-METALDIS	3	MAZ024
SW-07-0.0-0.3-NX-W-618-4	CLP-ORGANIC	4	ABJ07
SW-07-0.0-0.3-NX-W-618-4	CLP-METALDIS	4	MAAA11
SW-07-0.0-0.3-NX-W-618-4	CLP-INORGTOT	4	MAAA12
SW-07-0.0-0.3-NX-W-618-4	SAS-BOD/TOC	4	SA0409
SW-07-0.0-0.3-NX-W-704-5	CLP-ORGANIC	5	ABY08
SW-07-0.0-0.3-NX-W-704-5	CLP-INORGTOT	5	MAAA91
SW-07-0.0-0.3-NX-W-704-5	CLP-METALDIS	5	MAAA92
SW-07-0.0-0.3-NX-W-704-5	SAS-AMMONIA	5	SA1424
SW-08-0-0.3-FD-06-25-W-100	CLP-METALDIS	1	MAT055
SW-08-0-0.3-NX-06-25-W-031	SAS-SULFIDE	1	6206A-042
SW-08-0-0.3-NX-06-25-W-031	SAS-BOD/TOC	1	6240A-033
SW-08-0-0.3-NX-06-25-W-031	CLP-ORGANIC	1	AAJ06
SW-08-0-0.3-NX-06-25-W-031	CLP-METALDIS	1	MAT056
SW-08-0-0.3-NX-06-25-W-031	CLP-INORGTOT	1	MAT057
SW-08-0.0-0.3-FD-W-322-2	SAS-BOD/TOC	2	6699A-034
SW-08-0.0-0.3-FD-W-322-2	SAS-SULFIDE	2	6719A-042
SW-08-0.0-0.3-FD-W-322-2	SAS-WSO	2	6746A-034
SW-08-0.0-0.3-FD-W-322-2	CLP-ORGANIC	2	AAE55
SW-08-0.0-0.3-FD-W-322-2	CLP-INORGTOT	2	MAX396
SW-08-0.0-0.3-FD-W-322-2	CLP-METALDIS	2	MAX397
SW-08-0.0-0.3-NX-W-216-2	SAS-BOD/TOC	2	6699A-033
SW-08-0.0-0.3-NX-W-216-2	SAS-SULFIDE	2	6719A-041
SW-08-0.0-0.3-NX-W-216-2	SAS-WSO	2	6746A-033
SW-08-0.0-0.3-NX-W-216-2	CLP-ORGANIC	2	AAE54
SW-08-0.0-0.3-NX-W-216-2	CLP-INORGTOT	2	MAX394
SW-08-0.0-0.3-NX-W-216-2	CLP-METALDIS	2	MAX395
SW-09-0-0.3-FD-06-20-W-048	SAS-SULFIDE	1	6206A-016
SW-09-0-0.3-FD-06-20-W-048	SAS-BOD/TOC	1	6240A-012
SW-09-0-0.3-FD-06-20-W-048	CLP-ORGANIC	1	AY018
SW-09-0-0.3-FD-06-20-W-048	CLP-INORGTOT	1	MAT026

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M&E SAMPLE ID: CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SW-09-0-0.3-FD-06-20-W-048	CLP-METALDIS	1	MAT027
SW-09-0-0.3-NX-06-20-W-032	SAS-SULFIDE	1	6206A-014
SW-09-0-0.3-NX-06-20-W-032	SAS-BOD/TOC	1	6240A-011
SW-09-0-0.3-NX-06-20-W-032	CLP-ORGANIC	1	AY015
SW-09-0-0.3-NX-06-20-W-032	CLP-INORGTOT	1	MAT022
SW-09-0-0.3-NX-06-20-W-032	CLP-METALDIS	1	MAT023
SW-09-0.0-0.3-FD-W-745-5	CLP-ORGANIC	5	ABY12
SW-09-0.0-0.3-FD-W-745-5	CLP-INORGTOT	5	MAAA98
SW-09-0.0-0.3-FD-W-745-5	CLP-METALDIS	5	MAAA99
SW-09-0.0-0.3-FD-W-745-5	SAS-AMMONIA	5	SA1430
SW-09-0.0-0.3-NX-W-222-2	SAS-BOD/TOC	2	6699A-051
SW-09-0.0-0.3-NX-W-222-2	SAS-SULFIDE	2	6719A-068
SW-09-0.0-0.3-NX-W-222-2	SAS-WSO	2	6746A-052
SW-09-0.0-0.3-NX-W-222-2	CLP-ORGANIC	2	AAK85
SW-09-0.0-0.3-NX-W-222-2	CLP-INORGTOT	2	MAX650
SW-09-0.0-0.3-NX-W-222-2	CLP-METALDIS	2	MAX651
SW-09-0.0-0.3-NX-W-526-3	SAS-BOD/TOC	3	7012A-004
SW-09-0.0-0.3-NX-W-526-3	SAS-SULFIDE	3	7012A-011
SW-09-0.0-0.3-NX-W-526-3	CLP-ORGANIC	3	ABH35
SW-09-0.0-0.3-NX-W-526-3	CLP-INORGTOT	3	MAZ008
SW-09-0.0-0.3-NX-W-526-3	CLP-METALDIS	3	MAZ009
SW-09-0.0-0.3-NX-W-526-3	CLP-INORGTOT	3	MAZ026
SW-09-0.0-0.3-NX-W-619-4	CLP-ORGANIC	4	ABJ21
SW-09-0.0-0.3-NX-W-619-4	CLP-INORGTOT	4	MAAA35
SW-09-0.0-0.3-NX-W-619-4	CLP-METALDIS	4	MAAA36
SW-09-0.0-0.3-NX-W-619-4	SAS-BOD/TOC	4	SA0421
SW-09-0.0-0.3-NX-W-705-5	CLP-ORGANIC	5	ABY11
SW-09-0.0-0.3-NX-W-705-5	CLP-INORGTOT	5	MAAA96
SW-09-0.0-0.3-NX-W-705-5	CLP-METALDIS	5	MAAA97
SW-09-0.0-0.3-NX-W-705-5	SAS-AMMONIA	5	SA1431
SW-10-0-0.3-NX-06-20-W-033	SAS-SULFIDE	1	6206A-010
SW-10-0-0.3-NX-06-20-W-033	SAS-BOD/TOC	1	6240A-008
SW-10-0-0.3-NX-06-20-W-033	CLP-ORGANIC	1	AY011
SW-10-0-0.3-NX-06-20-W-033	CLP-INORGTOT	1	MAW542
SW-10-0-0.3-NX-06-20-W-033	CLP-METALDIS	1	MAW546
SW-10-0.0-0.3-FD-W-321-2	SAS-BOD/TOC	2	6699A-056
SW-10-0.0-0.3-FD-W-321-2	SAS-SULFIDE	2	6719A-077
SW-10-0.0-0.3-FD-W-321-2	SAS-WSO	2	6746A-057
SW-10-0.0-0.3-FD-W-321-2	CLP-ORGANIC	2	AAK92
SW-10-0.0-0.3-FD-W-321-2	CLP-INORGTOT	2	MAX662
SW-10-0.0-0.3-FD-W-321-2	CLP-METALDIS	2	MAX663
SW-10-0.0-0.3-NX-W-221-2	SAS-BOD/TOC	2	6699A-055
SW-10-0.0-0.3-NX-W-221-2	SAS-SULFIDE	2	6719A-076
SW-10-0.0-0.3-NX-W-221-2	SAS-WSO	2	6746A-056
SW-10-0.0-0.3-NX-W-221-2	CLP-ORGANIC	2	AAK91
SW-10-0.0-0.3-NX-W-221-2	CLP-INORGTOT	2	MAX660
SW-10-0.0-0.3-NX-W-221-2	CLP-METALDIS	2	MAX661
SW-10-0.0-0.3-NX-W-527-3	SAS-SULFIDE	3	7012A-006
SW-10-0.0-0.3-NX-W-527-3	SAS-BOD/TOC	3	7012A-009
SW-10-0.0-0.3-NX-W-527-3	CLP-ORGANIC	3	ABH40
SW-10-0.0-0.3-NX-W-527-3	CLP-INORGTOT	3	MAZ017
SW-10-0.0-0.3-NX-W-527-3	CLP-METALDIS	3	MAZ018
SW-11-0.0-0.3-NX-W-219-2	SAS-BOD/TOC	2	6699A-040
SW-11-0.0-0.3-NX-W-219-2	SAS-SULFIDE	2	6719A-054
SW-11-0.0-0.3-NX-W-219-2	SAS-WSO	2	6746A-040
SW-11-0.0-0.3-NX-W-219-2	CLP-ORGANIC	2	AAK67
SW-11-0.0-0.3-NX-W-219-2	CLP-INORGTOT	2	MAX622
SW-11-0.0-0.3-NX-W-219-2	CLP-METALDIS	2	MAX623
SW-11-0.0-0.3-NX-W-528-3	SAS-BOD/TOC	3	7012A-002

ROSE HILL ANALYTICAL DATA
M&E SAMPLE ID: CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SW-11-0.0-0.3-NX-W-528-3	SAS-SULFIDE	3	7012A-010
SW-11-0.0-0.3-NX-W-528-3	CLP-ORGANIC	3	ABHZ2
SW-11-0.0-0.3-NX-W-528-3	CLP-INORGTOT	3	MAZ004
SW-11-0.0-0.3-NX-W-528-3	CLP-METALDIS	3	MAZ005
SW-11-0.0-0.3-NX-W-528-3	CLP-INORGTOT	3	MAZ025
SW-11-0.0-0.3-NX-W-621-4	CLP-ORGANIC	4	ABJ26
SW-11-0.0-0.3-NX-W-621-4	CLP-INORGTOT	4	MAAA45
SW-11-0.0-0.3-NX-W-621-4	CLP-METALDIS	4	MAAA46
SW-11-0.0-0.3-NX-W-621-4	SAS-BOD/TOC	4	SA0426
SW-11-0.0-0.3-NX-W-706-5	CLP-ORGANIC	5	ABY13
SW-11-0.0-0.3-NX-W-706-5	CLP-INORGTOT	5	MAAB00
SW-11-0.0-0.3-NX-W-706-5	CLP-METALDIS	5	MAAB01
SW-11-0.0-0.3-NX-W-706-5	SAS-AMMONIA	5	SA1432
SW-12-0-0.3-NX-06-25-W-035	SAS-SULFIDE	1	6206A-036
SW-12-0-0.3-NX-06-25-W-035	SAS-BOD/TOC	1	6240A-030
SW-12-0-0.3-NX-06-25-W-035	CLP-ORGANIC	1	AY047
SW-12-0-0.3-NX-06-25-W-035	CLP-INORGTOT	1	MAT044
SW-12-0-0.3-NX-06-25-W-035	CLP-METALDIS	1	MAT045
SW-12-0.0-0.3-FD-W-569-3	SAS-SULFIDE	3	7012A-008
SW-12-0.0-0.3-FD-W-569-3	SAS-BOD/TOC	3	7012A-011
SW-12-0.0-0.3-FD-W-569-3	CLP-ORGANIC	3	ABH45
SW-12-0.0-0.3-FD-W-569-3	CLP-INORGTOT	3	MAZ028
SW-12-0.0-0.3-FD-W-569-3	CLP-METALDIS	3	MAZ029
SW-12-0.0-0.3-NX-W-220-2	SAS-BOD/TOC	2	6699A-044
SW-12-0.0-0.3-NX-W-220-2	SAS-SULFIDE	2	6719A-060
SW-12-0.0-0.3-NX-W-220-2	CLP-ORGANIC	2	AAK73
SW-12-0.0-0.3-NX-W-220-2	CLP-INORGTOT	2	MAX633
SW-12-0.0-0.3-NX-W-220-2	CLP-METALDIS	2	MAX634
SW-12-0.0-0.3-NX-W-230-2	SAS-WSO	2	6746A-045
SW-12-0.0-0.3-NX-W-529-3	SAS-SULFIDE	3	7012A-007
SW-12-0.0-0.3-NX-W-529-3	SAS-BOD/TOC	3	7012A-010
SW-12-0.0-0.3-NX-W-529-3	CLP-ORGANIC	3	ABH42
SW-12-0.0-0.3-NX-W-529-3	CLP-INORGTOT	3	MAZ021
SW-12-0.0-0.3-NX-W-529-3	CLP-METALDIS	3	MAZ022
SW-12-0.0-0.3-NX-W-622-4	CLP-ORGANIC	4	ABJ08
SW-12-0.0-0.3-NX-W-622-4	CLP-INORGTOT	4	MAAA13
SW-12-0.0-0.3-NX-W-622-4	CLP-METALDIS	4	MAAA14
SW-12-0.0-0.3-NX-W-622-4	SAS-BOD/TOC	4	SA0410
SW-12-0.0-0.3-NX-W-707-5	CLP-ORGANIC	5	ABY04
SW-12-0.0-0.3-NX-W-707-5	CLP-INORGTOT	5	MAAA86
SW-12-0.0-0.3-NX-W-707-5	CLP-METALDIS	5	MAAA87
SW-12-0.0-0.3-NX-W-707-5	SAS-AMMONIA	5	SA1422
SW-13-0-0.3-NX-06-20-W-036	SAS-SULFIDE	1	6206A-008
SW-13-0-0.3-NX-06-20-W-036	SAS-BOD/TOC	1	6240A-007
SW-13-0-0.3-NX-06-20-W-036	CLP-ORGANIC	1	AY009
SW-13-0-0.3-NX-06-20-W-036	CLP-INORGTOT	1	MAW543
SW-13-0-0.3-NX-06-20-W-036	CLP-METALDIS	1	MAW544
SW-13-0.0-0.3-NX-W-218-2	SAS-BOD/TOC	2	6699A-042A
SW-13-0.0-0.3-NX-W-218-2	SAS-SULFIDE	2	6719A-056
SW-13-0.0-0.3-NX-W-218-2	SAS-WSO	2	6746A-042
SW-13-0.0-0.3-NX-W-218-2	CLP-ORGANIC	2	AAK69
SW-13-0.0-0.3-NX-W-218-2	CLP-METALDIS	2	MAX626
SW-13-0.0-0.3-NX-W-218-2	CLP-INORGTOT	2	MAX627
SW-14-0-0.3-NX-06-19-W-037	SAS-SULFIDE	1	6206A-006
SW-14-0-0.3-NX-06-19-W-037	SAS-BOD/TOC	1	6240A-006
SW-14-0-0.3-NX-06-19-W-037	CLP-ORGANIC	1	AY008
SW-14-0-0.3-NX-06-19-W-037	CLP-INORGTOT	1	MAW509
SW-14-0-0.3-NX-06-19-W-037	CLP-METALDIS	1	MAW510
SW-14-0.0-0.3-NX-W-217-2	SAS-BOD/TOC	2	6699A-039

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M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SW-14-0.0-0.3-NX-W-217-2	SAS-SULFIDE	2	6719A-050
SW-14-0.0-0.3-NX-W-217-2	SAS-WSO	2	6746A-039
SW-14-0.0-0.3-NX-W-217-2	CLP-INORGTOT	2	MAX617
SW-14-0.0-0.3-NX-W-217-2	CLP-METALDIS	2	MAX618
SW-14-0.0-0.3-NX-W-317-2	CLP-ORGANIC	2	AAK63
SW-15-0-0.3-NX-06-25-W-038	SAS-SULFIDE	1	6206A-040
SW-15-0-0.3-NX-06-25-W-038	SAS-BOD/TOC	1	6240A-032
SW-15-0-0.3-NX-06-25-W-038	CLP-ORGANIC	1	AAJ04
SW-15-0-0.3-NX-06-25-W-038	CLP-INORGTOT	1	MAT051
SW-15-0-0.3-NX-06-25-W-038	CLP-METALDIS	1	MAT052
SW-15-0.0-0.3-NX-W-223-2	SAS-BOD/TOC	2	6699A-048
SW-15-0.0-0.3-NX-W-223-2	SAS-SULFIDE	2	6719A-065
SW-15-0.0-0.3-NX-W-223-2	SAS-WSO	2	6746A-049
SW-15-0.0-0.3-NX-W-223-2	CLP-ORGANIC	2	AAK79
SW-15-0.0-0.3-NX-W-223-2	CLP-METALDIS	2	MAX642
SW-15-0.0-0.3-NX-W-223-2	CLP-INORGTOT	2	MAX643
SW-16-0.0-0.3-NX-W-709-5	CLP-ORGANIC	5	ABY30
SW-16-0.0-0.3-NX-W-709-5	CLP-INORGTOT	5	MAAB21
SW-16-0.0-0.3-NX-W-709-5	CLP-METALDIS	5	MAAB22
SW-16-0.0-0.3-NX-W-709-5	SAS-AMMONIA	5	SA1447
SW-17-0.0-0.3-NX-W-710-5	CLP-ORGANIC	5	ABY29
SW-17-0.0-0.3-NX-W-710-5	CLP-INORGTOT	5	MAAB19
SW-17-0.0-0.3-NX-W-710-5	CLP-METALDIS	5	MAAB20
SW-17-0.0-0.3-NX-W-710-5	SAS-AMMONIA	5	SA1446
SW-18-0.0-0.3-NX-W-708-5	CLP-ORGANIC	5	ABY32
SW-18-0.0-0.3-NX-W-708-5	CLP-INORGTOT	5	MAAB23
SW-18-0.0-0.3-NX-W-708-5	CLP-METALDIS	5	MAAB24
SW-18-0.0-0.3-NX-W-708-5	SAS-AMMONIA	5	SA1448
SEDIMENTS			
SE-01-0-0.5-NX-06-20-D-049	SUBCONTRACT	1	
SE-01-0-0.5-NX-06-20-D-049	SAS-SULFIDE	1	6206A-020
SE-01-0-0.5-NX-06-20-D-049	CLP-ORGANIC	1	AY023
SE-01-0-0.5-NX-06-20-D-049	CLP-INORGTOT	1	MAW516
SE-01-0.0-0.5-NX-D-224-2	SUBCONTRACT	2	
SE-01-0.0-0.5-NX-D-224-2	SAS-SULFIDE	2	6719A-018
SE-01-0.0-0.5-NX-D-224-2	CLP-ORGANIC	2	AZ479
SE-01-0.0-0.5-NX-D-224-2	CLP-INORGTOT	2	MAX354
SE-02-0-0.5-NX-06-25-D-050	SUBCONTRACT	1	
SE-02-0-0.5-NX-06-25-D-050	SAS-SULFIDE	1	6206A-035
SE-02-0-0.5-NX-06-25-D-050	CLP-ORGANIC	1	AY045
SE-02-0-0.5-NX-06-25-D-050	CLP-INORGTOT	1	MAT041
SE-02-0.0-0.3-NX-D-711-5	SUBCONTRACT	5	92-149B
SE-02-0.0-0.3-NX-D-711-5	CLP-ORGANIC	5	ABY23
SE-02-0.0-0.3-NX-D-711-5	CLP-INORGTOT	5	MAAB12
SE-02-0.0-0.3-NX-D-711-5	SAS-AMMONIA	5	SA1440
SE-02-0.0-0.5-NX-D-225-2	SUBCONTRACT	2	
SE-02-0.0-0.5-NX-D-225-2	SAS-SULFIDE	2	6719A-020
SE-02-0.0-0.5-NX-D-225-2	CLP-ORGANIC	2	AZ481
SE-02-0.0-0.5-NX-D-225-2	CLP-INORGTOT	2	MAX357
SE-03-0-0.5-NX-06-24-D-051	SUBCONTRACT	1	
SE-03-0-0.5-NX-06-24-D-051	SAS-SULFIDE	1	6206A-026
SE-03-0-0.5-NX-06-24-D-051	CLP-ORGANIC	1	AY031
SE-03-0-0.5-NX-06-24-D-051	CLP-INORGTOT	1	MAW530
SE-03-0.0-0.5-NX-D-226-2	SUBCONTRACT	2	
SE-03-0.0-0.5-NX-D-226-2	SAS-SULFIDE	2	6719A-023
SE-03-0.0-0.5-NX-D-226-2	CLP-ORGANIC	2	AZ484
SE-03-0.0-0.5-NX-D-226-2	CLP-INORGTOT	2	MAX362

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SE-04-0-0.5-NX-06-24-D-052	SUBCONTRACT	1	
SE-04-0-0.5-NX-06-24-D-052	SAS-SULFIDE	1	6206A-029
SE-04-0-0.5-NX-06-24-D-052	CLP-ORGANIC	1	AY038
SE-04-0-0.5-NX-06-24-D-052	CLP-INORGTOT	1	MAT029
SE-04-0.0-0.3-NX-D-712-5	SUBCONTRACT	5	92-148B
SE-04-0.0-0.3-NX-D-712-5	CLP-ORGANIC	5	ABY18
SE-04-0.0-0.3-NX-D-712-5	CLP-INORGTOT	5	MAAB06
SE-04-0.0-0.3-NX-D-712-5	SAS-AMMONIA	5	SA1442
SE-04-0.0-0.5-NX-D-227-2	SUBCONTRACT	2	
SE-04-0.0-0.5-NX-D-227-2	SAS-SULFIDE	2	6719A-033
SE-04-0.0-0.5-NX-D-227-2	CLP-ORGANIC	2	AZ495
SE-04-0.0-0.5-NX-D-227-2	CLP-INORGTOT	2	MAX380
SE-05-0-0.5-NX-06-24-D-053	SUBCONTRACT	1	
SE-05-0-0.5-NX-06-24-D-053	SAS-SULFIDE	1	6206A-031
SE-05-0-0.5-NX-06-24-D-053	CLP-ORGANIC	1	AY040
SE-05-0-0.5-NX-06-24-D-053	CLP-INORGTOT	1	MAT032
SE-05-0.0-0.3-NX-D-713-5	SUBCONTRACT	5	92-149A
SE-05-0.0-0.3-NX-D-713-5	CLP-ORGANIC	5	ABY21
SE-05-0.0-0.3-NX-D-713-5	CLP-INORGTOT	5	MAAB09
SE-05-0.0-0.3-NX-D-713-5	SAS-AMMONIA	5	SA1441
SE-05-0.0-0.5-NX-D-228-2	SUBCONTRACT	2	
SE-05-0.0-0.5-NX-D-228-2	SAS-SULFIDE	2	6719A-031
SE-05-0.0-0.5-NX-D-228-2	CLP-ORGANIC	2	AZ493
SE-05-0.0-0.5-NX-D-228-2	CLP-INORGTOT	2	MAX377
SE-06-0-0.5-FD-06-21-D-073	SUBCONTRACT	1	
SE-06-0-0.5-FD-06-21-D-073	SAS-SULFIDE	1	6206A-023
SE-06-0-0.5-FD-06-21-D-073	CLP-ORGANIC	1	AY026
SE-06-0-0.5-FD-06-21-D-073	CLP-INORGTOT	1	MAW521
SE-06-0-0.5-NX-06-21-D-054	SUBCONTRACT	1	
SE-06-0-0.5-NX-06-21-D-054	SAS-SULFIDE	1	6206A-019
SE-06-0-0.5-NX-06-21-D-054	CLP-ORGANIC	1	AY022
SE-06-0-0.5-NX-06-21-D-054	CLP-INORGTOT	1	MAW515
SE-06-0.0-0.3-NX-D-714-5	SUBCONTRACT	5	92-148A
SE-06-0.0-0.3-NX-D-714-5	CLP-ORGANIC	5	ABY17
SE-06-0.0-0.3-NX-D-714-5	CLP-INORGTOT	5	MAAB05
SE-06-0.0-0.3-NX-D-714-5	SAS-AMMONIA	5	SA1436
SE-06-0.0-0.5-NX-D-229-2	SUBCONTRACT	2	
SE-06-0.0-0.5-NX-D-229-2	SAS-SULFIDE	2	6719A-035
SE-06-0.0-0.5-NX-D-229-2	CLP-ORGANIC	2	AZ497
SE-06-0.0-0.5-NX-D-229-2	CLP-INORGTOT	2	MAX383
SE-07-0-0.5-NX-06-25-D-055	SUBCONTRACT	1	
SE-07-0-0.5-NX-06-25-D-055	SAS-SULFIDE	1	6206A-033
SE-07-0-0.5-NX-06-25-D-055	CLP-ORGANIC	1	AY042
SE-07-0-0.5-NX-06-25-D-055	CLP-INORGTOT	1	MAT035
SE-07-0.0-0.3-NX-D-715-5	SUBCONTRACT	5	92-146A
SE-07-0.0-0.3-NX-D-715-5	CLP-ORGANIC	5	ABY07
SE-07-0.0-0.3-NX-D-715-5	CLP-INORGTOT	5	MAAA90
SE-07-0.0-0.3-NX-D-715-5	SAS-AMMONIA	5	SA1423
SE-07-0.0-0.5-NX-D-230-2	SUBCONTRACT	2	
SE-07-0.0-0.5-NX-D-230-2	SAS-SULFIDE	2	6719A-061
SE-07-0.0-0.5-NX-D-230-2	CLP-ORGANIC	2	AAK75
SE-07-0.0-0.5-NX-D-230-2	CLP-INORGTOT	2	MAX635
SE-08-0-0.5-NX-06-25-D-031	SAS-SULFIDE	1	6206A-043
SE-08-0-0.5-NX-06-25-D-056	SUBCONTRACT	1	
SE-08-0-0.5-NX-06-25-D-056	CLP-ORGANIC	1	AAJ07
SE-08-0-0.5-NX-06-25-D-056	CLP-INORGTOT	1	MAT058
SE-08-0.0-0.5-FD-D-324-2	SUBCONTRACT	2	
SE-08-0.0-0.5-FD-D-324-2	SAS-SULFIDE	2	6719A-043
SE-08-0.0-0.5-FD-D-324-2	CLP-ORGANIC	2	AAK56

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M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SE-08-0.0-0.5-FD-D-324-2	CLP-INORGTOT	2	MAX398
SE-08-0.0-0.5-NX-D-231-2	SUBCONTRACT	2	
SE-08-0.0-0.5-NX-D-231-2	SAS-SULFIDE	2	6719A-044
SE-08-0.0-0.5-NX-D-231-2	CLP-ORGANIC	2	AAK57
SE-08-0.0-0.5-NX-D-231-2	CLP-INORGTOT	2	MAX399
SE-09-0-0.3-FD-06-20-D-074	SAS-SULFIDE	1	6206A-017
SE-09-0-0.5-FD-06-20-D-074	SUBCONTRACT	1	
SE-09-0-0.5-FD-06-20-D-074	CLP-ORGANIC	1	AY019
SE-09-0-0.5-FD-06-20-D-074	CLP-INORGTOT	1	MAT028
SE-09-0-0.5-NX-06-20-D-057	SUBCONTRACT	1	
SE-09-0-0.5-NX-06-20-D-057	SAS-SULFIDE	1	6206A-015
SE-09-0-0.5-NX-06-20-D-057	CLP-ORGANIC	1	AY016
SE-09-0-0.5-NX-06-20-D-057	CLP-INORGTOT	1	MAT024
SE-09-0.0-0.3-FD-D-746-5	SUBCONTRACT	5	92-146C
SE-09-0.0-0.3-FD-D-746-5	CLP-ORGANIC	5	ABY10
SE-09-0.0-0.3-FD-D-746-5	CLP-INORGTOT	5	MAAA95
SE-09-0.0-0.3-FD-D-746-5	SAS-AMMONIA	5	SA1429
SE-09-0.0-0.3-NX-D-716-5	SUBCONTRACT	5	92-146B
SE-09-0.0-0.3-NX-D-716-5	CLP-ORGANIC	5	ABY09
SE-09-0.0-0.3-NX-D-716-5	CLP-INORGTOT	5	MAAA94
SE-09-0.0-0.3-NX-D-716-5	SAS-AMMONIA	5	SA1427
SE-09-0.0-0.5-NX-D-237-2	SUBCONTRACT	2	
SE-09-0.0-0.5-NX-D-237-2	SAS-SULFIDE	2	6719A-069
SE-09-0.0-0.5-NX-D-237-2	CLP-ORGANIC	2	AAK84
SE-09-0.0-0.5-NX-D-237-2	CLP-INORGTOT	2	MAX649
SE-10-0-0.5-NX-06-20-D-058	SUBCONTRACT	1	
SE-10-0-0.5-NX-06-20-D-058	SAS-SULFIDE	1	6206A-011
SE-10-0-0.5-NX-06-20-D-058	CLP-ORGANIC	1	AY012
SE-10-0-0.5-NX-06-20-D-058	CLP-INORGTOT	1	MAW547
SE-10-0.0-0.5-FD-D-323-2	SUBCONTRACT	2	
SE-10-0.0-0.5-FD-D-323-2	SAS-SULFIDE	2	6719A-074
SE-10-0.0-0.5-FD-D-323-2	CLP-ORGANIC	2	AAK89
SE-10-0.0-0.5-FD-D-323-2	CLP-INORGTOT	2	MAX657
SE-10-0.0-0.5-NX-D-236-2	SUBCONTRACT	2	
SE-10-0.0-0.5-NX-D-236-2	SAS-SULFIDE	2	6719A-073
SE-10-0.0-0.5-NX-D-236-2	CLP-ORGANIC	2	AAK88
SE-10-0.0-0.5-NX-D-236-2	CLP-INORGTOT	2	MAX656
SE-11-0.0-0.3-NX-D-717-5	SUBCONTRACT	5	92-146D
SE-11-0.0-0.3-NX-D-717-5	CLP-ORGANIC	5	ABY14
SE-11-0.0-0.3-NX-D-717-5	CLP-INORGTOT	5	MAAB02
SE-11-0.0-0.3-NX-D-717-5	SAS-AMMONIA	5	SA1433
SE-11-0.0-0.5-NX-D-234-2	SUBCONTRACT	2	
SE-11-0.0-0.5-NX-D-234-2	SAS-SULFIDE	2	6719A-052
SE-11-0.0-0.5-NX-D-234-2	CLP-ORGANIC	2	AAK65
SE-11-0.0-0.5-NX-D-234-2	CLP-INORGTOT	2	MAX620
SE-12-0-0.5-NX-06-25-D-060	SUBCONTRACT	1	
SE-12-0-0.5-NX-06-25-D-060	SAS-SULFIDE	1	6206A-037
SE-12-0-0.5-NX-06-25-D-060	CLP-ORGANIC	1	AY048
SE-12-0-0.5-NX-06-25-D-060	CLP-INORGTOT	1	MAT046
SE-12-0.0-0.3-NX-D-718-5	SUBCONTRACT	5	92-145
SE-12-0.0-0.3-NX-D-718-5	CLP-ORGANIC	5	ABY03
SE-12-0.0-0.3-NX-D-718-5	CLP-INORGTOT	5	MAAA88
SE-12-0.0-0.3-NX-D-718-5	SAS-AMMONIA	5	SA1426
SE-12-0.0-0.5-NX-D-235-2	SUBCONTRACT	2	
SE-12-0.0-0.5-NX-D-235-2	SAS-SULFIDE	2	6719A-059
SE-12-0.0-0.5-NX-D-235-2	CLP-ORGANIC	2	AAK72
SE-12-0.0-0.5-NX-D-235-2	CLP-INORGTOT	2	MAX632
SE-13-0-0.5-NX-06-20-D-061	SUBCONTRACT	1	
SE-13-0-0.5-NX-06-20-D-061	SAS-SULFIDE	1	6206A-009

ROSE HILL ANALYTICAL DATA

M&E SAMPLE IDs CROSS-REFERENCED TO CONTRACT LABORATORY PROGRAM (CLP) NUMBERS

M&E SAMPLE ID	METHOD	ROUNDNO	CLPSAMPID
SE-13-0-0.5-NX-06-20-D-061	CLP-ORGANIC	1	AY010
SE-13-0-0.5-NX-06-20-D-061	CLP-ORGANIC	1	AYO10
SE-13-0-0.5-NX-06-20-D-061	CLP-INORGTOT	1	MAW545
SE-13-0.0-0.5-NX-D-233-2	SUBCONTRACT	2	
SE-13-0.0-0.5-NX-D-233-2	SAS-SULFIDE	2	6719A-053
SE-13-0.0-0.5-NX-D-233-2	CLP-ORGANIC	2	AAK66
SE-13-0.0-0.5-NX-D-233-2	CLP-INORGTOT	2	MAX621
SE-14-0-0.3-NX-06-19-D-062	SUBCONTRACT	1	
SE-14-0-0.3-NX-06-19-D-062	SAS-SULFIDE	1	6206A-007
SE-14-0-0.3-NX-06-19-D-062	CLP-ORGANIC	1	AAJ01
SE-14-0-0.3-NX-06-19-D-062	CLP-INORGTOT	1	MAW511
SE-14-0.0-0.5-NX-D-232-2	SUBCONTRACT	2	
SE-14-0.0-0.5-NX-D-232-2	SAS-SULFIDE	2	6719A-051
SE-14-0.0-0.5-NX-D-232-2	CLP-ORGANIC	2	AAK64
SE-14-0.0-0.5-NX-D-232-2	CLP-INORGTOT	2	MAX619
SE-15-0-0.5-NX-06-25-D-063	SUBCONTRACT	1	
SE-15-0-0.5-NX-06-25-D-063	SAS-SULFIDE	1	6206A-041
SE-15-0-0.5-NX-06-25-D-063	CLP-ORGANIC	1	AAJ05
SE-15-0-0.5-NX-06-25-D-063	CLP-INORGTOT	1	MAT053
SE-15-0.0-0.5-NX-D-238-2	SUBCONTRACT	2	
SE-15-0.0-0.5-NX-D-238-2	SAS-SULFIDE	2	6719A-066
SE-15-0.0-0.5-NX-D-238-2	CLP-ORGANIC	2	AAK80
SE-15-0.0-0.5-NX-D-238-2	CLP-INORGTOT	2	MAX644
SE-16-0.0-0.3-NX-D-720-5	SUBCONTRACT	5	92-150B
SE-16-0.0-0.3-NX-D-720-5	CLP-ORGANIC	5	ABY28
SE-16-0.0-0.3-NX-D-720-5	CLP-INORGTOT	5	MAAB18
SE-16-0.0-0.3-NX-D-720-5	SAS-AMMONIA	5	SA1445
SE-17-0.0-0.3-NX-D-721-5	SUBCONTRACT	5	92-150A
SE-17-0.0-0.3-NX-D-721-5	CLP-ORGANIC	5	ABYZ7
SE-17-0.0-0.3-NX-D-721-5	CLP-INORGTOT	5	MAAB17
SE-17-0.0-0.3-NX-D-721-5	SAS-AMMONIA	5	SA1444
SE-18-0.0-0.3-NX-D-719-5	SUBCONTRACT	5	92-150C
SE-18-0.0-0.3-NX-D-719-5	CLP-ORGANIC	5	ABY33
SE-18-0.0-0.3-NX-D-719-5	CLP-INORGTOT	5	MAAB25
SE-18-0.0-0.3-NX-D-719-5	SAS-AMMONIA	5	SA1449
LANDFILL GAS			
SG-BW(04+100)-6	SAS-SUMMA	5	SA1402
SG-BW(05+500)-12	SAS-SUMMA	5	SA1403
SG-SS(08+000)-12	SAS-SUMMA	5	SA1401
SG-SW(03+300)-6	SAS-SUMMA	5	SA1407
SG-SW(11+500)-5	SAS-SUMMA	5	SA1405
SG-SW(13+300)-12	SAS-SUMMA	5	SA1404
SG-SWD(13+300)-12	SAS-SUMMA	5	SA1406

NOTES:

SUBCONTRACT - Subcontracted, non-CLP analysis, i.e. Atterberg limits, permeability tests, grain size analysis, and total combustible organics.

CLP-ORGANIC - CLP analysis of volatile organic compounds, semivolatile organic compounds, and pesticides/PCBs.

CLP-INORGTOT - CLP analysis of unfiltered/total metals and cyanide.

CLP-METALDIS - CLP analysis of filtered metals.

SAS-SULFIDE - Special Analytical Service analysis for sulfide.

SAS-BOD/TOC - Special Analytical Service analysis for biological oxygen demand or total organic carbon.

SAS-WSO - Special Analytical Service analysis for water soluble organic compounds.

SAS-524.2 - Special Analytical Service analysis for volatile organic

compounds under EPA method 524.2.
SAS-AMMONIA - Special Analytical Service analysis for ammonia.
SAS-SUMMA - Special Analytical Service analysis for summa canisters using method TO-14.

D-6 COMPLETE ANALYTICAL DATA, SURFACE SOILS

- SEPTEMBER/OCTOBER 1991
- APRIL 1992

SURFACE SOIL - SEPTEMBER/OCTOBER 1991

LOCATION NAME:		SS-01	SS-02	SS-03	SS-04	SS-05
SITE LOCATION:		BACKGROUND	BACKGROUND	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-01-0.0-0.5-NX-S-239-2	SS-02-0.0-0.5-NX-S-240-2	SS-03-0.0-0.5-NX-S-241-2	SS-04-0.0-0.5-NX-S-242-2	SS-05-0.0-0.5-NX-S-243-2
DATE SAMPLED:		09/26/91	09/26/91	09/27/91	09/26/91	09/27/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	13 U	14 UJ	8 J	13 U	11 U
1,1,2,2-Tetrachloroethane	10	13 U	14 UJ	13 U	13 U	11 U
1,1,2-Trichloroethane	10	13 U	14 UJ	13 U	13 U	11 U
1,1-Dichloroethane	10	13 U	14 U	25	13 U	11 U
1,1-Dichloroethene	10	13 U	14 U	13 U	13 U	11 U
1,2-Dichloroethane	10	13 U	14 U	13 U	13 U	11 U
1,2-Dichloroethene(total)	10	13 U	14 U	970 J	13 U	11 U
1,2-Dichloropropane	10	13 U	14 UJ	13 U	13 U	11 U
2-Butanone	10	13 U	14 U	24 J	830 J	11 U
2-Hexanone	10	13 U	14 UJ	13 U	6 J	11 U
4-Methyl-2-pentanone	10	13 U	14 UJ	13 U	3 J	11 U
Acetone	10	13 U	7 J	8500 U	160000 J	75
Benzene	10	13 U	14 UJ	6 J	13 U	11 U
Bromodichloromethane	10	13 U	14 UJ	13 U	13 U	11 U
Bromoform	10	13 U	14 UJ	13 U	13 U	11 U
Bromomethane	10	13 U	14 U	13 U	13 U	11 U
Carbon Disulfide	10	13 U	14 U	13 U	13 U	11 U
Carbon Tetrachloride	10	13 U	14 UJ	13 U	13 U	11 U
Chlorobenzene	10	13 U	14 UJ	13 U	13 U	11 U
Chloroethane	10	13 U	14 U	13 U	13 U	11 U
Chloroform	10	13 U	14 U	3 J	13 U	2 J
Chloromethane	10	13 U	14 U	13 UJ	13 U	11 UJ
Dibromochloromethane	10	13 U	14 UJ	13 U	13 U	11 U
Ethylbenzene	10	13 U	14 UJ	11 J	19	11 U
Methylene Chloride	10	13 U	14 U	13 U	13 U	11 U
Styrene	10	13 U	14 UJ	13 U	13 U	11 U
Tetrachloroethene	10	13 U	14 UJ	2 J	5 J	11 U
Toluene	10	13 U	14 UJ	87	58	11 U
Total Xylenes	10	13 U	14 UJ	20	45	11 U
Trichloroethene	10	13 U	14 UJ	13 U	13 U	11 U
Vinyl Chloride	10	13 U	14 U	4 J	13 U	11 U
cis-1,3-Dichloropropene	10	13 U	14 UJ	13 U	13 U	11 U
trans-1,3-Dichloropropene	10	13 U	14 UJ	13 U	13 U	11 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	420 U	460 U	420 UJ	420 U	370 UJ

LOCATION NAME:		SS-01	SS-02	SS-03	SS-04	SS-05
SITE LOCATION:		BACKGROUND	BACKGROUND	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-01-0.0-0.5-NX-S-239-2	SS-02-0.0-0.5-NX-S-240-2	SS-03-0.0-0.5-NX-S-241-2	SS-04-0.0-0.5-NX-S-242-2	SS-05-0.0-0.5-NX-S-243-2
DATE SAMPLED:		09/26/91	09/26/91	09/27/91	09/26/91	09/27/91
REMARKS:						
1,2-Dichlorobenzene	330	420 U	460 U	420 UJ	420 U	370 UJ
1,3-Dichlorobenzene	330	420 U	460 U	420 UJ	420 U	370 UJ
1,4-Dichlorobenzene	330	420 U	460 U	420 UJ	420 U	370 UJ
2,2'-oxybis(1-Chloropropane)	330	420 U	460 U	420 UJ	420 U	370 UJ
2,4,5-Trichlorophenol	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
2,4,6-Trichlorophenol	330	420 U	460 U	420 UJ	420 U	370 UJ
2,4-Dichlorophenol	330	420 U	460 U	420 UJ	420 U	370 UJ
2,4-Dimethylphenol	330	420 U	460 U	420 UJ	420 U	370 UJ
2,4-Dinitrophenol	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
2,4-Dinitrotoluene	330	420 U	460 U	420 UJ	420 U	370 UJ
2,6-Dinitrotoluene	330	420 U	460 U	420 UJ	420 U	370 UJ
2-Chloronaphthalene	330	420 U	460 U	420 UJ	420 U	370 UJ
2-Chlorophenol	330	420 U	460 U	420 UJ	420 U	370 UJ
2-Methylnaphthalene	330	420 U	460 U	420 UJ	420 U	370 UJ
2-Methylphenol	330	420 U	460 U	420 UJ	420 U	370 UJ
2-Nitroaniline	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
2-Nitrophenol	330	420 U	460 U	420 UJ	420 U	370 UJ
3,3'-Dichlorobenzidine	330	420 U	460 U	420 UJ	420 U	370 UJ
3-Nitroaniline	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
4,6-Dinitro-2-methylphenol	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
4-Bromophenyl-phenylether	330	420 U	460 U	420 UJ	420 U	370 UJ
4-Chloro-3-methylphenol	330	420 U	460 U	420 UJ	420 U	370 UJ
4-Chloroaniline	330	420 U	460 U	420 UJ	420 U	370 UJ
4-Chlorophenyl-phenylether	330	420 U	460 U	420 UJ	420 U	370 UJ
4-Methylphenol	330	420 U	460 U	420 UJ	420 U	370 UJ
4-Nitroaniline	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
4-Nitrophenol	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
Acenaphthene	330	420 U	460 U	420 UJ	420 U	370 UJ
Acenaphthylene	330	420 U	460 U	420 UJ	420 U	370 UJ
Anthracene	330	420 U	460 U	420 UJ	420 U	370 UJ
Benzo(a)anthracene	330	420 U	460 U	420 UJ	37 J	78 J
Benzo(a)pyrene	330	420 U	460 U	420 UJ	31 J	68 J
Benzo(b)fluoranthene	330	420 U	460 U	420 UJ	39 J	76 J
Benzo(g,h,i)perylene	330	420 U	460 U	420 UJ	23 J	57 J
Benzo(k)fluoranthene	330	420 U	460 U	420 UJ	28 J	64 J
Butylbenzylphthalate	330	41 J	460 U	41 J	420 U	370 UJ
Carbazole	330	420 U	460 U	420 UJ	420 U	370 UJ
Chrysene	330	420 U	460 U	420 UJ	33 J	95 J
Di-n-butylphthalate	330	420 U	460 U	420 UJ	420 U	370 UJ

LOCATION NAME:		SS-01	SS-02	SS-03	SS-04	SS-05
SITE LOCATION:		BACKGROUND	BACKGROUND	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-01-0.0-0.5-NX-S-239-2	SS-02-0.0-0.5-NX-S-240-2	SS-03-0.0-0.5-NX-S-241-2	SS-04-0.0-0.5-NX-S-242-2	SS-05-0.0-0.5-NX-S-243-2
DATE SAMPLED:		09/26/91	09/26/91	09/27/91	09/26/91	09/27/91
REMARKS:						
Di-n-octylphthalate	330	420 U	460 U	420 UJ	420 U	370 UJ
Dibenz(a,h)anthracene	330	420 U	460 U	420 UJ	420 U	370 UJ
Dibenzofuran	330	420 U	460 U	420 UJ	420 U	370 UJ
Diethylphthalate	330	420 U	31 J	420 UJ	420 U	370 UJ
Dimethylphthalate	330	420 U	460 U	420 UJ	420 U	370 UJ
Fluoranthene	330	25 J	460 U	420 UJ	59 J	160 J
Fluorene	330	420 U	460 U	420 UJ	420 U	370 UJ
Hexachlorobenzene	330	420 U	460 U	420 UJ	420 U	370 UJ
Hexachlorobutadiene	330	420 U	460 U	420 UJ	420 U	370 UJ
Hexachlorocyclopentadiene	330	420 U	460 U	420 UJ	420 U	370 UJ
Hexachloroethane	330	420 U	460 U	420 UJ	420 U	370 UJ
Indeno(1,2,3-cd)pyrene	330	420 U	460 U	420 UJ	23 J	52 J
Isophorone	330	420 U	460 U	420 UJ	420 U	370 UJ
N-Nitroso-di-n-propylamine	330	420 U	460 U	420 UJ	420 U	370 UJ
N-Nitrosodiphenylamine	330	420 U	460 U	420 UJ	420 U	370 UJ
Naphthalene	330	420 U	460 U	420 UJ	420 U	370 UJ
Nitrobenzene	330	420 U	460 U	420 UJ	420 U	370 UJ
Pentachlorophenol	800	1000 U	1100 U	1000 UJ	1000 U	910 UJ
Phenanthrene	330	420 U	460 U	420 UJ	55 J	110 J
Phenol	330	420 U	460 U	420 UJ	420 U	370 UJ
Pyrene	330	29 J	460 U	420 UJ	64 J	170 J
bis(2-Chloroethoxy)methane	330	420 U	460 U	420 UJ	420 U	370 UJ
bis(2-Chloroethyl) ether	330	420 U	460 U	420 UJ	420 U	370 UJ
bis(2-Ethylhexyl)phthalate	330	420 U	460 U	420 UJ	420 U	370 UJ
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ
4,4'-DDE	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ
4,4'-DDT	3.3	1.2 J	4.6 U	4.2 UJ	4.7 J	3.7 UJ
Aldrin	1.7	0.6 J	2.4 U	2.2 UJ	2.2 U	1.9 UJ
Aroclor-1016	33.0	42.0 U	46.0 U	42.0 UJ	42.0 U	37.0 UJ
Aroclor-1221	67.0	85.0 U	93.0 U	85.0 UJ	85.0 U	76.0 UJ
Aroclor-1232	33.0	42.0 U	46.0 U	42.0 UJ	42.0 U	37.0 UJ
Aroclor-1242	33.0	42.0 U	46.0 U	42.0 UJ	42.0 U	37.0 UJ
Aroclor-1248	33.0	42.0 U	46.0 U	42.0 UJ	42.0 U	37.0 UJ
Aroclor-1254	33.0	42.0 U	46.0 U	42.0 UJ	42.0 U	37.0 UJ
Aroclor-1260	33.0	42.0 U	46.0 U	42.0 UJ	42.0 U	37.0 UJ
Dieldrin	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ

LOCATION NAME:		SS-01	SS-02	SS-03	SS-04	SS-05
SITE LOCATION:		BACKGROUND	BACKGROUND	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-01-0.0-0.5-NX-S-239-2	SS-02-0.0-0.5-NX-S-240-2	SS-03-0.0-0.5-NX-S-241-2	SS-04-0.0-0.5-NX-S-242-2	SS-05-0.0-0.5-NX-S-243-2
DATE SAMPLED:		09/26/91	09/26/91	09/27/91	09/26/91	09/27/91
REMARKS:						
Endosulfan I	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
Endosulfan II	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ
Endosulfan Sulfate	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ
Endrin	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ
Endrin Aldehyde	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ
Endrin Ketone	3.3	4.2 U	4.6 U	4.2 UJ	4.2 U	3.7 UJ
Heptachlor	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
Heptachlor Epoxide	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
Methoxychlor	17.0	21.0 U	24.0 U	22.0 UJ	22.0 U	19.0 UJ
Toxaphene	170.0	210.0 U	240.0 U	220.0 UJ	220.0 U	190.0 UJ
alpha-BHC	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
alpha-Chlordane	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
beta-BHC	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
delta-BHC	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
gamma-BHC(Lindane)	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
gamma-Chlordane	1.7	2.1 U	2.4 U	2.2 UJ	2.2 U	1.9 UJ
METALS	CRDL(mg/kg)					
Aluminum	200	12200	16600	11000	7880	7650
Antimony	60	6.3 U	6.9 UJ	6.5 UJ	6.1 UJ	5.7 UJ
Arsenic	10	2.8 J	2.1 J	1.4	1.2 J	0.81
Barium	200	15.4	37.8	17.7	17.0	17.2
Beryllium	5	0.57 UJ	0.62 UJ	0.56 U	0.55 UJ	0.63 U
Cadmium	5	0.8 U	0.8 U	0.78 U	0.7 U	0.68 U
Calcium	5000	645	712	534	696	781
Chromium	10	11.2	17.5	11.2	10.0	9.7
Cobalt	50	3.0	3.6	4.1	4.8	4.0
Copper	25	3.5	5.3	253	5.4	7.2
Iron	100	12300	18100	12100	12100	10200
Lead	3	30.1 J	14.3 J	10.3	7.3 J	8.1
Magnesium	5000	1110	1220	1600	1750	1310
Manganese	15	104	267	92.1	131	123
Mercury	0.2	0.1 U	0.1 U	0.13 U	0.1 U	0.11 U
Nickel	40	4.1	5.5	10.3	6.8	5.2
Potassium	5000	673	909	612	945 UJ	697
Selenium	5	0.83 U	0.78 UJ	0.45 UJ	0.57 UJ	0.23 UJ
Silver	10	0.8 U	0.8 U	0.78 U	0.73	0.68 U
Sodium	5000	47.6 U	54.0 U	44.7 U	57.0 U	46.5 U

LOCATION NAME:		SS-01	SS-02	SS-03	SS-04	SS-05
SITE LOCATION:		BACKGROUND	BACKGROUND	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-01-0.0-0.5-NX-S-239-2	SS-02-0.0-0.5-NX-S-240-2	SS-03-0.0-0.5-NX-S-241-2	SS-04-0.0-0.5-NX-S-242-2	SS-05-0.0-0.5-NX-S-243-2
DATE SAMPLED:		09/26/91	09/26/91	09/27/91	09/26/91	09/27/91
REMARKS:						
Thallium	10	0.3 U	0.3 U	0.36	0.2 U	0.23 U
Vanadium	50	21.0	25.7	18.2	16.9	13.7
Zinc	20	22.3	30.1	40.5	24.4	39.9
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	3.2 U	3.4 U	3.3 U	3.0 U	2.8 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	21.5	28.3	22.6	19.2	14.7
Organic Content	(%)	6.8	7.5	5.5	3.7	2.3
Solids Content	(%)	78.5	71.7	77.3	80.8	85.3

LOCATION NAME:		SS-06	SS-07	SS-07	SS-08	SS-09
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-06-0.0-0.5-NX-S-244-2	SS-07-0.0-0.5-FD-S-326-2	SS-07-0.0-0.5-NX-S-245-2	SS-08-0.0-0.5-NX-S-246-2	SS-09-0.0-0.5-FD-S-325-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/27/91
REMARKS:			Field Duplicate			Field Duplicate
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	11 U	14 U	14 UJ	13 U	12 U
1,1,2,2-Tetrachloroethane	10	11 U	14 UJ	14 UJ	13 U	12 U
1,1,2-Trichloroethane	10	11 U	14 U	14 UJ	13 U	12 U
1,1-Dichloroethane	10	11 U	2 J	14 UJ	13 U	12 U
1,1-Dichloroethene	10	11 U	14 U	14 U	13 U	12 U
1,2-Dichloroethane	10	11 U	14 U	14 U	13 U	12 U
1,2-Dichloroethene(total)	10	11 U	56 J	6 J	13 U	12 U
1,2-Dichloropropane	10	11 U	14 U	14 UJ	13 U	12 U
2-Butanone	10	11 U	23 J	14 UJ	13 U	33 J
2-Hexanone	10	11 U	14 UJ	14 UJ	13 U	12 U
4-Methyl-2-pentanone	10	11 U	14 UJ	14 UJ	13 U	12 U
Acetone	10	32	4400 U	16 J	15 J	2400 J
Benzene	10	11 U	14 U	14 UJ	13 U	12 U
Bromodichloromethane	10	11 U	14 U	14 UJ	13 U	12 U
Bromoform	10	11 U	14 U	14 UJ	13 U	12 U
Bromomethane	10	11 U	14 U	14 U	13 U	12 U
Carbon Disulfide	10	11 U	14 U	14 U	13 U	12 U
Carbon Tetrachloride	10	11 U	14 U	14 UJ	13 U	12 U
Chlorobenzene	10	11 U	14 UJ	14 UJ	13 U	12 U
Chloroethane	10	11 U	14 U	14 U	13 U	12 U
Chloroform	10	2 J	14 U	14 U	13 U	2 J
Chloromethane	10	11 UJ	14 U	14 U	13 U	12 U
Dibromochloromethane	10	11 U	14 U	14 UJ	13 U	12 U
Ethylbenzene	10	11 U	14 UJ	14 UJ	13 U	12 UJ
Methylene Chloride	10	11 U	14 U	14 U	20 U	12 U
Styrene	10	11 U	14 UJ	14 UJ	13 U	12 U
Tetrachloroethene	10	11 U	14 UJ	14 UJ	4 J	2 J
Toluene	10	11 U	14 UJ	14 UJ	13 U	12 UJ
Total Xylenes	10	11 U	14 UJ	14 UJ	13 U	12 UJ
Trichloroethene	10	11 U	14 U	14 UJ	13 U	12 UJ
Vinyl Chloride	10	11 U	14 U	14 U	13 U	12 U
cis-1,3-Dichloropropene	10	11 U	14 U	14 UJ	13 U	12 U
trans-1,3-Dichloropropene	10	11 U	14 U	14 UJ	13 U	12 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	340 UJ	460 U	450 U	420 U	400 UJ

LOCATION NAME:		SS-06	SS-07	SS-07	SS-08	SS-09
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-06-0.0-0.5-NX-S-244-2	SS-07-0.0-0.5-FD-S-326-2	SS-07-0.0-0.5-NX-S-245-2	SS-08-0.0-0.5-NX-S-246-2	SS-09-0.0-0.5-FD-S-325-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/27/91
REMARKS:			Field Duplicate			Field Duplicate
1,2-Dichlorobenzene	330	340 UJ	460 U	450 U	420 U	400 UJ
1,3-Dichlorobenzene	330	340 UJ	460 U	450 U	420 U	400 UJ
1,4-Dichlorobenzene	330	340 UJ	460 U	450 U	420 U	400 UJ
2,2'-oxybis(1-Chloropropane)	330	340 UJ	460 U	450 U	420 U	400 UJ
2,4,5-Trichlorophenol	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
2,4,6-Trichlorophenol	330	340 UJ	460 U	450 U	420 U	400 UJ
2,4-Dichlorophenol	330	340 UJ	460 U	450 U	420 U	400 UJ
2,4-Dimethylphenol	330	340 UJ	460 U	450 U	420 U	400 UJ
2,4-Dinitrophenol	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
2,4-Dinitrotoluene	330	340 UJ	460 U	450 U	420 U	400 UJ
2,6-Dinitrotoluene	330	340 UJ	460 U	450 U	420 U	400 UJ
2-Chloronaphthalene	330	340 UJ	460 U	450 U	420 U	400 UJ
2-Chlorophenol	330	340 UJ	460 U	450 U	420 U	400 UJ
2-Methylnaphthalene	330	340 UJ	460 U	450 U	420 U	400 UJ
2-Methylphenol	330	340 UJ	460 U	450 U	420 U	400 UJ
2-Nitroaniline	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
2-Nitrophenol	330	340 UJ	460 U	450 U	420 U	400 UJ
3,3'-Dichlorobenzidine	330	340 UJ	460 U	450 U	420 U	400 UJ
3-Nitroaniline	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
4,6-Dinitro-2-methylphenol	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
4-Bromophenyl-phenylether	330	340 UJ	460 U	450 U	420 U	400 UJ
4-Chloro-3-methylphenol	330	340 UJ	460 U	450 U	420 U	400 UJ
4-Chloroaniline	330	340 UJ	460 U	450 U	420 U	400 UJ
4-Chlorophenyl-phenylether	330	340 UJ	460 U	450 U	420 U	400 UJ
4-Methylphenol	330	340 UJ	460 U	450 U	420 U	400 UJ
4-Nitroaniline	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
4-Nitrophenol	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
Acenaphthene	330	340 UJ	460 U	450 U	420 U	400 UJ
Acenaphthylene	330	340 UJ	460 U	450 U	420 U	400 UJ
Anthracene	330	340 UJ	460 U	450 U	420 U	400 UJ
Benzo(a)anthracene	330	340 UJ	53 J	38 J	420 U	400 UJ
Benzo(a)pyrene	330	340 UJ	41 J	31 J	420 U	400 UJ
Benzo(b)fluoranthene	330	340 UJ	60 J	50 J	420 U	400 UJ
Benzo(g,h,i)perylene	330	340 UJ	32 J	450 UJ	420 U	400 UJ
Benzo(k)fluoranthene	330	340 UJ	54 J	40 J	420 U	400 UJ
Butylbenzylphthalate	330	340 UJ	460 U	450 U	420 U	400 UJ
Carbazole	330	340 UJ	460 U	450 U	420 U	400 UJ
Chrysene	330	340 UJ	61 J	44 J	420 U	400 UJ
Di-n-butylphthalate	330	340 UJ	460 UJ	450 UJ	420 U	400 UJ

LOCATION NAME:		SS-06	SS-07	SS-07	SS-08	SS-09
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-06-0.0-0.5-NX-S-244-2	SS-07-0.0-0.5-FD-S-326-2	SS-07-0.0-0.5-NX-S-245-2	SS-08-0.0-0.5-NX-S-246-2	SS-09-0.0-0.5-FD-S-325-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/27/91
REMARKS:			Field Duplicate			Field Duplicate
Di-n-octylphthalate	330	340 UJ	460 U	450 U	420 U	400 UJ
Dibenz(a,h)anthracene	330	340 UJ	460 U	450 U	420 U	400 UJ
Dibenzofuran	330	340 UJ	460 U	450 U	420 U	400 UJ
Diethylphthalate	330	340 UJ	460 U	450 U	420 U	400 UJ
Dimethylphthalate	330	340 UJ	460 U	450 U	420 U	400 UJ
Fluoranthene	330	340 UJ	89 J	57 J	420 U	400 UJ
Fluorene	330	340 UJ	460 U	450 U	420 U	400 UJ
Hexachlorobenzene	330	340 UJ	460 U	450 U	420 U	400 UJ
Hexachlorobutadiene	330	340 UJ	460 U	450 U	420 U	400 UJ
Hexachlorocyclopentadiene	330	340 UJ	460 U	450 U	420 U	400 UJ
Hexachloroethane	330	340 UJ	460 U	450 U	420 U	400 UJ
Indeno(1,2,3-cd)pyrene	330	340 UJ	34 J	450 UJ	420 U	400 UJ
Isophorone	330	340 UJ	460 U	450 U	420 U	400 UJ
N-Nitroso-di-n-propylamine	330	340 UJ	460 U	450 U	420 U	400 UJ
N-Nitrosodiphenylamine	330	340 UJ	460 U	450 U	420 U	400 UJ
Naphthalene	330	340 UJ	460 U	450 U	420 U	400 UJ
Nitrobenzene	330	340 UJ	460 U	450 U	420 U	400 UJ
Pentachlorophenol	800	840 UJ	1100 U	1100 U	1000 U	980 UJ
Phenanthrene	330	340 UJ	80 J	50 J	420 U	400 UJ
Phenol	330	340 UJ	460 U	450 U	420 U	400 UJ
Pyrene	330	340 UJ	130 J	100 J	23 J	400 UJ
bis(2-Chloroethoxy)methane	330	340 UJ	460 U	450 U	420 U	400 UJ
bis(2-Chloroethyl) ether	330	340 UJ	460 U	450 U	420 U	400 UJ
bis(2-Ethylhexyl)phthalate	330	340 UJ	460 U	450 U	420 U	400 UJ
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	3.5 U	4.6 U	4.6 U	4.3 U	4.1 U
4,4'-DDE	3.3	3.5 U	9.1	8.5	4.3 U	4.1 U
4,4'-DDT	3.3	3.5 U	5.5 J	4.9 J	4.3 U	4.1 U
Aldrin	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
Aroclor-1016	33.0	35.0 U	46.0 U	46.0 U	43.0 U	41.0 U
Aroclor-1221	67.0	71.0 U	94.0 U	93.0 U	86.0 U	82.0 U
Aroclor-1232	33.0	35.0 U	46.0 U	46.0 U	43.0 U	41.0 U
Aroclor-1242	33.0	35.0 U	46.0 U	46.0 U	43.0 U	41.0 U
Aroclor-1248	33.0	35.0 U	46.0 U	46.0 U	43.0 U	41.0 U
Aroclor-1254	33.0	35.0 U	46.0 U	46.0 U	43.0 U	41.0 U
Aroclor-1260	33.0	35.0 U	46.0 U	46.0 U	43.0 U	41.0 U
Dieldrin	3.3	3.5 U	4.6 U	4.6 U	4.3 U	4.1 U

LOCATION NAME:		SS-06	SS-07	SS-07	SS-08	SS-09
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-06-0.0-0.5-NX-S-244-2	SS-07-0.0-0.5-FD-S-326-2	SS-07-0.0-0.5-NX-S-245-2	SS-08-0.0-0.5-NX-S-246-2	SS-09-0.0-0.5-FD-S-325-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/27/91
REMARKS:			Field Duplicate			Field Duplicate
Endosulfan I	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
Endosulfan II	3.3	3.5 U	4.6 U	4.6 U	4.3 U	4.1 U
Endosulfan Sulfate	3.3	3.5 U	4.6 U	4.6 U	4.3 U	4.1 U
Endrin	3.3	3.5 U	4.6 U	4.6 U	4.3 U	4.1 U
Endrin Aldehyde	3.3	3.5 U	4.6 U	4.6 U	4.3 U	4.1 U
Endrin Ketone	3.3	3.5 U	4.6 U	4.6 U	4.3 U	4.1 U
Heptachlor	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
Heptachlor Epoxide	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
Methoxychlor	17.0	18.0 U	24.0 U	24.0 U	22.0 U	21.0 U
Toxaphene	170.0	180.0 U	240.0 U	240.0 U	220.0 U	210.0 U
alpha-BHC	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
alpha-Chlordane	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
beta-BHC	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
delta-BHC	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
gamma-BHC(Lindane)	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
gamma-Chlordane	1.7	1.8 U	2.4 U	2.4 U	2.2 U	2.1 U
METALS	CRDL(mg/kg)					
Aluminum	200	1740	12900	13100	11400	8870
Antimony	60	5.2 UJ	7.0 UJ	6.9 UJ	6.4 UJ	6.2 UJ
Arsenic	10	0.21 U	3.4 J	3.3 J	3.1 J	0.90
Barium	200	5.2	16.7	16.9	16.9	15.9
Beryllium	5	0.45 U	0.54 UJ	0.72 UJ	0.74 UJ	0.69 U
Cadmium	5	0.63 U	0.84	0.8 U	0.8 U	0.74 U
Calcium	5000	196	705	737	952	492
Chromium	10	3.2	13.7	14.1	13.2	7.5
Cobalt	50	1.3 U	3.9	3.7	6.2	3.5
Copper	25	5.0 U	8.0 U	6.3	38.7 U	4.2 U
Iron	100	4090	14600	14800	13300	12200
Lead	3	3.1	28.7 J	26.1 J	10.3 J	5.4
Magnesium	5000	381	976	975	1710	960
Manganese	15	86.6	105	128	167	179
Mercury	0.2	0.10 U	0.1 U	0.1 U	0.1 U	0.12 U
Nickel	40	3.3 U	4.5 U	4.4 U	10.6	4.0 U
Potassium	5000	308	634	705	717	597
Selenium	5	0.21 U	0.74 U	0.99 UJ	0.25 UJ	0.32 UJ
Silver	10	0.63 U	0.8 U	0.8 U	0.8 U	0.74 U
Sodium	5000	23.9 U	59.9 U	54.6 U	69.3 U	43.6 U

LOCATION NAME:		SS-06	SS-07	SS-07	SS-08	SS-09
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-06-0.0-0.5-NX-S-244-2	SS-07-0.0-0.5-FD-S-326-2	SS-07-0.0-0.5-NX-S-245-2	SS-08-0.0-0.5-NX-S-246-2	SS-09-0.0-0.5-FD-S-325-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/27/91
REMARKS:			Field Duplicate			Field Duplicate
Thallium	10	0.21 U	0.3 U	0.3 U	0.3 U	0.25 U
Vanadium	50	3.2	27.3	27.1	20.5	13.1
Zinc	20	20.8	35.8	27.6	37.4	35.0
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	2.6 U	3.5 U	3.5 U	3.2 U	3.1 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	19.1	28.1	29.1	22.5	18.2
Organic Content	(%)	3.2	12.5	12.6	3.7	3.3
Solids Content	(%)	80.9	71.8	70.9	77.5	81.7

LOCATION NAME:		SS-09	SS-10	SS-11	SS-12	SS-13
SITE LOCATION:		BULKY WASTE	BULKY WASTE	SEWAGE SLUDGE	SEWAGE SLUDGE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-09-0.0-0.5-NX-S-247-2	SS-10-0.0-0.5-NX-S-248-2	SS-11-0.0-0.5-NX-S-249-2	SS-12-0.0-0.5-NX-S-250-2	SS-13-0.0-0.5-NX-S-338-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/26/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	12 U	12 U	12 U	11 U	17 U
1,1,2,2-Tetrachloroethane	10	12 U	12 U	12 U	11 U	17 UJ
1,1,2-Trichloroethane	10	12 U	12 U	12 U	11 U	17 U
1,1-Dichloroethane	10	12 U	12 U	12 U	11 U	17 U
1,1-Dichloroethene	10	12 U	12 U	12 U	11 U	4 J
1,2-Dichloroethane	10	12 U	12 U	12 U	11 U	17 U
1,2-Dichloroethene(total)	10	8 J	12 U	12 U	11 U	2400 J
1,2-Dichloropropane	10	12 U	12 U	12 U	11 U	17 U
2-Butanone	10	1400 J	12 U	12 U	4 J	66 J
2-Hexanone	10	12 U	12 U	12 U	11 U	17 UJ
4-Methyl-2-pentanone	10	12 U	12 U	12 U	11 U	17 UJ
Acetone	10	45000 J	37 J	23	14	11000 U
Benzene	10	12 U	12 U	12 U	11 U	6 J
Bromodichloromethane	10	12 U	12 U	12 U	11 U	17 U
Bromoform	10	12 U	12 U	12 U	11 U	17 U
Bromomethane	10	12 U	12 U	12 U	11 U	17 U
Carbon Disulfide	10	12 U	12 U	12 U	11 U	17 U
Carbon Tetrachloride	10	12 U	12 U	12 U	11 U	17 U
Chlorobenzene	10	12 U	12 U	12 U	11 U	17 UJ
Chloroethane	10	12 U	12 U	12 U	11 U	17 U
Chloroform	10	12 U	12 U	12 U	11 U	17 U
Chloromethane	10	12 U	12 U	12 UJ	11 U	17 U
Dibromochloromethane	10	12 U	12 U	12 U	11 U	17 U
Ethylbenzene	10	2 J	12 U	12 U	11 U	21 J
Methylene Chloride	10	12 U	14 U	12 U	11 U	25 U
Styrene	10	12 U	12 U	12 U	11 U	17 UJ
Tetrachloroethene	10	24 J	3 J	2 J	11 U	4 J
Toluene	10	3 J	12 U	12 U	11 U	110 J
Total Xylenes	10	10 J	12 U	12 U	11 U	84 J
Trichloroethene	10	2 J	12 U	12 U	11 U	17 U
Vinyl Chloride	10	12 U	12 U	12 U	11 U	250
cis-1,3-Dichloropropene	10	12 U	12 U	12 U	11 U	17 U
trans-1,3-Dichloropropene	10	12 U	12 U	12 U	11 U	17 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	400 UJ	380 U	400 U	360 U	550 U

LOCATION NAME:		SS-09	SS-10	SS-11	SS-12	SS-13
SITE LOCATION:		BULKY WASTE	BULKY WASTE	SEWAGE SLUDGE	SEWAGE SLUDGE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-09-0.0-0.5-NX-S-247-2	SS-10-0.0-0.5-NX-S-248-2	SS-11-0.0-0.5-NX-S-249-2	SS-12-0.0-0.5-NX-S-250-2	SS-13-0.0-0.5-NX-S-338-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/26/91
REMARKS:						
1,2-Dichlorobenzene	330	400 UJ	380 U	400 U	360 U	550 U
1,3-Dichlorobenzene	330	400 UJ	380 U	400 U	360 U	550 U
1,4-Dichlorobenzene	330	400 UJ	380 U	400 U	360 U	550 U
2,2'-oxybis(1-Chloropropane)	330	400 UJ	380 U	400 U	360 U	550 U
2,4,5-Trichlorophenol	800	970 UJ	920 U	960 U	870 U	1300 U
2,4,6-Trichlorophenol	330	400 UJ	380 U	400 U	360 U	550 U
2,4-Dichlorophenol	330	400 UJ	380 U	400 U	360 U	550 U
2,4-Dimethylphenol	330	400 UJ	380 U	400 U	360 U	550 U
2,4-Dinitrophenol	800	970 UJ	920 U	960 U	870 U	1300 U
2,4-Dinitrotoluene	330	400 UJ	380 U	400 U	360 U	550 U
2,6-Dinitrotoluene	330	400 UJ	380 U	400 U	360 U	550 U
2-Chloronaphthalene	330	400 UJ	380 U	400 U	360 U	550 U
2-Chlorophenol	330	400 UJ	380 U	400 U	360 U	550 U
2-Methylnaphthalene	330	400 UJ	380 U	400 U	360 U	550 U
2-Methylphenol	330	400 UJ	380 U	400 U	360 U	550 U
2-Nitroaniline	800	970 UJ	920 U	960 U	870 U	1300 U
2-Nitrophenol	330	400 UJ	380 U	400 U	360 U	550 U
3,3'-Dichlorobenzidine	330	400 UJ	380 U	400 U	360 U	550 U
3-Nitroaniline	800	970 UJ	920 U	960 U	870 U	1300 U
4,6-Dinitro-2-methylphenol	800	970 UJ	920 U	960 U	870 U	1300 U
4-Bromophenyl-phenylether	330	400 UJ	380 U	400 U	360 U	550 U
4-Chloro-3-methylphenol	330	400 UJ	380 U	400 U	360 U	550 U
4-Chloroaniline	330	400 UJ	380 U	490	360 U	550 U
4-Chlorophenyl-phenylether	330	400 UJ	380 U	400 U	360 U	550 U
4-Methylphenol	330	400 UJ	380 U	400 U	360 U	550 U
4-Nitroaniline	800	970 UJ	920 U	960 U	870 U	1300 U
4-Nitrophenol	800	970 UJ	920 U	960 U	870 U	1300 U
Acenaphthene	330	400 UJ	380 U	400 U	360 U	550 U
Acenaphthylene	330	400 UJ	380 U	400 U	360 U	550 U
Anthracene	330	400 UJ	380 U	400 U	360 U	550 U
Benzo(a)anthracene	330	400 UJ	380 U	400 U	360 U	550 U
Benzo(a)pyrene	330	400 UJ	380 U	400 U	360 U	550 U
Benzo(b)fluoranthene	330	400 UJ	380 U	400 U	360 U	550 U
Benzo(g,h,i)perylene	330	400 UJ	380 U	400 U	360 U	550 U
Benzo(k)fluoranthene	330	400 UJ	380 U	400 U	360 U	550 U
Butylbenzylphthalate	330	400 UJ	120 J	400 U	360 U	550 U
Carbazole	330	400 UJ	380 U	400 U	360 U	550 U
Chrysene	330	400 UJ	380 U	400 U	360 U	550 U
Di-n-butylphthalate	330	400 UJ	380 U	400 U	360 U	550 U

LOCATION NAME:		SS-09	SS-10	SS-11	SS-12	SS-13
SITE LOCATION:		BULKY WASTE	BULKY WASTE	SEWAGE SLUDGE	SEWAGE SLUDGE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-09-0.0-0.5-NX-S-247-2	SS-10-0.0-0.5-NX-S-248-2	SS-11-0.0-0.5-NX-S-249-2	SS-12-0.0-0.5-NX-S-250-2	SS-13-0.0-0.5-NX-S-338-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/26/91
REMARKS:						
Di-n-octylphthalate	330	400 UJ	380 U	400 U	360 U	550 U
Dibenz(a,h)anthracene	330	400 UJ	380 U	400 U	360 U	550 U
Dibenzofuran	330	400 UJ	380 U	400 U	360 U	550 U
Diethylphthalate	330	400 UJ	380 U	400 U	29 J	29 J
Dimethylphthalate	330	400 UJ	380 U	400 U	360 U	550 U
Fluoranthene	330	400 UJ	380 U	400 U	360 U	33 J
Fluorene	330	400 UJ	380 U	400 U	360 U	550 U
Hexachlorobenzene	330	400 UJ	380 U	400 U	360 U	550 U
Hexachlorobutadiene	330	400 UJ	380 U	400 U	360 U	550 U
Hexachlorocyclopentadiene	330	400 UJ	380 U	400 U	360 U	550 U
Hexachloroethane	330	400 UJ	380 U	400 U	360 U	550 U
Indeno(1,2,3-cd)pyrene	330	400 UJ	380 U	400 U	360 U	550 U
Isophorone	330	400 UJ	380 U	400 U	360 U	550 U
N-Nitroso-di-n-propylamine	330	400 UJ	380 U	400 U	360 U	550 U
N-Nitrosodiphenylamine	330	400 UJ	380 U	400 U	360 U	550 U
Naphthalene	330	400 UJ	380 U	400 U	360 U	550 U
Nitrobenzene	330	400 UJ	380 U	400 U	360 U	550 U
Pentachlorophenol	800	970 UJ	920 U	960 U	870 U	1300 U
Phenanthrene	330	400 UJ	380 U	400 U	360 U	550 U
Phenol	330	400 UJ	380 U	400 U	360 U	550 U
Pyrene	330	400 UJ	380 U	26 J	360 U	38 J
bis(2-Chloroethoxy)methane	330	400 UJ	380 U	400 U	360 U	550 U
bis(2-Chloroethyl) ether	330	400 UJ	380 U	400 U	360 U	550 U
bis(2-Ethylhexyl)phthalate	330	400 UJ	380 U	400 U	360 U	550 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	5.2 J
4,4'-DDE	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	7.6
4,4'-DDT	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	5.5 U
Aldrin	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
Aroclor-1016	33.0	40.0 UJ	38.0 U	200.0 U	36.0 U	55.0 U
Aroclor-1221	67.0	81.0 UJ	77.0 U	400.0 U	72.0 U	110.0 U
Aroclor-1232	33.0	40.0 UJ	38.0 U	200.0 U	36.0 U	55.0 U
Aroclor-1242	33.0	40.0 UJ	38.0 U	200.0 U	36.0 U	55.0 U
Aroclor-1248	33.0	40.0 UJ	38.0 U	200.0 U	36.0 U	55.0 U
Aroclor-1254	33.0	40.0 UJ	38.0 U	200.0 U	36.0 U	55.0 U
Aroclor-1260	33.0	40.0 UJ	38.0 U	200.0 U	36.0 U	55.0 U
Dieldrin	3.3	4.0 UJ	3.8 U	4.5 J	3.6 U	5.5 U

LOCATION NAME:		SS-09	SS-10	SS-11	SS-12	SS-13
SITE LOCATION:		BULKY WASTE	BULKY WASTE	SEWAGE SLUDGE	SEWAGE SLUDGE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-09-0.0-0.5-NX-S-247-2	SS-10-0.0-0.5-NX-S-248-2	SS-11-0.0-0.5-NX-S-249-2	SS-12-0.0-0.5-NX-S-250-2	SS-13-0.0-0.5-NX-S-338-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/26/91
REMARKS:						
Endosulfan I	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
Endosulfan II	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	5.5 U
Endosulfan Sulfate	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	5.5 U
Endrin	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	5.5 U
Endrin Aldehyde	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	5.5 U
Endrin Ketone	3.3	4.0 UJ	3.8 U	20.0 U	3.6 U	5.5 U
Heptachlor	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
Heptachlor Epoxide	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
Methoxychlor	17.0	21.0 UJ	20.0 U	100.0 U	18.0 U	28.0 U
Toxaphene	170.0	210.0 UJ	200.0 U	1000.0 U	180.0 U	280.0 U
alpha-BHC	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
alpha-Chlordane	1.7	2.1 UJ	2.0 U	3.7 J	1.8 U	2.8 U
beta-BHC	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
delta-BHC	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
gamma-BHC(Lindane)	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
gamma-Chlordane	1.7	2.1 UJ	2.0 U	10.0 U	1.8 U	2.8 U
METALS	CRDL(mg/kg)					
Aluminum	200	9010	8630	6360	3450	11000
Antimony	60	6.2 UJ	5.7 UJ	78.8 J	5.1 UJ	7.3 UJ
Arsenic	10	1.2	1.3 J	0.86 J	0.52 J	1.6 J
Barium	200	16.9	16.5	58.9	8.5	20.3
Beryllium	5	0.68 U	0.59 UJ	0.68 UJ	0.59 UJ	0.57 UJ
Cadmium	5	0.74 U	0.7 U	0.7 U	0.6 U	0.9 U
Calcium	5000	684	685	680	263	678
Chromium	10	7.8	9.8	9.8	5.3 J	12.8
Cobalt	50	3.0	4.8	3.6	3.0	5.7
Copper	25	3.8 U	5.4 U	99.3	4.0 U	8.7
Iron	100	11100	10600	10400	7190	9970
Lead	3	5.8	5.6 J	11.8 J	2.6 J	11.5 J
Magnesium	5000	932	1270	1100	773	1990
Manganese	15	128	108	96.4	135	109
Mercury	0.2	0.12 U	0.1 U	0.28	0.1 U	0.1 U
Nickel	40	4.6	6.6	5.4	3.9	9.8
Potassium	5000	535	766	847	653	944
Selenium	5	0.25 U	0.26 UJ	0.24 UJ	0.20 UJ	0.54 U
Silver	10	0.74 U	0.7 U	1.6	0.6 U	0.87
Sodium	5000	50.6 U	50.0 U	57.6 U	32.0 U	66.6 U

LOCATION NAME:		SS-09	SS-10	SS-11	SS-12	SS-13
SITE LOCATION:		BULKY WASTE	BULKY WASTE	SEWAGE SLUDGE	SEWAGE SLUDGE	SOLID WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SS-09-0.0-0.5-NX-S-247-2	SS-10-0.0-0.5-NX-S-248-2	SS-11-0.0-0.5-NX-S-249-2	SS-12-0.0-0.5-NX-S-250-2	SS-13-0.0-0.5-NX-S-338-2
DATE SAMPLED:		09/27/91	09/26/91	09/26/91	09/26/91	09/26/91
REMARKS:						
Thallium	10	0.25 U	0.2 U	0.2 U	0.25 J	0.3 U
Vanadium	50	13.2	15.0	12.0	6.9 U	22.9
Zinc	20	36.9	22.7	56.5	19.9	38.3
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	3.1 U	2.8 U	2.9 U	2.5 U	3.6 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	5.8	15.4	15.7	8.8	36.1
Organic Content	(%)	0.5	2.9	2.8	0.9	9.4
Solids Content	(%)	94.2	84.6	84.2	91.2	63.8

SURFACE SOIL - APRIL 1992

LOCATION NAME:		SS-14	SS-15	SS-16	SS-17	SS-18
SITE LOCATION:		BACKGROUND	SEWAGE SLUDGE	SOLID WASTE	SOLID WASTE	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-0.5	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-14-0.0-1.0-NX-S-623-4	SS-15-0.0-1.0-NX-S-624-4	SS-16-0.0-0.5-NX-S-625-4	SS-17-0.0-1.0-NX-S-626-4	SS-18-0.0-1.0-NX-S-627-4
DATE SAMPLED:		04/14/92	04/15/92	04/14/92	04/14/92	04/15/92
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	14 U	11 U	11 U	11 U	15 U
1,1,2,2-Tetrachloroethane	10	14 UJ	11 U	11 U	11 U	15 UJ
1,1,2-Trichloroethane	10	14 U	11 U	11 U	11 U	15 U
1,1-Dichloroethane	10	14 U	11 U	11 U	11 U	15 U
1,1-Dichloroethene	10	14 U	11 U	11 U	11 U	15 U
1,2-Dichloroethane	10	14 U	11 U	11 U	11 U	15 U
1,2-Dichloroethene(total)	10	14 U	11 U	11 U	11 U	15 U
1,2-Dichloropropane	10	14 U	11 U	11 U	11 U	15 U
2-Butanone	10	14 U	11 U	11 U	11 U	15 U
2-Hexanone	10	14 UJ	11 U	11 U	11 U	15 UJ
4-Methyl-2-pentanone	10	14 UJ	11 U	11 U	11 U	15 UJ
Acetone	10	480	11 U	4000	47 U	15 U
Benzene	10	14 U	11 U	11 U	11 U	15 U
Bromodichloromethane	10	14 U	11 U	11 U	11 U	15 U
Bromoform	10	14 U	11 U	11 U	11 U	15 U
Bromomethane	10	14 U	11 U	11 U	11 U	15 U
Carbon Disulfide	10	14 U	11 U	11 U	11 U	15 U
Carbon Tetrachloride	10	14 U	11 U	11 U	11 U	15 U
Chlorobenzene	10	14 UJ	11 U	11 U	11 U	15 UJ
Chloroethane	10	14 U	11 U	11 U	11 U	15 U
Chloroform	10	14 U	11 U	11 U	11 U	15 U
Chloromethane	10	14 U	11 U	11 U	11 U	15 U
Dibromochloromethane	10	14 U	11 U	11 U	11 U	15 U
Ethylbenzene	10	14 UJ	11 U	11 U	11 U	15 UJ
Methylene Chloride	10	56 U	11 U	27 U	33 U	15 U
Styrene	10	14 UJ	11 U	11 U	11 U	15 UJ
Tetrachloroethene	10	14 UJ	11 U	11 U	11 U	15 UJ
Toluene	10	14 UJ	11 U	11 U	11 U	15 UJ
Total Xylenes	10	14 UJ	11 U	11 U	11 U	15 UJ
Trichloroethene	10	14 U	11 U	11 U	11 U	15 U
Vinyl Chloride	10	14 U	11 U	11 U	11 U	15 U
cis-1,3-Dichloropropene	10	14 U	11 U	11 U	11 U	15 U
trans-1,3-Dichloropropene	10	14 U	11 U	11 U	11 U	15 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ

LOCATION NAME:		SS-14	SS-15	SS-16	SS-17	SS-18
SITE LOCATION:		BACKGROUND	SEWAGE SLUDGE	SOLID WASTE	SOLID WASTE	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-0.5	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-14-0.0-1.0-NX-S-623-4	SS-15-0.0-1.0-NX-S-624-4	SS-16-0.0-0.5-NX-S-625-4	SS-17-0.0-1.0-NX-S-626-4	SS-18-0.0-1.0-NX-S-627-4
DATE SAMPLED:		04/14/92	04/15/92	04/14/92	04/14/92	04/15/92
REMARKS:						
1,2-Dichlorobenzene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
1,3-Dichlorobenzene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
1,4-Dichlorobenzene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2,2'-oxybis(1-Chloropropane)	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2,4,5-Trichlorophenol	800	440 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
2,4,6-Trichlorophenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2,4-Dichlorophenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2,4-Dimethylphenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2,4-Dinitrophenol	800	1100 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
2,4-Dinitrotoluene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2,6-Dinitrotoluene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2-Chloronaphthalene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2-Chlorophenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2-Methylnaphthalene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2-Methylphenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
2-Nitroaniline	800	1100 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
2-Nitrophenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
3,3'-Dichlorobenzidine	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
3-Nitroaniline	800	1100 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
4,6-Dinitro-2-methylphenol	800	1100 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
4-Bromophenyl-phenylether	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
4-Chloro-3-methylphenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
4-Chloroaniline	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
4-Chlorophenyl-phenylether	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
4-Methylphenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
4-Nitroaniline	800	1100 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
4-Nitrophenol	800	1100 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
Acenaphthene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Acenaphthylene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Anthracene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Benzo(a)anthracene	330	440 UJ	370 UJ	370 UJ	22 J	480 UJ
Benzo(a)pyrene	330	440 UJ	370 UJ	370 UJ	23 J	480 UJ
Benzo(b)fluoranthene	330	440 UJ	370 UJ	370 UJ	26 J	480 UJ
Benzo(g,h,i)perylene	330	440 UJ	370 UJ	370 UJ	19 J	480 UJ
Benzo(k)fluoranthene	330	440 UJ	370 UJ	370 UJ	24 J	480 UJ
Butylbenzylphthalate	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Carbazole	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Chrysene	330	440 UJ	370 UJ	370 UJ	21 J	480 UJ
Di-n-butylphthalate	330	440 UJ	370 U	370 U	370 UJ	480 UJ

LOCATION NAME:		SS-14	SS-15	SS-16	SS-17	SS-18
SITE LOCATION:		BACKGROUND	SEWAGE SLUDGE	SOLID WASTE	SOLID WASTE	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-0.5	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-14-0.0-1.0-NX-S-623-4	SS-15-0.0-1.0-NX-S-624-4	SS-16-0.0-0.5-NX-S-625-4	SS-17-0.0-1.0-NX-S-626-4	SS-18-0.0-1.0-NX-S-627-4
DATE SAMPLED:		04/14/92	04/15/92	04/14/92	04/14/92	04/15/92
REMARKS:						
Di-n-octylphthalate	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Dibenz(a,h)anthracene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Dibenzofuran	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Diethylphthalate	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Dimethylphthalate	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Fluoranthene	330	440 UJ	370 UJ	370 UJ	60 J	480 UJ
Fluorene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Hexachlorobenzene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Hexachlorobutadiene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Hexachlorocyclopentadiene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Hexachloroethane	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Indeno(1,2,3-cd)pyrene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Isophorone	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
N-Nitroso-di-n-propylamine	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
N-Nitrosodiphenylamine	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Naphthalene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Nitrobenzene	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Pentachlorophenol	800	1100 UJ	900 UJ	900 UJ	900 UJ	1200 UJ
Phenanthrene	330	440 UJ	370 UJ	370 UJ	31 J	480 UJ
Phenol	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
Pyrene	330	440 UJ	370 UJ	370 UJ	40 J	480 UJ
bis(2-Chloroethoxy)methane	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
bis(2-Chloroethyl) ether	330	440 UJ	370 UJ	370 UJ	370 UJ	480 UJ
bis(2-Ethylhexyl)phthalate	330	440 UJ	1800 U	1600 U	2100 U	480 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	4.5 UJ	3.7 UJ	0.24 J	3.7 UJ	4.8 UJ
4,4'-DDE	3.3	0.99 J	3.7 UJ	3.7 UJ	0.33 J	0.38 J
4,4'-DDT	3.3	1.0 J	3.7 UJ	3.7 UJ	0.90 J	0.38 J
Aldrin	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
Aroclor-1016	33.0	45 UJ	37 UJ	37 UJ	37 UJ	48 UJ
Aroclor-1221	67.0	91 UJ	76 UJ	75 UJ	75 UJ	98 UJ
Aroclor-1232	33.0	45 UJ	37 UJ	37 UJ	37 UJ	48 UJ
Aroclor-1242	33.0	45 UJ	37 UJ	37 UJ	37 UJ	48 UJ
Aroclor-1248	33.0	45 UJ	37 UJ	37 UJ	37 UJ	48 UJ
Aroclor-1254	33.0	45 UJ	37 UJ	37 UJ	37 UJ	48 UJ
Aroclor-1260	33.0	45 UJ	37 UJ	37 UJ	37 UJ	48 UJ
Dieldrin	3.3	4.5 U	3.7 UJ	3.7 U	3.7 U	4.8 UJ

LOCATION NAME:		SS-14	SS-15	SS-16	SS-17	SS-18
SITE LOCATION:		BACKGROUND	SEWAGE SLUDGE	SOLID WASTE	SOLID WASTE	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-0.5	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-14-0.0-1.0-NX-S-623-4	SS-15-0.0-1.0-NX-S-624-4	SS-16-0.0-0.5-NX-S-625-4	SS-17-0.0-1.0-NX-S-626-4	SS-18-0.0-1.0-NX-S-627-4
DATE SAMPLED:		04/14/92	04/15/92	04/14/92	04/14/92	04/15/92
REMARKS:						
Endosulfan I	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
Endosulfan II	3.3	4.5 UJ	3.7 UJ	3.7 UJ	3.7 UJ	4.8 UJ
Endosulfan Sulfate	3.3	4.5 UJ	3.7 UJ	3.7 UJ	3.7 UJ	4.8 UJ
Endrin	3.3	4.5 UJ	3.7 UJ	3.7 UJ	3.7 UJ	4.8 UJ
Endrin Aldehyde	3.3	4.5 UJ	3.7 UJ	3.7 UJ	3.7 UJ	4.8 UJ
Endrin Ketone	3.3	0.46 J	3.7 UJ	3.7 UJ	3.7 UJ	2.3 J
Heptachlor	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
Heptachlor Epoxide	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
Methoxychlor	17.0	23 UJ	19 UJ	19 UJ	19 U	25 UJ
Toxaphene	170.0	230 UJ	190 UJ	190 UJ	190 UJ	250 UJ
alpha-BHC	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
alpha-Chlordane	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
beta-BHC	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
delta-BHC	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
gamma-BHC(Lindane)	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
gamma-Chlordane	1.7	2.3 UJ	1.9 UJ	1.9 UJ	1.9 UJ	2.5 UJ
METALS	CRDL(mg/kg)					
Aluminum	200	10700	6740	5650	4590	14400
Antimony	60	4 UJ	3.5 UJ	3.6 UJ	3.6 UJ	4.7 UJ
Arsenic	10	0.93 U	2 U	1.1 U	0.76 U	3.5
Barium	200	11	15.8	16.9	15.5	14.2
Beryllium	5	0.39	0.4	1.1	0.46	0.5
Cadmium	5	0.6 U	0.44 U	0.52 U	0.45 U	0.68 U
Calcium	5000	213	470	309	476	153
Chromium	10	9.8 UJ	8.1 UJ	6 UJ	5.2 UJ	12.1 J
Cobalt	50	4.8 U	4.4 U	4.2 U	3.1 U	3.6 U
Copper	25	4.3	9.9	7.6	5.5	2.7 U
Iron	100	12700	9240	12000	6840	15100
Lead	3	11.1	4.4	4.1	3.9	31.1
Magnesium	5000	1360	1300	1060	1030	732
Manganese	15	82	97.3	138	114	60.8
Mercury	0.2	0.17	0.1 U	0.11 U	0.1 U	0.15 U
Nickel	40	6.9 U	5.7 U	5.1 U	4.4 U	4.7 U
Potassium	5000	443	518	630	766	179
Selenium	5	1 UJ	0.83 UJ	0.9 U	0.86 UJ	5.9 J
Silver	10	0.5 U	0.44 U	0.45 U	0.45 U	0.59 U
Sodium	5000	41.5 U	53.1 U	40.1 U	42.2 U	54 U

LOCATION NAME:		SS-14	SS-15	SS-16	SS-17	SS-18
SITE LOCATION:		BACKGROUND	SEWAGE SLUDGE	SOLID WASTE	SOLID WASTE	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-0.5	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-14-0.0-1.0-NX-S-623-4	SS-15-0.0-1.0-NX-S-624-4	SS-16-0.0-0.5-NX-S-625-4	SS-17-0.0-1.0-NX-S-626-4	SS-18-0.0-1.0-NX-S-627-4
DATE SAMPLED:		04/14/92	04/15/92	04/14/92	04/14/92	04/15/92
REMARKS:						
Thallium	10	0.28 J	0.21 U	0.22 UJ	0.22 U	0.3 U
Vanadium	50	16.5	12.1	10.2	6.9	21.3
Zinc	20	21 J	22.1 J	25.7 J	19.8 J	16.3 J
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	0.66 U	0.57 U	0.53 U	0.54 U	0.75 U

LOCATION NAME:		SS-19	SS-20	SS-21	SS-22	SS-22
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-19-0.0-1.0-NX-S-628-4	SS-20-0.0-1.0-NX-S-629-4	SS-21-0.0-1.0-NX-S-630-4	SS-22-0.0-1.0-FD-S-673-4	SS-22-0.0-1.0-NX-S-631-4
DATE SAMPLED:		04/14/92	04/14/92	04/14/92	04/15/92	04/15/92
REMARKS:					Field Duplicate	
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	15 UJ	16 U	11 U	14 U	15 U
1,1,2,2-Tetrachloroethane	10	15 UJ	16 UJ	11 U	14 U	15 UJ
1,1,2-Trichloroethane	10	15 UJ	16 U	11 U	14 U	15 U
1,1-Dichloroethane	10	15 U	16 U	11 U	14 U	15 U
1,1-Dichloroethene	10	15 U	16 U	11 U	14 U	15 U
1,2-Dichloroethane	10	15 U	16 U	11 U	14 U	15 U
1,2-Dichloroethene(total)	10	15 U	16 U	11 U	14 U	15 U
1,2-Dichloropropane	10	15 UJ	16 U	11 U	14 U	15 U
2-Butanone	10	15 U	16 U	11 U	14 UJ	32 J
2-Hexanone	10	15 UJ	16 UJ	11 U	14 U	15 UJ
4-Methyl-2-pentanone	10	15 UJ	16 UJ	11 U	14 U	15 UJ
Acetone	10	15 U	77 U	66 U	14 UJ	190 J
Benzene	10	15 UJ	16 U	11 U	14 U	15 U
Bromodichloromethane	10	15 UJ	16 U	11 U	14 U	15 U
Bromoform	10	15 UJ	16 U	11 U	14 U	15 U
Bromomethane	10	15 U	16 U	11 U	14 U	15 U
Carbon Disulfide	10	15 U	16 U	11 U	14 U	15 U
Carbon Tetrachloride	10	15 UJ	16 U	11 U	14 U	15 U
Chlorobenzene	10	15 UJ	16 UJ	11 U	14 U	15 UJ
Chloroethane	10	15 U	16 U	11 U	14 U	15 U
Chloroform	10	15 U	16 U	11 U	14 U	15 U
Chloromethane	10	15 U	16 U	11 U	14 U	15 U
Dibromochloromethane	10	15 UJ	16 U	11 U	14 U	15 U
Ethylbenzene	10	15 UJ	16 UJ	11 U	14 U	9 J
Methylene Chloride	10	31 U	45 U	46 U	14 U	20 U
Styrene	10	15 UJ	16 UJ	11 U	14 U	15 UJ
Tetrachloroethene	10	15 UJ	16 UJ	11 U	14 U	15 UJ
Toluene	10	15 UJ	16 UJ	11 U	14 U	2 J
Total Xylenes	10	15 UJ	16 UJ	11 U	14 UJ	16 J
Trichloroethene	10	15 UJ	16 U	11 U	14 U	15 U
Vinyl Chloride	10	15 U	16 U	11 U	14 U	15 U
cis-1,3-Dichloropropene	10	15 UJ	16 U	11 U	14 U	15 U
trans-1,3-Dichloropropene	10	15 UJ	16 U	11 U	14 U	15 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ

LOCATION NAME:		SS-19	SS-20	SS-21	SS-22	SS-22
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-19-0.0-1.0-NX-S-628-4	SS-20-0.0-1.0-NX-S-629-4	SS-21-0.0-1.0-NX-S-630-4	SS-22-0.0-1.0-FD-S-673-4	SS-22-0.0-1.0-NX-S-631-4
DATE SAMPLED:		04/14/92	04/14/92	04/14/92	04/15/92	04/15/92
REMARKS:					Field Duplicate	
1,2-Dichlorobenzene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
1,3-Dichlorobenzene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
1,4-Dichlorobenzene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2,2'-oxybis(1-Chloropropane)	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2,4,5-Trichlorophenol	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
2,4,6-Trichlorophenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2,4-Dichlorophenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2,4-Dimethylphenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2,4-Dinitrophenol	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
2,4-Dinitrotoluene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2,6-Dinitrotoluene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2-Chloronaphthalene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2-Chlorophenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2-Methylnaphthalene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2-Methylphenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
2-Nitroaniline	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
2-Nitrophenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
3,3'-Dichlorobenzidine	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
3-Nitroaniline	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
4,6-Dinitro-2-methylphenol	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
4-Bromophenyl-phenylether	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
4-Chloro-3-methylphenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
4-Chloroaniline	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
4-Chlorophenyl-phenylether	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
4-Methylphenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
4-Nitroaniline	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
4-Nitrophenol	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
Acenaphthene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Acenaphthylene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Anthracene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Benzo(a)anthracene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Benzo(a)pyrene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Benzo(b)fluoranthene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Benzo(g,h,i)perylene	330	510 UJ	520 UJ	330 UJ	450 UJ	480 UJ
Benzo(k)fluoranthene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Butylbenzylphthalate	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Carbazole	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Chrysene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Di-n-butylphthalate	330	510 UJ	520 U	350 U	450 U	480 UJ

LOCATION NAME:		SS-19	SS-20	SS-21	SS-22	SS-22
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-19-0.0-1.0-NX-S-628-4	SS-20-0.0-1.0-NX-S-629-4	SS-21-0.0-1.0-NX-S-630-4	SS-22-0.0-1.0-FD-S-673-4	SS-22-0.0-1.0-NX-S-631-4
DATE SAMPLED:		04/14/92	04/14/92	04/14/92	04/15/92	04/15/92
REMARKS:					Field Duplicate	
Di-n-octylphthalate	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Dibenz(a,h)anthracene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Dibenzofuran	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Diethylphthalate	330	510 UJ	27 J	350 UJ	42 J	49 J
Dimethylphthalate	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Fluoranthene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Fluorene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Hexachlorobenzene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Hexachlorobutadiene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Hexachlorocyclopentadiene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Hexachloroethane	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Indeno(1,2,3-cd)pyrene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Isophorone	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
N-Nitroso-di-n-propylamine	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
N-Nitrosodiphenylamine	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Naphthalene	330	510 UJ	520 UJ	350 UJ	33 J	36 J
Nitrobenzene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Pentachlorophenol	800	1200 UJ	1300 UJ	850 UJ	1100 UJ	1200 UJ
Phenanthrene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Phenol	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
Pyrene	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
bis(2-Chloroethoxy)methane	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
bis(2-Chloroethyl) ether	330	510 UJ	520 UJ	350 UJ	450 UJ	480 UJ
bis(2-Ethylhexyl)phthalate	330	510 UJ	520 UJ	2400 U	1800 U	480 UJ
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	5.1 UJ	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
4,4'-DDE	3.3	1.8 J	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
4,4'-DDT	3.3	2.0 J	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
Aldrin	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
Aroclor-1016	33.0	51 UJ	52 UJ	35 UJ	45 UJ	49 UJ
Aroclor-1221	67.0	100 UJ	110 UJ	71 UJ	92 UJ	99 UJ
Aroclor-1232	33.0	51 UJ	52 UJ	35 UJ	45 UJ	49 UJ
Aroclor-1242	33.0	51 UJ	52 UJ	35 UJ	45 UJ	49 UJ
Aroclor-1248	33.0	51 UJ	52 UJ	35 UJ	45 UJ	49 UJ
Aroclor-1254	33.0	51 UJ	52 UJ	35 UJ	45 UJ	49 UJ
Aroclor-1260	33.0	51 UJ	52 UJ	35 UJ	45 UJ	49 UJ
Dieldrin	3.3	5.1 U	5.2 U	3.5 U	4.5 UJ	4.9 UJ

LOCATION NAME:		SS-19	SS-20	SS-21	SS-22	SS-22
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-19-0.0-1.0-NX-S-628-4	SS-20-0.0-1.0-NX-S-629-4	SS-21-0.0-1.0-NX-S-630-4	SS-22-0.0-1.0-FD-S-673-4	SS-22-0.0-1.0-NX-S-631-4
DATE SAMPLED:		04/14/92	04/14/92	04/14/92	04/15/92	04/15/92
REMARKS:					Field Duplicate	
Endosulfan I	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
Endosulfan II	3.3	5.1 UJ	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
Endosulfan Sulfate	3.3	5.1 UJ	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
Endrin	3.3	5.1 UJ	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
Endrin Aldehyde	3.3	5.1 UJ	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
Endrin Ketone	3.3	5.1 UJ	5.2 UJ	3.5 UJ	4.5 UJ	4.9 UJ
Heptachlor	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
Heptachlor Epoxide	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
Methoxychlor	17.0	26 UJ	27 UJ	18 UJ	23 UJ	25 UJ
Toxaphene	170.0	260 UJ	270 UJ	180 UJ	230 UJ	250 UJ
alpha-BHC	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
alpha-Chlordane	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
beta-BHC	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
delta-BHC	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
gamma-BHC(Lindane)	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
gamma-Chlordane	1.7	2.6 UJ	2.7 UJ	1.8 UJ	2.3 UJ	2.5 UJ
METALS	CRDL(mg/kg)					
Aluminum	200	6800	6790	2520	2920	3210
Antimony	60	4.8 UJ	5.1 UJ	3.3 UJ	4.9 UJ	5.3 UJ
Arsenic	10	2.9 U	2.4 U	0.42 U	1.3 U	1.4 U
Barium	200	17.1	9.2	20.5 J	41.2	33.4
Beryllium	5	0.43	0.42	0.37	0.88	0.88
Cadmium	5	0.59 U	0.82 U	1.1 U	0.98 U	0.66 U
Calcium	5000	146	151	348	1050	842
Chromium	10	4.1 UJ	5.4 UJ	2.8 UJ	8.9 UJ	8.8 UJ
Cobalt	50	1.9 U	2.2 U	3 U	7.7	6.5
Copper	25	5.4	3.1 U	0 R	3.9	3.4 U
Iron	100	6020	7030	40500	22400	17000
Lead	3	23.5	8.5	4.4	7.7	6.7
Magnesium	5000	185	238	639	649	627
Manganese	15	12.9	18.4	257	348	289
Mercury	0.2	0.2	0.14 U	0.09 U	0.13 U	0.16 U
Nickel	40	2.7 U	2.3 U	1.9 U	9	6.8 U
Potassium	5000	106	147	472	292	288
Selenium	5	1.9 UJ	1.3 UJ	0.85 UJ	1.2 U	1.3 U
Silver	10	0.59 U	0.64 U	0.41 U	0.61 U	0.66 U
Sodium	5000	45.8 U	54 U	42.7 U	66.2 U	67.5 U

LOCATION NAME:		SS-19	SS-20	SS-21	SS-22	SS-22
SITE LOCATION:		NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL	NON-DISPOSAL
SAMPLE DEPTH (FT):		0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
M&E SAMPLE ID:		SS-19-0.0-1.0-NX-S-628-4	SS-20-0.0-1.0-NX-S-629-4	SS-21-0.0-1.0-NX-S-630-4	SS-22-0.0-1.0-FD-S-673-4	SS-22-0.0-1.0-NX-S-631-4
DATE SAMPLED:		04/14/92	04/14/92	04/14/92	04/15/92	04/15/92
REMARKS:					Field Duplicate	
Thallium	10	0.29 UJ	0.32 U	0.21 U	0.3 UJ	0.32 UJ
Vanadium	50	8.8	8.1	5.8 J	5.8	5.6
Zinc	20	10.3 J	18.5 J	0 R	13.2 J	13.4 J

SOIL QUALITY PARAMETERS

CYANIDE	CRDL(mg/kg)					
Cyanide	20	0.77 U	0.76 U	0.49 U	0.72 U	0.81 U

LOCATION NAME:	SS-23	SS-24
SITE LOCATION:	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):	0.0-0.5	0.0-1.0
M&E SAMPLE ID:	SS-23-0.0-0.5-NX-S-632-4	SS-24-0.0-1.0-NX-S-677-4
DATE SAMPLED:	04/14/92	04/15/92
REMARKS:		

VOLATILE ORGANICS-CLP	CRQL(ug/kg)		
1,1,1-Trichloroethane	10	32 U	13 U
1,1,2,2-Tetrachloroethane	10	32 UJ	13 U
1,1,2-Trichloroethane	10	32 U	13 U
1,1-Dichloroethane	10	32 U	13 U
1,1-Dichloroethene	10	32 U	13 U
1,2-Dichloroethane	10	32 U	13 U
1,2-Dichloroethene(total)	10	32 U	13 U
1,2-Dichloropropane	10	32 U	13 U
2-Butanone	10	32 U	13 U
2-Hexanone	10	32 UJ	13 U
4-Methyl-2-pentanone	10	32 UJ	13 U
Acetone	10	32 U	13 U
Benzene	10	32 U	13 U
Bromodichloromethane	10	32 U	13 U
Bromoform	10	32 U	13 U
Bromomethane	10	32 U	13 U
Carbon Disulfide	10	32 U	13 U
Carbon Tetrachloride	10	32 U	13 U
Chlorobenzene	10	32 UJ	13 U
Chloroethane	10	32 U	13 U
Chloroform	10	32 U	13 U
Chloromethane	10	32 U	13 U
Dibromochloromethane	10	32 U	13 U
Ethylbenzene	10	32 UJ	13 U
Methylene Chloride	10	32 U	13 U
Styrene	10	32 UJ	13 U
Tetrachloroethene	10	32 UJ	13 U
Toluene	10	9 J	13 U
Total Xylenes	10	32 UJ	13 U
Trichloroethene	10	32 U	13 U
Vinyl Chloride	10	32 U	13 U
cis-1,3-Dichloropropene	10	32 U	13 U
trans-1,3-Dichloropropene	10	32 U	13 U
SEMIVOLATILE ORGANICS	**CRQL(ug/kg)**		
1,2,4-Trichlorobenzene	330	1100 UJ	420 UJ

LOCATION NAME:		SS-23	SS-24
SITE LOCATION:		NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-1.0
M&E SAMPLE ID:		SS-23-0.0-0.5-NX-S-632-4	SS-24-0.0-1.0-NX-S-677-4
DATE SAMPLED:		04/14/92	04/15/92
REMARKS:			
1,2-Dichlorobenzene	330	1100 UJ	420 UJ
1,3-Dichlorobenzene	330	1100 UJ	420 UJ
1,4-Dichlorobenzene	330	1100 UJ	420 UJ
2,2'-oxybis(1-Chloropropane)	330	1100 UJ	420 UJ
2,4,5-Trichlorophenol	800	2600 UJ	1000 UJ
2,4,6-Trichlorophenol	330	1100 UJ	420 UJ
2,4-Dichlorophenol	330	1100 UJ	420 UJ
2,4-Dimethylphenol	330	1100 UJ	420 UJ
2,4-Dinitrophenol	800	2600 UJ	1000 UJ
2,4-Dinitrotoluene	330	1100 UJ	420 UJ
2,6-Dinitrotoluene	330	1100 UJ	420 UJ
2-Chloronaphthalene	330	1100 UJ	420 UJ
2-Chlorophenol	330	1100 UJ	420 UJ
2-Methylnaphthalene	330	1100 UJ	420 UJ
2-Methylphenol	330	1100 UJ	420 UJ
2-Nitroaniline	800	2600 UJ	1000 UJ
2-Nitrophenol	330	1100 UJ	420 UJ
3,3'-Dichlorobenzidine	330	1100 UJ	420 UJ
3-Nitroaniline	800	2600 UJ	1000 UJ
4,6-Dinitro-2-methylphenol	800	2600 UJ	1000 UJ
4-Bromophenyl-phenylether	330	1100 UJ	420 UJ
4-Chloro-3-methylphenol	330	1100 UJ	420 UJ
4-Chloroaniline	330	1100 UJ	420 UJ
4-Chlorophenyl-phenylether	330	1100 UJ	420 UJ
4-Methylphenol	330	1100 UJ	420 UJ
4-Nitroaniline	800	2600 UJ	1000 UJ
4-Nitrophenol	800	2600 UJ	1000 UJ
Acenaphthene	330	1100 UJ	420 UJ
Acenaphthylene	330	1100 UJ	420 UJ
Anthracene	330	1100 UJ	420 UJ
Benzo(a)anthracene	330	1100 UJ	420 UJ
Benzo(a)pyrene	330	1100 UJ	420 UJ
Benzo(b)fluoranthene	330	57 J	420 UJ
Benzo(g,h,i)perylene	330	1100 UJ	420 UJ
Benzo(k)fluoranthene	330	1100 UJ	420 UJ
Butylbenzylphthalate	330	1100 UJ	420 UJ
Carbazole	330	1100 UJ	420 UJ
Chrysene	330	55 J	420 UJ
Di-n-butylphthalate	330	1100 UJ	420 U

LOCATION NAME:	SS-23	SS-24
SITE LOCATION:	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):	0.0-0.5	0.0-1.0
M&E SAMPLE ID:	SS-23-0.0-0.5-NX-S-632-4	SS-24-0.0-1.0-NX-S-677-4
DATE SAMPLED:	04/14/92	04/15/92
REMARKS:		

Di-n-octylphthalate	330	1100 UJ	420 UJ
Dibenz(a,h)anthracene	330	1100 UJ	420 UJ
Dibenzofuran	330	1100 UJ	420 UJ
Diethylphthalate	330	1100 UJ	420 UJ
Dimethylphthalate	330	1100 UJ	420 UJ
Fluoranthene	330	64 J	420 UJ
Fluorene	330	1100 UJ	420 UJ
Hexachlorobenzene	330	1100 UJ	420 UJ
Hexachlorobutadiene	330	1100 UJ	420 UJ
Hexachlorocyclopentadiene	330	1100 UJ	420 UJ
Hexachloroethane	330	1100 UJ	420 UJ
Indeno(1,2,3-cd)pyrene	330	1100 UJ	420 UJ
Isophorone	330	1100 UJ	420 UJ
N-Nitroso-di-n-propylamine	330	1100 UJ	420 UJ
N-Nitrosodiphenylamine	330	1100 UJ	420 UJ
Naphthalene	330	1100 UJ	420 UJ
Nitrobenzene	330	1100 UJ	420 UJ
Pentachlorophenol	800	2600 UJ	1000 UJ
Phenanthrene	330	59 J	420 UJ
Phenol	330	1100 UJ	420 UJ
Pyrene	330	120 J	420 UJ
bis(2-Chloroethoxy)methane	330	1100 UJ	420 UJ
bis(2-Chloroethyl) ether	330	1100 UJ	420 UJ
bis(2-Ethylhexyl)phthalate	330	1100 UJ	2500 U
PESTICIDES/PCBs	**CRQL(ug/kg)**		
4,4'-DDD	3.3	11 UJ	4.2 UJ
4,4'-DDE	3.3	11 J	4.2 UJ
4,4'-DDT	3.3	3.4 J	4.2 UJ
Aldrin	1.7	5.5 UJ	2.2 UJ
Aroclor-1016	33.0	110 UJ	42 UJ
Aroclor-1221	67.0	220 UJ	86 UJ
Aroclor-1232	33.0	110 UJ	42 UJ
Aroclor-1242	33.0	110 UJ	42 UJ
Aroclor-1248	33.0	110 UJ	42 UJ
Aroclor-1254	33.0	110 UJ	42 UJ
Aroclor-1260	33.0	110 UJ	42 UJ
Dieldrin	3.3	11 U	4.2 UJ

LOCATION NAME:	SS-23	SS-24
SITE LOCATION:	NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):	0.0-0.5	0.0-1.0
M&E SAMPLE ID:	SS-23-0.0-0.5-NX-S-632-4	SS-24-0.0-1.0-NX-S-677-4
DATE SAMPLED:	04/14/92	04/15/92
REMARKS:		

Endosulfan I	1.7	5.5 UJ	2.2 UJ
Endosulfan II	3.3	11 UJ	4.2 UJ
Endosulfan Sulfate	3.3	11 UJ	4.2 UJ
Endrin	3.3	11 UJ	4.2 UJ
Endrin Aldehyde	3.3	11 UJ	4.2 UJ
Endrin Ketone	3.3	11 UJ	4.2 UJ
Heptachlor	1.7	5.5 UJ	2.2 UJ
Heptachlor Epoxide	1.7	5.5 UJ	2.2 UJ
Methoxychlor	17.0	55 UJ	22 UJ
Toxaphene	170.0	550 UJ	220 UJ
alpha-BHC	1.7	5.5 UJ	2.2 UJ
alpha-Chlordane	1.7	5.5 UJ	2.2 UJ
beta-BHC	1.7	5.5 UJ	2.2 UJ
delta-BHC	1.7	5.5 UJ	2.2 UJ
gamma-BHC(Lindane)	1.7	5.5 UJ	2.2 UJ
gamma-Chlordane	1.7	5.5 UJ	2.2 UJ
METALS	**CRDL(mg/kg)**		
Aluminum	200	4760	6500
Antimony	60	10.1 UJ	3.5 UJ
Arsenic	10	4.4 U	1.2 U
Barium	200	86.2 J	14.4
Beryllium	5	0.83	0.52
Cadmium	5	0 R	0.44 U
Calcium	5000	1870	442
Chromium	10	8.3 UJ	5.9 UJ
Cobalt	50	12.8	4.5 U
Copper	25	0 R	5.6
Iron	100	149000	9240
Lead	3	124	4.3
Magnesium	5000	493	1150
Manganese	15	6120	105
Mercury	0.2	0.41	0.11 U
Nickel	40	0 R	4.6 U
Potassium	5000	278	504
Selenium	5	2.6 U	0.9 U
Silver	10	1.3 U	0.44 U
Sodium	5000	112 U	41.9 U

LOCATION NAME:		SS-23	SS-24
SITE LOCATION:		NON-DISPOSAL	BULKY WASTE
SAMPLE DEPTH (FT):		0.0-0.5	0.0-1.0
M&E SAMPLE ID:		SS-23-0.0-0.5-NX-S-632-4	SS-24-0.0-1.0-NX-S-677-4
DATE SAMPLED:		04/14/92	04/15/92
REMARKS:			
Thallium	10	0.64 UJ	0.22 U
Vanadium	50	18.1 J	10.2
Zinc	20	0 R	19.3 J

SOIL QUALITY PARAMETERS

CYANIDE	CRDL(mg/kg)		
Cyanide	20	1.6 U	0.53 U

D-7 COMPLETE ANALYTICAL DATA, SUBSURFACE SOILS

- SEPTEMBER/OCTOBER 1991

SUBSURFACE SOIL - SEPTEMBER/OCTOBER 1991

LOCATION NAME:		BH-01	BH-01	BH-01	BH-02	BH-02
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		2.0-8.0	4.0-6.0	8.0- 10	8.0- 10	16- 18
M&E SAMPLE ID:		BH-01-02-08-NX-B-125-2	BH-01-04-06-NX-B-125-2	BH-01-8-12-NX-B-126-2	BH-02-08-10-NX-B-127-2	BH-02-16-18-FD-B-154-2
DATE SAMPLED:		08/20/91	08/20/91	08/20/91	08/21/91	08/21/91
REMARKS:						Field Duplicate
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	NA	57 U	11 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	NA	57 U	11 U	10 U	10 U
1,1,2-Trichloroethane	10	NA	57 U	11 U	10 U	10 U
1,1-Dichloroethane	10	NA	57 U	11 U	10 U	10 U
1,1-Dichloroethene	10	NA	57 U	11 U	10 U	10 U
1,2-Dichloroethane	10	NA	57 U	11 U	10 U	10 U
1,2-Dichloroethene(total)	10	NA	57 U	11 U	10 U	10 U
1,2-Dichloropropane	10	NA	57 U	11 U	10 U	10 U
2-Butanone	10	NA	340 J	73 J	10 UJ	10 UJ
2-Hexanone	10	NA	57 U	11 U	10 U	10 U
4-Methyl-2-pentanone	10	NA	57 U	11 U	10 U	10 U
Acetone	10	NA	740 J	84 J	10 U	10 U
Benzene	10	NA	57 U	11 U	10 U	10 U
Bromodichloromethane	10	NA	57 U	11 U	10 U	10 U
Bromoform	10	NA	57 U	11 U	10 U	10 U
Bromomethane	10	NA	57 U	11 U	10 U	10 U
Carbon Disulfide	10	NA	57 U	11 U	10 U	10 U
Carbon Tetrachloride	10	NA	57 U	11 U	10 U	10 U
Chlorobenzene	10	NA	57 U	11 U	10 U	10 U
Chloroethane	10	NA	57 U	11 U	10 U	10 U
Chloroform	10	NA	57 U	11 U	10 U	10 U
Chloromethane	10	NA	57 U	11 U	10 U	10 U
Dibromochloromethane	10	NA	57 U	11 U	10 U	10 U
Ethylbenzene	10	NA	57 U	11 U	10 U	10 U
Methylene Chloride	10	NA	57 U	11 U	10 U	10 U
Styrene	10	NA	57 U	11 U	10 U	10 U
Tetrachloroethene	10	NA	57 U	11 U	10 U	10 U
Toluene	10	NA	57 U	11 U	10 U	10 U
Total Xylenes	10	NA	57 U	11 U	10 U	10 U
Trichloroethene	10	NA	57 U	11 U	10 U	10 U
Vinyl Chloride	10	NA	57 U	11 U	10 U	10 U
cis-1,3-Dichloropropene	10	NA	57 U	11 U	10 U	10 U
trans-1,3-Dichloropropene	10	NA	57 U	11 U	10 U	10 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	770 U	NA	350 U	340 U	340 U

LOCATION NAME:		BH-01	BH-01	BH-01	BH-02	BH-02
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		2.0-8.0	4.0-6.0	8.0- 10	8.0- 10	16- 18
M&E SAMPLE ID:		BH-01-02-08-NX-B-125-2	BH-01-04-06-NX-B-125-2	BH-01-8-12-NX-B-126-2	BH-02-08-10-NX-B-127-2	BH-02-16-18-FD-B-154-2
DATE SAMPLED:		08/20/91	08/20/91	08/20/91	08/21/91	08/21/91
REMARKS:						Field Duplicate
1,2-Dichlorobenzene	330	770 U	NA	350 U	340 U	340 U
1,3-Dichlorobenzene	330	770 U	NA	350 U	340 U	340 U
1,4-Dichlorobenzene	330	770 U	NA	350 U	340 U	340 U
2,2'-oxybis(1-Chloropropane)	330	770 U	NA	350 U	340 U	340 U
2,4,5-Trichlorophenol	800	1900 U	NA	850 U	830 U	820 U
2,4,6-Trichlorophenol	330	770 U	NA	350 U	340 U	340 U
2,4-Dichlorophenol	330	770 U	NA	350 U	340 U	340 U
2,4-Dimethylphenol	330	770 U	NA	350 U	340 U	340 U
2,4-Dinitrophenol	800	1900 U	NA	850 U	830 U	820 U
2,4-Dinitrotoluene	330	770 U	NA	350 U	340 U	340 U
2,6-Dinitrotoluene	330	770 U	NA	350 U	340 U	340 U
2-Chloronaphthalene	330	770 U	NA	350 U	340 U	340 U
2-Chlorophenol	330	770 U	NA	350 U	340 U	340 U
2-Methylnaphthalene	330	140 J	NA	27 J	340 U	340 U
2-Methylphenol	330	770 U	NA	350 U	340 U	340 U
2-Nitroaniline	800	1900 U	NA	850 U	830 U	820 U
2-Nitrophenol	330	770 U	NA	350 U	340 U	340 U
3,3'-Dichlorobenzidine	330	770 U	NA	350 U	340 U	340 U
3-Nitroaniline	800	1900 U	NA	850 U	830 U	820 U
4,6-Dinitro-2-methylphenol	800	1900 U	NA	850 U	830 U	820 U
4-Bromophenyl-phenylether	330	770 U	NA	350 U	340 U	340 U
4-Chloro-3-methylphenol	330	770 U	NA	350 U	340 U	340 U
4-Chloroaniline	330	770 U	NA	350 U	340 U	340 U
4-Chlorophenyl-phenylether	330	770 U	NA	350 U	340 U	340 U
4-Methylphenol	330	5600	NA	2200	340 U	340 U
4-Nitroaniline	800	1900 U	NA	850 U	830 U	820 U
4-Nitrophenol	800	1900 U	NA	850 U	830 U	820 U
Acenaphthene	330	770 U	NA	350 U	340 U	340 U
Acenaphthylene	330	770 U	NA	350 U	340 U	340 U
Anthracene	330	770 U	NA	350 U	340 U	340 U
Benzo(a)anthracene	330	770 U	NA	350 U	340 U	340 U
Benzo(a)pyrene	330	770 U	NA	350 U	340 U	340 U
Benzo(b)fluoranthene	330	770 U	NA	350 U	340 U	340 U
Benzo(g,h,i)perylene	330	770 U	NA	350 U	340 U	340 U
Benzo(k)fluoranthene	330	770 U	NA	350 U	340 U	340 U
Butylbenzylphthalate	330	770 U	NA	350 U	340 U	340 U
Carbazole	330	770 U	NA	350 U	340 U	340 U
Chrysene	330	770 U	NA	350 U	340 U	340 U
Di-n-butylphthalate	330	770 U	NA	350 U	96 J	340 U

LOCATION NAME:		BH-01	BH-01	BH-01	BH-02	BH-02
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		2.0-8.0	4.0-6.0	8.0- 10	8.0- 10	16- 18
M&E SAMPLE ID:		BH-01-02-08-NX-B-125-2	BH-01-04-06-NX-B-125-2	BH-01-8-12-NX-B-126-2	BH-02-08-10-NX-B-127-2	BH-02-16-18-FD-B-154-2
DATE SAMPLED:		08/20/91	08/20/91	08/20/91	08/21/91	08/21/91
REMARKS:						Field Duplicate
Di-n-octylphthalate	330	770 U	NA	350 U	340 U	340 U
Dibenz(a,h)anthracene	330	770 U	NA	350 U	340 U	340 U
Dibenzofuran	330	770 U	NA	350 U	340 U	340 U
Diethylphthalate	330	770 U	NA	350 U	340 U	340 U
Dimethylphthalate	330	770 U	NA	350 U	340 U	340 U
Fluoranthene	330	770 U	NA	350 U	340 U	340 U
Fluorene	330	770 U	NA	350 U	340 U	340 U
Hexachlorobenzene	330	770 U	NA	350 U	340 U	340 U
Hexachlorobutadiene	330	770 U	NA	350 U	340 U	340 U
Hexachlorocyclopentadiene	330	770 U	NA	350 U	340 U	340 U
Hexachloroethane	330	770 U	NA	350 U	340 U	340 U
Indeno(1,2,3-cd)pyrene	330	770 U	NA	350 U	340 U	340 U
Isophorone	330	770 U	NA	350 U	340 U	340 U
N-Nitroso-di-n-propylamine	330	770 U	NA	350 U	340 U	340 U
N-Nitrosodiphenylamine	330	770 U	NA	350 U	340 U	340 U
Naphthalene	330	770 U	NA	350 U	340 U	340 U
Nitrobenzene	330	770 U	NA	350 U	340 U	340 U
Pentachlorophenol	800	1900 U	NA	850 U	830 U	820 U
Phenanthrene	330	770 U	NA	350 U	340 U	340 U
Phenol	330	240 J	NA	350 U	340 U	340 U
Pyrene	330	770 U	NA	350 U	340 U	340 U
bis(2-Chloroethoxy)methane	330	770 U	NA	350 U	340 U	340 U
bis(2-Chloroethyl) ether	330	770 U	NA	350 U	340 U	340 U
bis(2-Ethylhexyl)phthalate	330	770 U	NA	350 U	340 U	340 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
4,4'-DDE	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
4,4'-DDT	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
Aldrin	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
Aroclor-1016	33.0	38 U	NA	35 U	34 U	34 U
Aroclor-1221	67.0	77 U	NA	71 U	70 U	69 U
Aroclor-1232	33.0	38 U	NA	35 U	34 U	34 U
Aroclor-1242	33.0	38 U	NA	35 U	34 U	34 U
Aroclor-1248	33.0	38 U	NA	35 U	34 U	34 U
Aroclor-1254	33.0	38 U	NA	35 U	34 U	34 U
Aroclor-1260	33.0	38 U	NA	35 U	34 U	34 U
Dieldrin	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U

LOCATION NAME:		BH-01	BH-01	BH-01	BH-02	BH-02
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		2.0-8.0	4.0-6.0	8.0- 10	8.0- 10	16- 18
M&E SAMPLE ID:		BH-01-02-08-NX-B-125-2	BH-01-04-06-NX-B-125-2	BH-01-8-12-NX-B-126-2	BH-02-08-10-NX-B-127-2	BH-02-16-18-FD-B-154-2
DATE SAMPLED:		08/20/91	08/20/91	08/20/91	08/21/91	08/21/91
REMARKS:						Field Duplicate
Endosulfan I	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
Endosulfan II	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
Endosulfan Sulfate	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
Endrin	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
Endrin Aldehyde	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
Endrin Ketone	3.3	3.8 U	NA	3.5 U	3.4 U	3.4 U
Heptachlor	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
Heptachlor Epoxide	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
Methoxychlor	17.0	20 U	NA	18 U	18 U	17 U
Toxaphene	170.0	200 U	NA	180 U	180.0 U	170 U
alpha-BHC	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
alpha-Chlordane	1.7	6.2	NA	1.8 U	1.8 U	1.7 U
beta-BHC	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
delta-BHC	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
gamma-BHC(Lindane)	1.7	2.0 U	NA	1.8 U	1.8 U	1.7 U
gamma-Chlordane	1.7	7.5	NA	1.8 U	1.8 U	1.7 U
METALS	CRDL(mg/kg)					
Aluminum	200	5360	NA	5490	3750	3790
Antimony	60	16.8 J	NA	3.6 UJ	3.5 UJ	10.7 J
Arsenic	10	0.97 U	NA	0.83 U	0.83 U	0.77 U
Barium	200	54.3	NA	32.7	17.4	14.5
Beryllium	5	0.58	NA	0.61	0.53	0.76
Cadmium	5	0.66 U	NA	0.63 U	0.61 U	0.60 U
Calcium	5000	931 UJ	NA	585 UJ	235 UJ	306 UJ
Chromium	10	5.9	NA	8.9	3.8	4.4
Cobalt	50	3.0	NA	4.2	2.4	4.3
Copper	25	79.2	NA	15.6	6.6	6.9
Iron	100	7230	NA	8330	5890	8790
Lead	3	8.8	NA	5.2	3.0	2.6
Magnesium	5000	1120	NA	1700	896	1210
Manganese	15	93.6 U	NA	166	141	226
Mercury	0.2	0.47 J	NA	0.10 U	0.15 J	0.09 U
Nickel	40	7.5 UJ	NA	7.4 UJ	5.1 UJ	4.9 UJ
Potassium	5000	686	NA	1450	823	915
Selenium	5	0.92 U	NA	0.83 UJ	4.1 UJ	0.77 U
Silver	10	0.88 U	NA	0.84 U	0.81 U	0.80 U
Sodium	5000	98.2 U	NA	85.1 U	51.0 U	50.5 U

LOCATION NAME:		BH-01	BH-01	BH-01	BH-02	BH-02
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		2.0-8.0	4.0-6.0	8.0- 10	8.0- 10	16- 18
M&E SAMPLE ID:		BH-01-02-08-NX-B-125-2	BH-01-04-06-NX-B-125-2	BH-01-8-12-NX-B-126-2	BH-02-08-10-NX-B-127-2	BH-02-16-18-FD-B-154-2
DATE SAMPLED:		08/20/91	08/20/91	08/20/91	08/21/91	08/21/91
REMARKS:						Field Duplicate
Thallium	10	0.23 U	NA	0.21 U	0.21 U	0.19 U
Vanadium	50	7.9	NA	11.4	5.7	8.3
Zinc	20	188	NA	36.4	16.7	21.6
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	0.27 U	NA	0.27 U	0.24 U	0.25 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	24.3	NA	NA	NA	NA
Organic Content	(%)	3.0	NA	NA	NA	NA
Solids Content	(%)	75.8	NA	NA	NA	NA
GRAIN SIZE						
Clay	(%)	2.3	NA	NA	NA	NA
Gravel	(%)	6.8	NA	NA	NA	NA
Sand	(%)	61.4	NA	NA	NA	NA
Silt	(%)	29.4	NA	NA	NA	NA
ATTERBERG LIMITS						
Liquid Limit	--	--	NA	NA	NA	NA
Plastic Limit	--	NP	NA	NA	NA	NA

LOCATION NAME:		BH-02	BH-03	BH-03	BH-03	BH-03
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		16- 18	2.0-4.0	16- 18	16- 20	18- 20
M&E SAMPLE ID:		BH-02-16-18-NX-B-128-2	BH-03-02-04-NX-B-129-2	BH-03-16-18-NX-B-130-2	BH-03-16-20-NX-B-130-2	BH-03-18-20-NX-B-130-2
DATE SAMPLED:		08/21/91	08/21/91	08/21/91	08/21/91	08/21/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	10 U	11 U	NA	NA	58 U
1,1,2,2-Tetrachloroethane	10	10 U	11 U	NA	NA	58 U
1,1,2-Trichloroethane	10	10 U	11 U	NA	NA	58 U
1,1-Dichloroethane	10	10 U	11 U	NA	NA	58 U
1,1-Dichloroethene	10	10 U	11 U	NA	NA	58 U
1,2-Dichloroethane	10	10 U	11 U	NA	NA	58 U
1,2-Dichloroethene(total)	10	10 U	11 U	NA	NA	58 U
1,2-Dichloropropane	10	10 U	11 U	NA	NA	58 U
2-Butanone	10	10 UJ	11 UJ	NA	NA	240 J
2-Hexanone	10	10 U	11 U	NA	NA	58 U
4-Methyl-2-pentanone	10	10 U	11 U	NA	NA	58 U
Acetone	10	10 U	11 U	NA	NA	540 J
Benzene	10	10 U	11 U	NA	NA	58 U
Bromodichloromethane	10	10 U	11 U	NA	NA	58 U
Bromoform	10	10 U	11 U	NA	NA	58 U
Bromomethane	10	10 U	11 U	NA	NA	58 U
Carbon Disulfide	10	10 U	11 U	NA	NA	58 U
Carbon Tetrachloride	10	10 U	11 U	NA	NA	58 U
Chlorobenzene	10	10 U	11 U	NA	NA	58 U
Chloroethane	10	10 U	11 U	NA	NA	58 U
Chloroform	10	10 U	11 U	NA	NA	58 U
Chloromethane	10	10 U	11 U	NA	NA	58 U
Dibromochloromethane	10	10 U	11 U	NA	NA	58 U
Ethylbenzene	10	10 U	11 U	NA	NA	58 U
Methylene Chloride	10	10 U	11 U	NA	NA	58 U
Styrene	10	10 U	11 U	NA	NA	58 U
Tetrachloroethene	10	10 U	11 U	NA	NA	58 U
Toluene	10	10 U	11 U	NA	NA	320
Total Xylenes	10	10 U	11 U	NA	NA	58 U
Trichloroethene	10	10 U	11 U	NA	NA	58 U
Vinyl Chloride	10	10 U	11 U	NA	NA	58 U
cis-1,3-Dichloropropene	10	10 U	11 U	NA	NA	58 U
trans-1,3-Dichloropropene	10	10 U	11 U	NA	NA	58 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	340 U	370 U	NA	340 U	NA

LOCATION NAME:		BH-02	BH-03	BH-03	BH-03	BH-03
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		16- 18	2.0-4.0	16- 18	16- 20	18- 20
M&E SAMPLE ID:		BH-02-16-18-NX-B-128-2	BH-03-02-04-NX-B-129-2	BH-03-16-18-NX-B-130-2	BH-03-16-20-NX-B-130-2	BH-03-18-20-NX-B-130-2
DATE SAMPLED:		08/21/91	08/21/91	08/21/91	08/21/91	08/21/91
REMARKS:						
1,2-Dichlorobenzene	330	340 U	370 U	NA	340 U	NA
1,3-Dichlorobenzene	330	340 U	370 U	NA	340 U	NA
1,4-Dichlorobenzene	330	340 U	370 U	NA	340 U	NA
2,2'-oxybis(1-Chloropropane)	330	340 U	370 U	NA	340 U	NA
2,4,5-Trichlorophenol	800	820 U	900 U	NA	820 U	NA
2,4,6-Trichlorophenol	330	340 U	370 U	NA	340 U	NA
2,4-Dichlorophenol	330	340 U	370 U	NA	340 U	NA
2,4-Dimethylphenol	330	340 U	370 U	NA	340 U	NA
2,4-Dinitrophenol	800	820 U	900 U	NA	820 U	NA
2,4-Dinitrotoluene	330	340 U	370 U	NA	340 U	NA
2,6-Dinitrotoluene	330	340 U	370 U	NA	340 U	NA
2-Chloronaphthalene	330	340 U	370 U	NA	340 U	NA
2-Chlorophenol	330	340 U	370 U	NA	340 U	NA
2-Methylnaphthalene	330	340 U	370 U	NA	340 U	NA
2-Methylphenol	330	340 U	370 U	NA	700	NA
2-Nitroaniline	800	820 U	900 U	NA	820 U	NA
2-Nitrophenol	330	340 U	370 U	NA	340 U	NA
3,3'-Dichlorobenzidine	330	340 U	370 U	NA	340 U	NA
3-Nitroaniline	800	820 U	900 U	NA	820 U	NA
4,6-Dinitro-2-methylphenol	800	820 U	900 U	NA	820 U	NA
4-Bromophenyl-phenylether	330	340 U	370 U	NA	340 U	NA
4-Chloro-3-methylphenol	330	340 U	370 U	NA	340 U	NA
4-Chloroaniline	330	340 U	370 U	NA	340 U	NA
4-Chlorophenyl-phenylether	330	340 U	370 U	NA	340 U	NA
4-Methylphenol	330	340 U	370 U	NA	340 U	NA
4-Nitroaniline	800	820 U	900 U	NA	820 U	NA
4-Nitrophenol	800	820 U	900 U	NA	820 U	NA
Acenaphthene	330	340 U	370 U	NA	340 U	NA
Acenaphthylene	330	340 U	370 U	NA	340 U	NA
Anthracene	330	340 U	370 U	NA	340 U	NA
Benzo(a)anthracene	330	340 U	370 U	NA	340 U	NA
Benzo(a)pyrene	330	340 U	370 U	NA	340 U	NA
Benzo(b)fluoranthene	330	340 U	370 U	NA	340 U	NA
Benzo(g,h,i)perylene	330	340 U	370 U	NA	340 U	NA
Benzo(k)fluoranthene	330	340 U	370 U	NA	340 U	NA
Butylbenzylphthalate	330	340 U	370 U	NA	340 U	NA
Carbazole	330	340 U	370 U	NA	340 U	NA
Chrysene	330	340 U	370 U	NA	340 U	NA
Di-n-butylphthalate	330	120 J	370 U	NA	40 J	NA

LOCATION NAME:		BH-02	BH-03	BH-03	BH-03	BH-03
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		16- 18	2.0-4.0	16- 18	16- 20	18- 20
M&E SAMPLE ID:		BH-02-16-18-NX-B-128-2	BH-03-02-04-NX-B-129-2	BH-03-16-18-NX-B-130-2	BH-03-16-20-NX-B-130-2	BH-03-18-20-NX-B-130-2
DATE SAMPLED:		08/21/91	08/21/91	08/21/91	08/21/91	08/21/91
REMARKS:						
Di-n-octylphthalate	330	26 J	370 U	NA	86 J	NA
Dibenz(a,h)anthracene	330	340 U	370 U	NA	340 U	NA
Dibenzofuran	330	340 U	370 U	NA	340 U	NA
Diethylphthalate	330	340 U	370 U	NA	340 U	NA
Dimethylphthalate	330	340 U	370 U	NA	340 U	NA
Fluoranthene	330	340 U	370 U	NA	340 U	NA
Fluorene	330	340 U	370 U	NA	340 U	NA
Hexachlorobenzene	330	340 U	370 U	NA	340 U	NA
Hexachlorobutadiene	330	340 U	370 U	NA	340 U	NA
Hexachlorocyclopentadiene	330	340 U	370 U	NA	340 U	NA
Hexachloroethane	330	340 U	370 U	NA	340 U	NA
Indeno(1,2,3-cd)pyrene	330	340 U	370 U	NA	340 U	NA
Isophorone	330	340 U	370 U	NA	340 U	NA
N-Nitroso-di-n-propylamine	330	340 U	370 U	NA	340 U	NA
N-Nitrosodiphenylamine	330	340 U	370 U	NA	340 U	NA
Naphthalene	330	340 U	370 U	NA	340 U	NA
Nitrobenzene	330	340 U	370 U	NA	340 U	NA
Pentachlorophenol	800	820 U	900 U	NA	820 U	NA
Phenanthrene	330	340 U	370 U	NA	340 U	NA
Phenol	330	340 U	370 U	NA	340 U	NA
Pyrene	330	340 U	370 U	NA	340 U	NA
bis(2-Chloroethoxy)methane	330	340 U	370 U	NA	340 U	NA
bis(2-Chloroethyl) ether	330	340 U	370 U	NA	340 U	NA
bis(2-Ethylhexyl)phthalate	330	340 U	370 U	NA	340 U	NA
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	3.4 U	3.7 U	NA	3.4 U	NA
4,4'-DDE	3.3	3.4 U	3.7 U	NA	3.4 U	NA
4,4'-DDT	3.3	3.4 U	3.7 U	NA	3.4 U	NA
Aldrin	1.7	1.7 U	1.9 U	NA	1.7 U	NA
Aroclor-1016	33.0	34 U	37 U	NA	34 U	NA
Aroclor-1221	67.0	68 U	75 U	NA	69 U	NA
Aroclor-1232	33.0	34 U	37 U	NA	34 U	NA
Aroclor-1242	33.0	34 U	37 U	NA	34 U	NA
Aroclor-1248	33.0	34 U	37 U	NA	34 U	NA
Aroclor-1254	33.0	34 U	37 U	NA	34 U	NA
Aroclor-1260	33.0	34 U	37 U	NA	34 U	NA
Dieldrin	3.3	3.4 U	3.7 U	NA	3.4 U	NA

LOCATION NAME:		BH-02	BH-03	BH-03	BH-03	BH-03
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		16- 18	2.0-4.0	16- 18	16- 20	18- 20
M&E SAMPLE ID:		BH-02-16-18-NX-B-128-2	BH-03-02-04-NX-B-129-2	BH-03-16-18-NX-B-130-2	BH-03-16-20-NX-B-130-2	BH-03-18-20-NX-B-130-2
DATE SAMPLED:		08/21/91	08/21/91	08/21/91	08/21/91	08/21/91
REMARKS:						
Endosulfan I	1.7	1.7 U	1.9 U	NA	1.7 U	NA
Endosulfan II	3.3	3.4 U	3.7 U	NA	3.4 U	NA
Endosulfan Sulfate	3.3	3.4 U	3.7 U	NA	3.4 U	NA
Endrin	3.3	3.4 U	3.7 U	NA	3.4 U	NA
Endrin Aldehyde	3.3	3.4 U	3.7 U	NA	3.4 U	NA
Endrin Ketone	3.3	3.4 U	3.7 U	NA	3.4 U	NA
Heptachlor	1.7	1.7 U	1.9 U	NA	1.7 U	NA
Heptachlor Epoxide	1.7	1.7 U	1.9 U	NA	1.7 U	NA
Methoxychlor	17.0	17 U	19 U	NA	17 U	NA
Toxaphene	170.0	170 U	190 U	NA	170 U	NA
alpha-BHC	1.7	1.7 U	1.9 U	NA	1.7 U	NA
alpha-Chlordane	1.7	1.7 U	1.9 U	NA	1.7 U	NA
beta-BHC	1.7	1.7 U	1.9 U	NA	1.7 U	NA
delta-BHC	1.7	1.7 U	1.9 U	NA	1.7 U	NA
gamma-BHC(Lindane)	1.7	1.7 U	1.9 U	NA	1.7 U	NA
gamma-Chlordane	1.7	1.7 U	1.9 U	NA	1.7 U	NA
METALS	CRDL(mg/kg)					
Aluminum	200	3620	4910	1690 U	NA	NA
Antimony	60	5.9 J	3.7 UJ	5.4 J	NA	NA
Arsenic	10	0.95 U	0.85 U	0.83 U	NA	NA
Barium	200	11.4 U	12.3 U	5.8 U	NA	NA
Beryllium	5	0.54	0.38	0.35	NA	NA
Cadmium	5	0.61 U	0.66 U	0.60 U	NA	NA
Calcium	5000	197 UJ	345 UJ	139 UJ	NA	NA
Chromium	10	3.8	3.7	1.6	NA	NA
Cobalt	50	4.1	2.6	1.0	NA	NA
Copper	25	5.4	7.1	2.21 U	NA	NA
Iron	100	8480	5770	3400	NA	NA
Lead	3	4.0	4.1	1.9 U	NA	NA
Magnesium	5000	1280	810	419	NA	NA
Manganese	15	200	65.5 U	91.5 U	NA	NA
Mercury	0.2	0.09 U	0.13 J	0.09 U	NA	NA
Nickel	40	5.7 UJ	4.9 UJ	4.1 UJ	NA	NA
Potassium	5000	774	475	367	NA	NA
Selenium	5	0.78 U	0.83 UJ	0.83 UJ	NA	NA
Silver	10	0.82 U	0.88 U	0.80 U	NA	NA
Sodium	5000	43.6 U	45.2 U	62.0 U	NA	NA

LOCATION NAME:		BH-02	BH-03	BH-03	BH-03	BH-03
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE	SEWAGE SLUDGE
SAMPLE DEPTH (FT):		16- 18	2.0-4.0	16- 18	16- 20	18- 20
M&E SAMPLE ID:		BH-02-16-18-NX-B-128-2	BH-03-02-04-NX-B-129-2	BH-03-16-18-NX-B-130-2	BH-03-16-20-NX-B-130-2	BH-03-18-20-NX-B-130-2
DATE SAMPLED:		08/21/91	08/21/91	08/21/91	08/21/91	08/21/91
REMARKS:						
Thallium	10	0.19 U	0.21 U	0.21 U	NA	NA
Vanadium	50	7.3	7.5	2.9 U	NA	NA
Zinc	20	20.0	16.5	2.8 UJ	NA	NA
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	0.25 U	0.26 U	0.26 U	NA	NA
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	NA	NA	NA	5.3	NA
Organic Content	(%)	NA	NA	NA	0.5	NA
Solids Content	(%)	NA	NA	NA	94.7	NA
GRAIN SIZE						
Clay	(%)	NA	NA	NA	.4	NA
Gravel	(%)	NA	NA	NA	5.5	NA
Sand	(%)	NA	NA	NA	79.9	NA
Silt	(%)	NA	NA	NA	14.1	NA
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	NA	--	NA
Plastic Limit	--	NA	NA	NA	NP	NA

LOCATION NAME:		BH-04	BH-04	BH-05	BH-05	BH-05
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	BACKGROUND	BACKGROUND	BACKGROUND
SAMPLE DEPTH (FT):		4.0-6.0	8.0- 10	0.0-2.0	0.0-4.0	10- 16
M&E SAMPLE ID:		BH-04-04-06-NX-B-131-2	BH-04-08-10-NX-B-132-2	BH-05-00-02-NX-B-133-2	BH-05-00-04-NX-B-133-2	BH-05-10-16-FD-B-153-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/22/91	08/22/91
REMARKS:						Field Duplicate
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	11 U	11 U	12 U	NA	NA
1,1,2,2-Tetrachloroethane	10	11 U	11 U	12 U	NA	NA
1,1,2-Trichloroethane	10	11 U	11 U	12 U	NA	NA
1,1-Dichloroethane	10	11 U	11 U	12 U	NA	NA
1,1-Dichloroethene	10	11 U	11 U	12 U	NA	NA
1,2-Dichloroethane	10	11 U	11 U	12 U	NA	NA
1,2-Dichloroethene(total)	10	11 U	11 U	12 U	NA	NA
1,2-Dichloropropane	10	11 U	11 U	12 U	NA	NA
2-Butanone	10	11 UJ	11 UJ	12 UJ	NA	NA
2-Hexanone	10	11 U	11 U	12 U	NA	NA
4-Methyl-2-pentanone	10	11 U	11 U	12 U	NA	NA
Acetone	10	11 UJ	11 UJ	12 U	NA	NA
Benzene	10	11 U	11 U	12 U	NA	NA
Bromodichloromethane	10	11 U	11 U	12 U	NA	NA
Bromoform	10	11 U	11 U	12 U	NA	NA
Bromomethane	10	11 U	11 U	12 U	NA	NA
Carbon Disulfide	10	11 U	11 U	12 U	NA	NA
Carbon Tetrachloride	10	11 U	11 U	12 U	NA	NA
Chlorobenzene	10	11 U	11 U	12 U	NA	NA
Chloroethane	10	11 U	11 U	12 U	NA	NA
Chloroform	10	11 U	11 U	12 U	NA	NA
Chloromethane	10	11 U	11 U	12 U	NA	NA
Dibromochloromethane	10	11 U	11 U	12 U	NA	NA
Ethylbenzene	10	11 U	11 U	12 U	NA	NA
Methylene Chloride	10	11 U	11 U	12 U	NA	NA
Styrene	10	11 U	11 U	12 U	NA	NA
Tetrachloroethene	10	11 U	11 U	12 U	NA	NA
Toluene	10	11 U	11 U	12 U	NA	NA
Total Xylenes	10	11 U	11 U	12 U	NA	NA
Trichloroethene	10	11 U	11 U	12 U	NA	NA
Vinyl Chloride	10	11 U	11 U	12 U	NA	NA
cis-1,3-Dichloropropene	10	11 U	11 U	12 U	NA	NA
trans-1,3-Dichloropropene	10	11 U	11 U	12 U	NA	NA
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	370 U	360 U	400 U	NA	360 U

LOCATION NAME:		BH-04	BH-04	BH-05	BH-05	BH-05
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	BACKGROUND	BACKGROUND	BACKGROUND
SAMPLE DEPTH (FT):		4.0-6.0	8.0- 10	0.0-2.0	0.0-4.0	10- 16
M&E SAMPLE ID:		BH-04-04-06-NX-B-131-2	BH-04-08-10-NX-B-132-2	BH-05-00-02-NX-B-133-2	BH-05-00-04-NX-B-133-2	BH-05-10-16-FD-B-153-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/22/91	08/22/91
REMARKS:						Field Duplicate
1,2-Dichlorobenzene	330	370 U	360 U	400 U	NA	360 U
1,3-Dichlorobenzene	330	370 U	360 U	400 U	NA	360 U
1,4-Dichlorobenzene	330	370 U	360 U	400 U	NA	360 U
2,2'-oxybis(1-Chloropropane)	330	370 U	360 U	400 U	NA	360 U
2,4,5-Trichlorophenol	800	890 U	870 U	970 U	NA	880 U
2,4,6-Trichlorophenol	330	370 U	360 U	400 U	NA	360 U
2,4-Dichlorophenol	330	370 U	360 U	400 U	NA	360 U
2,4-Dimethylphenol	330	370 U	360 U	400 U	NA	360 U
2,4-Dinitrophenol	800	890 U	870 U	970 U	NA	880 U
2,4-Dinitrotoluene	330	370 U	360 U	400 U	NA	360 U
2,6-Dinitrotoluene	330	370 U	360 U	400 U	NA	360 U
2-Chloronaphthalene	330	370 U	360 U	400 U	NA	360 U
2-Chlorophenol	330	370 U	360 U	400 U	NA	360 U
2-Methylnaphthalene	330	370 U	360 U	400 U	NA	360 U
2-Methylphenol	330	370 U	360 U	400 U	NA	360 U
2-Nitroaniline	800	890 U	870 U	970 U	NA	880 U
2-Nitrophenol	330	370 U	360 U	400 U	NA	360 U
3,3'-Dichlorobenzidine	330	370 U	360 U	400 U	NA	360 UJ
3-Nitroaniline	800	890 U	870 U	970 U	NA	880 U
4,6-Dinitro-2-methylphenol	800	890 U	870 U	970 U	NA	880 U
4-Bromophenyl-phenylether	330	370 U	360 U	400 U	NA	360 U
4-Chloro-3-methylphenol	330	370 U	360 U	400 U	NA	360 U
4-Chloroaniline	330	370 U	360 U	400 U	NA	360 U
4-Chlorophenyl-phenylether	330	370 U	360 U	400 U	NA	360 U
4-Methylphenol	330	370 U	360 U	400 U	NA	360 U
4-Nitroaniline	800	890 U	870 U	970 U	NA	880 U
4-Nitrophenol	800	890 U	870 U	970 U	NA	880 U
Acenaphthene	330	370 U	360 U	400 U	NA	360 U
Acenaphthylene	330	370 U	360 U	400 U	NA	360 U
Anthracene	330	370 U	360 U	400 U	NA	360 U
Benzo(a)anthracene	330	370 U	360 U	400 U	NA	360 U
Benzo(a)pyrene	330	370 U	360 U	400 UJ	NA	360 U
Benzo(b)fluoranthene	330	370 U	360 U	400 UJ	NA	360 U
Benzo(g,h,i)perylene	330	370 U	360 U	400 UJ	NA	360 U
Benzo(k)fluoranthene	330	370 U	360 U	400 UJ	NA	360 U
Butylbenzylphthalate	330	370 U	360 U	400 U	NA	360 U
Carbazole	330	370 U	360 U	400 U	NA	360 U
Chrysene	330	370 U	360 U	400 U	NA	360 U
Di-n-butylphthalate	330	370 U	86 J	62 J	NA	360 U

LOCATION NAME:		BH-04	BH-04	BH-05	BH-05	BH-05
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	BACKGROUND	BACKGROUND	BACKGROUND
SAMPLE DEPTH (FT):		4.0-6.0	8.0- 10	0.0-2.0	0.0-4.0	10- 16
M&E SAMPLE ID:		BH-04-04-06-NX-B-131-2	BH-04-08-10-NX-B-132-2	BH-05-00-02-NX-B-133-2	BH-05-00-04-NX-B-133-2	BH-05-10-16-FD-B-153-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/22/91	08/22/91
REMARKS:						Field Duplicate
Di-n-octylphthalate	330	370 U	360 U	400 UJ	NA	360 U
Dibenz(a,h)anthracene	330	370 U	360 U	400 UJ	NA	360 U
Dibenzofuran	330	370 U	360 U	400 U	NA	360 U
Diethylphthalate	330	370 U	360 U	400 U	NA	360 U
Dimethylphthalate	330	370 U	360 U	400 U	NA	360 U
Fluoranthene	330	370 U	360 U	400 U	NA	360 U
Fluorene	330	370 U	360 U	400 U	NA	360 U
Hexachlorobenzene	330	370 U	360 U	400 U	NA	360 U
Hexachlorobutadiene	330	370 U	360 U	400 U	NA	360 U
Hexachlorocyclopentadiene	330	370 U	360 U	400 U	NA	360 U
Hexachloroethane	330	370 U	360 U	400 U	NA	360 U
Indeno(1,2,3-cd)pyrene	330	370 U	360 U	400 UJ	NA	360 U
Isophorone	330	370 U	360 U	400 U	NA	360 U
N-Nitroso-di-n-propylamine	330	370 U	360 U	400 U	NA	360 U
N-Nitrosodiphenylamine	330	370 U	360 U	400 U	NA	360 U
Naphthalene	330	370 U	360 U	400 U	NA	360 U
Nitrobenzene	330	370 U	360 U	400 U	NA	360 U
Pentachlorophenol	800	890 U	870 U	970 U	NA	880 U
Phenanthrene	330	370 U	360 U	400 U	NA	360 U
Phenol	330	370 U	360 U	400 U	NA	360 U
Pyrene	330	370 U	360 U	400 U	NA	360 U
bis(2-Chloroethoxy)methane	330	370 U	360 U	400 U	NA	360 U
bis(2-Chloroethyl) ether	330	370 U	360 U	400 U	NA	360 U
bis(2-Ethylhexyl)phthalate	330	370 U	360 U	400 U	NA	360 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
4,4'-DDE	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
4,4'-DDT	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
Aldrin	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
Aroclor-1016	33.0	37 U	36 U	40 U	NA	36.0 U
Aroclor-1221	67.0	75 U	73 U	80 U	NA	73.0 U
Aroclor-1232	33.0	37 U	36 U	40 U	NA	36.0 U
Aroclor-1242	33.0	37 U	36 U	40 U	NA	36.0 U
Aroclor-1248	33.0	37 U	36 U	40 U	NA	36.0 U
Aroclor-1254	33.0	37 U	36 U	40 U	NA	36.0 U
Aroclor-1260	33.0	37 U	36 U	40 U	NA	36.0 U
Dieldrin	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U

LOCATION NAME:		BH-04	BH-04	BH-05	BH-05	BH-05
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	BACKGROUND	BACKGROUND	BACKGROUND
SAMPLE DEPTH (FT):		4.0-6.0	8.0- 10	0.0-2.0	0.0-4.0	10- 16
M&E SAMPLE ID:		BH-04-04-06-NX-B-131-2	BH-04-08-10-NX-B-132-2	BH-05-00-02-NX-B-133-2	BH-05-00-04-NX-B-133-2	BH-05-10-16-FD-B-153-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/22/91	08/22/91
REMARKS:						Field Duplicate
Endosulfan I	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
Endosulfan II	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
Endosulfan Sulfate	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
Endrin	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
Endrin Aldehyde	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
Endrin Ketone	3.3	3.7 U	3.6 U	4.0 U	NA	3.6 U
Heptachlor	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
Heptachlor Epoxide	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
Methoxychlor	17.0	19 U	18 U	20 U	NA	18.0 U
Toxaphene	170.0	190 U	180 U	200 U	NA	180.0 U
alpha-BHC	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
alpha-Chlordane	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
beta-BHC	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
delta-BHC	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
gamma-BHC(Lindane)	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
gamma-Chlordane	1.7	1.9 U	1.8 U	2.0 U	NA	1.8 U
METALS	CRDL(mg/kg)					
Aluminum	200	6000	4950	NA	11800	4180
Antimony	60	9.1 J	3.5 UJ	NA	3.9 UJ	3.7 UJ
Arsenic	10	1.2 UJ	0.85 U	NA	2.9 U	0.82 U
Barium	200	12.7 U	20.2	NA	13.2 U	20.2
Beryllium	5	0.39	0.71	NA	0.47	0.63
Cadmium	5	0.67 U	0.61 U	NA	0.70 U	0.65 U
Calcium	5000	484 UJ	501 UJ	NA	194 UJ	1640 UJ
Chromium	10	5.9	4.1	NA	9.2	3.5
Cobalt	50	6.3	4.1	NA	5.4	3.3
Copper	25	10.8	4.2	NA	3.5	3.3
Iron	100	7390	6940	NA	12800	6710
Lead	3	4.7	2.3	NA	12.6	2.8
Magnesium	5000	1350	1250	NA	1350	1050
Manganese	15	106	109	NA	125	162
Mercury	0.2	0.11 U	0.10 U	NA	0.15 J	0.09 U
Nickel	40	6.1 UJ	5.4 UJ	NA	7.7 UJ	5.4 UJ
Potassium	5000	394	1060	NA	415	921
Selenium	5	0.89 UJ	0.85 UJ	NA	0.95 U	0.82 UJ
Silver	10	0.89 U	0.81 U	NA	0.93 U	0.87 U
Sodium	5000	48.8 U	50.4 U	NA	47.0 U	58.8 U

LOCATION NAME:		BH-04	BH-04	BH-05	BH-05	BH-05
SITE LOCATION:		SEWAGE SLUDGE	SEWAGE SLUDGE	BACKGROUND	BACKGROUND	BACKGROUND
SAMPLE DEPTH (FT):		4.0-6.0	8.0- 10	0.0-2.0	0.0-4.0	10- 16
M&E SAMPLE ID:		BH-04-04-06-NX-B-131-2	BH-04-08-10-NX-B-132-2	BH-05-00-02-NX-B-133-2	BH-05-00-04-NX-B-133-2	BH-05-10-16-FD-B-153-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/22/91	08/22/91
REMARKS:						Field Duplicate
Thallium	10	0.22 U	0.21 U	NA	0.24 U	0.21 U
Vanadium	50	10.1	7.1	NA	19.3	6.7
Zinc	20	29.0	18.0	NA	20.0	16.3
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	0.28 U	0.26 U	NA	0.30 U	0.26 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	NA	NA	NA	NA	9.4
Organic Content	(%)	NA	NA	NA	NA	0.7
Solids Content	(%)	NA	NA	NA	NA	90.6
GRAIN SIZE						
Clay	(%)	NA	NA	NA	NA	3.2
Gravel	(%)	NA	NA	NA	NA	4.9
Sand	(%)	NA	NA	NA	NA	52.3
Silt	(%)	NA	NA	NA	NA	39.6
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	NA	NA	--
Plastic Limit	--	NA	NA	NA	NA	NP

LOCATION NAME:		BH-05	BH-05	BH-05	BH-06	BH-06
SITE LOCATION:		BACKGROUND	BACKGROUND	BACKGROUND	BULKY WASTE	BULKY WASTE
SAMPLE DEPTH (FT):		10- 16	12- 14	12- 14	2.0-4.0	6.0- 10
M&E SAMPLE ID:		BH-05-10-16-NX-B-134-2	BH-05-12-14-FD-B-153-2	BH-05-12-14-NX-B-134-2	BH-06-02-04-NX-B-135-2	BH-06-06-10-NX-B-136-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/23/91	08/23/91
REMARKS:			Field Duplicate			
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	NA	11 UJ	11 U	25 UJ	NA
1,1,2,2-Tetrachloroethane	10	NA	11 UJ	11 U	25 UJ	NA
1,1,2-Trichloroethane	10	NA	11 UJ	11 U	25 UJ	NA
1,1-Dichloroethane	10	NA	11 UJ	11 U	25 UJ	NA
1,1-Dichloroethene	10	NA	11 UJ	11 U	25 UJ	NA
1,2-Dichloroethane	10	NA	11 UJ	11 U	25 UJ	NA
1,2-Dichloroethene(total)	10	NA	11 UJ	11 U	25 UJ	NA
1,2-Dichloropropane	10	NA	11 UJ	11 U	25 UJ	NA
2-Butanone	10	NA	11 UJ	11 UJ	25 UJ	NA
2-Hexanone	10	NA	11 UJ	11 U	25 UJ	NA
4-Methyl-2-pentanone	10	NA	11 UJ	11 U	25 UJ	NA
Acetone	10	NA	11 UJ	11 UJ	350 J	NA
Benzene	10	NA	11 UJ	11 U	25 UJ	NA
Bromodichloromethane	10	NA	11 UJ	11 U	25 UJ	NA
Bromoform	10	NA	11 UJ	11 U	25 UJ	NA
Bromomethane	10	NA	11 UJ	11 U	25 UJ	NA
Carbon Disulfide	10	NA	11 UJ	11 U	25 UJ	NA
Carbon Tetrachloride	10	NA	11 UJ	11 U	25 UJ	NA
Chlorobenzene	10	NA	11 UJ	11 U	25 UJ	NA
Chloroethane	10	NA	11 UJ	11 U	25 UJ	NA
Chloroform	10	NA	11 UJ	11 U	25 UJ	NA
Chloromethane	10	NA	11 UJ	11 U	25 UJ	NA
Dibromochloromethane	10	NA	11 UJ	11 U	25 UJ	NA
Ethylbenzene	10	NA	11 UJ	11 U	25 UJ	NA
Methylene Chloride	10	NA	11 UJ	11 U	25 UJ	NA
Styrene	10	NA	11 UJ	11 U	25 UJ	NA
Tetrachloroethene	10	NA	11 UJ	11 U	25 UJ	NA
Toluene	10	NA	11 UJ	11 U	25 UJ	NA
Total Xylenes	10	NA	11 UJ	11 U	25 UJ	NA
Trichloroethene	10	NA	11 UJ	11 U	25 UJ	NA
Vinyl Chloride	10	NA	11 UJ	11 U	25 UJ	NA
cis-1,3-Dichloropropene	10	NA	11 UJ	11 U	25 UJ	NA
trans-1,3-Dichloropropene	10	NA	11 UJ	11 U	25 UJ	NA
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	360 U	NA	NA	400 U	360 U

LOCATION NAME:		BH-05	BH-05	BH-05	BH-06	BH-06
SITE LOCATION:		BACKGROUND	BACKGROUND	BACKGROUND	BULKY WASTE	BULKY WASTE
SAMPLE DEPTH (FT):		10- 16	12- 14	12- 14	2.0-4.0	6.0- 10
M&E SAMPLE ID:		BH-05-10-16-NX-B-134-2	BH-05-12-14-FD-B-153-2	BH-05-12-14-NX-B-134-2	BH-06-02-04-NX-B-135-2	BH-06-06-10-NX-B-136-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/23/91	08/23/91
REMARKS:			Field Duplicate			
1,2-Dichlorobenzene	330	360 U	NA	NA	400 U	360 U
1,3-Dichlorobenzene	330	360 U	NA	NA	400 U	360 U
1,4-Dichlorobenzene	330	360 U	NA	NA	400 U	360 U
2,2'-oxybis(1-Chloropropane)	330	360 U	NA	NA	400 U	360 U
2,4,5-Trichlorophenol	800	860 U	NA	NA	970 U	870 U
2,4,6-Trichlorophenol	330	360 U	NA	NA	400 U	360 U
2,4-Dichlorophenol	330	360 U	NA	NA	400 U	360 U
2,4-Dimethylphenol	330	360 U	NA	NA	400 U	360 U
2,4-Dinitrophenol	800	860 U	NA	NA	970 U	870 U
2,4-Dinitrotoluene	330	360 U	NA	NA	400 U	R
2,6-Dinitrotoluene	330	360 U	NA	NA	400 U	360 U
2-Chloronaphthalene	330	360 U	NA	NA	400 U	360 U
2-Chlorophenol	330	360 U	NA	NA	400 U	360 U
2-Methylnaphthalene	330	360 U	NA	NA	400 U	360 U
2-Methylphenol	330	360 U	NA	NA	400 U	360 U
2-Nitroaniline	800	860 U	NA	NA	970 U	870 U
2-Nitrophenol	330	360 U	NA	NA	400 U	360 U
3,3'-Dichlorobenzidine	330	360 U	NA	NA	400 UJ	360 UJ
3-Nitroaniline	800	860 U	NA	NA	970 U	870 U
4,6-Dinitro-2-methylphenol	800	860 U	NA	NA	970 U	870 U
4-Bromophenyl-phenylether	330	360 U	NA	NA	400 U	360 U
4-Chloro-3-methylphenol	330	360 U	NA	NA	400 U	360 U
4-Chloroaniline	330	360 U	NA	NA	400 U	360 U
4-Chlorophenyl-phenylether	330	360 U	NA	NA	400 U	360 U
4-Methylphenol	330	360 U	NA	NA	400 U	360 U
4-Nitroaniline	800	860 U	NA	NA	970 U	870 U
4-Nitrophenol	800	860 U	NA	NA	970 U	870 U
Acenaphthene	330	360 U	NA	NA	400 U	360 U
Acenaphthylene	330	360 U	NA	NA	400 U	360 U
Anthracene	330	360 U	NA	NA	400 U	360 U
Benzo(a)anthracene	330	360 U	NA	NA	400 U	360 U
Benzo(a)pyrene	330	360 U	NA	NA	400 U	360 U
Benzo(b)fluoranthene	330	360 U	NA	NA	400 U	360 U
Benzo(g,h,i)perylene	330	360 U	NA	NA	400 U	360 U
Benzo(k)fluoranthene	330	360 U	NA	NA	400 U	360 U
Butylbenzylphthalate	330	360 U	NA	NA	400 U	360 U
Carbazole	330	360 U	NA	NA	400 U	360 U
Chrysene	330	360 U	NA	NA	400 U	360 U
Di-n-butylphthalate	330	360 U	NA	NA	400 U	360 U

LOCATION NAME:		BH-05	BH-05	BH-05	BH-06	BH-06
SITE LOCATION:		BACKGROUND	BACKGROUND	BACKGROUND	BULKY WASTE	BULKY WASTE
SAMPLE DEPTH (FT):		10- 16	12- 14	12- 14	2.0-4.0	6.0- 10
M&E SAMPLE ID:		BH-05-10-16-NX-B-134-2	BH-05-12-14-FD-B-153-2	BH-05-12-14-NX-B-134-2	BH-06-02-04-NX-B-135-2	BH-06-06-10-NX-B-136-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/23/91	08/23/91
REMARKS:			Field Duplicate			
Di-n-octylphthalate	330	19 J	NA	NA	400 U	360 U
Dibenz(a,h)anthracene	330	360 U	NA	NA	400 U	360 U
Dibenzofuran	330	360 U	NA	NA	400 U	360 U
Diethylphthalate	330	360 U	NA	NA	400 U	360 U
Dimethylphthalate	330	360 U	NA	NA	400 U	360 U
Fluoranthene	330	360 U	NA	NA	400 U	360 U
Fluorene	330	360 U	NA	NA	400 U	360 U
Hexachlorobenzene	330	360 U	NA	NA	400 U	360 U
Hexachlorobutadiene	330	360 U	NA	NA	400 U	360 U
Hexachlorocyclopentadiene	330	360 U	NA	NA	400 U	360 U
Hexachloroethane	330	360 U	NA	NA	400 U	360 U
Indeno(1,2,3-cd)pyrene	330	360 U	NA	NA	400 U	360 U
Isophorone	330	360 U	NA	NA	400 U	360 U
N-Nitroso-di-n-propylamine	330	360 U	NA	NA	400 U	360 U
N-Nitrosodiphenylamine	330	360 U	NA	NA	400 U	360 U
Naphthalene	330	360 U	NA	NA	400 U	360 U
Nitrobenzene	330	360 U	NA	NA	400 U	360 U
Pentachlorophenol	800	860 U	NA	NA	970 U	870 U
Phenanthrene	330	360 U	NA	NA	400 U	360 U
Phenol	330	360 U	NA	NA	400 U	360 U
Pyrene	330	360 U	NA	NA	400 U	360 U
bis(2-Chloroethoxy)methane	330	360 U	NA	NA	400 U	360 U
bis(2-Chloroethyl) ether	330	360 U	NA	NA	400 U	360 U
bis(2-Ethylhexyl)phthalate	330	360 U	NA	NA	400 U	360 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	3.6 U	NA	NA	4.0 U	3.6 U
4,4'-DDE	3.3	3.6 U	NA	NA	4.6	3.6 U
4,4'-DDT	3.3	3.6 U	NA	NA	4.0 U	3.6 U
Aldrin	1.7	1.8 U	NA	NA	2.1 U	1.9 U
Aroclor-1016	33.0	36 U	NA	NA	40.0 U	36.0 U
Aroclor-1221	67.0	73 U	NA	NA	82.0 U	73.0 U
Aroclor-1232	33.0	36 U	NA	NA	40.0 U	36.0 U
Aroclor-1242	33.0	36 U	NA	NA	40.0 U	36.0 U
Aroclor-1248	33.0	36 U	NA	NA	40.0 U	36.0 U
Aroclor-1254	33.0	36 U	NA	NA	40.0 U	36.0 U
Aroclor-1260	33.0	36 U	NA	NA	40.0 U	36.0 U
Dieldrin	3.3	3.6 U	NA	NA	4.0 U	3.6 U

LOCATION NAME:		BH-05	BH-05	BH-05	BH-06	BH-06
SITE LOCATION:		BACKGROUND	BACKGROUND	BACKGROUND	BULKY WASTE	BULKY WASTE
SAMPLE DEPTH (FT):		10- 16	12- 14	12- 14	2.0-4.0	6.0- 10
M&E SAMPLE ID:		BH-05-10-16-NX-B-134-2	BH-05-12-14-FD-B-153-2	BH-05-12-14-NX-B-134-2	BH-06-02-04-NX-B-135-2	BH-06-06-10-NX-B-136-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/23/91	08/23/91
REMARKS:			Field Duplicate			
Endosulfan I	1.7	1.8 U	NA	NA	2.1 U	1.9 U
Endosulfan II	3.3	3.6 U	NA	NA	4.0 U	3.6 U
Endosulfan Sulfate	3.3	3.6 U	NA	NA	4.0 U	3.6 U
Endrin	3.3	3.6 U	NA	NA	4.0 U	3.6 U
Endrin Aldehyde	3.3	3.6 U	NA	NA	4.0 U	3.6 U
Endrin Ketone	3.3	3.6 U	NA	NA	4.0 U	3.6 U
Heptachlor	1.7	1.8 U	NA	NA	2.1 U	1.9 U
Heptachlor Epoxide	1.7	1.8 U	NA	NA	2.1 U	1.9 U
Methoxychlor	17.0	18 U	NA	NA	21.0 U	19.0 U
Toxaphene	170.0	180 U	NA	NA	210.0 U	190.0 U
alpha-BHC	1.7	1.8 U	NA	NA	2.1 U	1.9 U
alpha-Chlordane	1.7	1.8 U	NA	NA	2.1 U	1.9 U
beta-BHC	1.7	1.8 U	NA	NA	2.1 U	1.9 U
delta-BHC	1.7	1.8 U	NA	NA	2.1 U	1.9 U
gamma-BHC(Lindane)	1.7	1.8 U	NA	NA	2.1 U	1.9 U
gamma-Chlordane	1.7	1.8 U	NA	NA	2.1 U	1.9 U
METALS	CRDL(mg/kg)					
Aluminum	200	3730	NA	NA	8810	5100
Antimony	60	3.5 UJ	NA	NA	4.0 UJ	6.0 J
Arsenic	10	0.82 U	NA	NA	1.3 U	0.80 U
Barium	200	18.0	NA	NA	14.6	19.8
Beryllium	5	0.54	NA	NA	0.61	0.55
Cadmium	5	0.62 U	NA	NA	0.70 U	0.63 U
Calcium	5000	1610 UJ	NA	NA	1050 UJ	450 UJ
Chromium	10	4.0	NA	NA	6.3	3.0
Cobalt	50	2.8	NA	NA	3.5	3.5
Copper	25	3.5	NA	NA	4.1	3.3
Iron	100	6120	NA	NA	9530	6620
Lead	3	2.3	NA	NA	61.4	4.5
Magnesium	5000	882	NA	NA	846	1150
Manganese	15	133	NA	NA	116	94.1 U
Mercury	0.2	0.09 U	NA	NA	0.20 J	0.24 J
Nickel	40	6.9 UJ	NA	NA	6.7 UJ	5.2 UJ
Potassium	5000	854	NA	NA	401	963
Selenium	5	0.82 UJ	NA	NA	0.95 UJ	0.80 UJ
Silver	10	0.83 U	NA	NA	0.94 U	0.84 U
Sodium	5000	53.3 U	NA	NA	98.8 U	79.1 U

LOCATION NAME:		BH-05	BH-05	BH-05	BH-06	BH-06
SITE LOCATION:		BACKGROUND	BACKGROUND	BACKGROUND	BULKY WASTE	BULKY WASTE
SAMPLE DEPTH (FT):		10- 16	12- 14	12- 14	2.0-4.0	6.0- 10
M&E SAMPLE ID:		BH-05-10-16-NX-B-134-2	BH-05-12-14-FD-B-153-2	BH-05-12-14-NX-B-134-2	BH-06-02-04-NX-B-135-2	BH-06-06-10-NX-B-136-2
DATE SAMPLED:		08/22/91	08/22/91	08/22/91	08/23/91	08/23/91
REMARKS:			Field Duplicate			
Thallium	10	0.21 U	NA	NA	0.24 U	0.20 U
Vanadium	50	5.7	NA	NA	11.3	6.7
Zinc	20	15.6 UJ	NA	NA	95.9	18.9
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	0.27 U	NA	NA	0.29 U	0.26 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	12.7	NA	NA	NA	8.7
Organic Content	(%)	0.7	NA	NA	NA	1.0
Solids Content	(%)	87.3	NA	NA	NA	91.3
GRAIN SIZE						
Clay	(%)	2.9	NA	NA	NA	5.5
Gravel	(%)	8.1	NA	NA	NA	8.8
Sand	(%)	49.8	NA	NA	NA	59.8
Silt	(%)	39.2	NA	NA	NA	25.8
ATTERBERG LIMITS						
Liquid Limit	--	--	NA	NA	NA	--
Plastic Limit	--	NP	NA	NA	NA	NP

LOCATION NAME:		BH-06	MW-14-01	MW-14-01	MW-14-01	MW-14-01
SITE LOCATION:		BULKY WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		8.0- 10	4.0-6.0	4.0-8.0	4.0- 14	14- 16
M&E SAMPLE ID:		BH-06-08-10-NX-B-136-2	BH-07-04-06-NX-B-138-2	BH-07-04-08-NX-B-138-2	BH-07-04-14-NX-B-138-2	BH-07-14-16-NX-B-137-2
DATE SAMPLED:		08/23/91	08/26/91	08/26/91	08/26/91	08/26/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	11 U	1600 UJ	NA	NA	3100 UJ
1,1,2,2-Tetrachloroethane	10	11 U	1600 UJ	NA	NA	3100 UJ
1,1,2-Trichloroethane	10	11 U	1600 UJ	NA	NA	3100 UJ
1,1-Dichloroethane	10	11 U	1600 UJ	NA	NA	3100 UJ
1,1-Dichloroethene	10	11 U	1600 UJ	NA	NA	3100 UJ
1,2-Dichloroethane	10	11 U	1600 UJ	NA	NA	3100 UJ
1,2-Dichloroethene(total)	10	11 U	1600 UJ	NA	NA	3100 UJ
1,2-Dichloropropane	10	11 U	1600 UJ	NA	NA	3100 UJ
2-Butanone	10	11 UJ	1600 UJ	NA	NA	3100 UJ
2-Hexanone	10	11 U	1600 UJ	NA	NA	3100 UJ
4-Methyl-2-pentanone	10	11 U	1600 UJ	NA	NA	3100 UJ
Acetone	10	48 J	1600 UJ	NA	NA	3100 UJ
Benzene	10	11 U	1600 UJ	NA	NA	3100 UJ
Bromodichloromethane	10	11 U	1600 UJ	NA	NA	3100 UJ
Bromoform	10	11 U	1600 UJ	NA	NA	3100 UJ
Bromomethane	10	11 U	1600 UJ	NA	NA	3100 UJ
Carbon Disulfide	10	11 U	1600 UJ	NA	NA	3100 UJ
Carbon Tetrachloride	10	11 U	1600 UJ	NA	NA	3100 UJ
Chlorobenzene	10	11 U	1600 UJ	NA	NA	3100 UJ
Chloroethane	10	11 U	1600 UJ	NA	NA	3100 UJ
Chloroform	10	11 U	1600 UJ	NA	NA	3100 UJ
Chloromethane	10	11 U	1600 UJ	NA	NA	3100 UJ
Dibromochloromethane	10	11 U	1600 UJ	NA	NA	3100 UJ
Ethylbenzene	10	11 U	1600 UJ	NA	NA	3100 UJ
Methylene Chloride	10	11 U	1600 UJ	NA	NA	3100 UJ
Styrene	10	11 U	1600 UJ	NA	NA	3100 UJ
Tetrachloroethene	10	11 U	1600 UJ	NA	NA	3100 UJ
Toluene	10	11 U	1600 UJ	NA	NA	3100 UJ
Total Xylenes	10	11 U	1600 UJ	NA	NA	3100 UJ
Trichloroethene	10	11 U	1600 UJ	NA	NA	3100 UJ
Vinyl Chloride	10	11 U	1600 UJ	NA	NA	3100 UJ
cis-1,3-Dichloropropene	10	11 U	1600 UJ	NA	NA	3100 UJ
trans-1,3-Dichloropropene	10	11 U	1600 UJ	NA	NA	3100 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	NA	NA	370 U	NA	NA

LOCATION NAME:		BH-06	MW-14-01	MW-14-01	MW-14-01	MW-14-01
SITE LOCATION:		BULKY WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		8.0- 10	4.0-6.0	4.0-8.0	4.0- 14	14- 16
M&E SAMPLE ID:		BH-06-08-10-NX-B-136-2	BH-07-04-06-NX-B-138-2	BH-07-04-08-NX-B-138-2	BH-07-04-14-NX-B-138-2	BH-07-14-16-NX-B-137-2
DATE SAMPLED:		08/23/91	08/26/91	08/26/91	08/26/91	08/26/91
REMARKS:						
1,2-Dichlorobenzene	330	NA	NA	240 J	NA	NA
1,3-Dichlorobenzene	330	NA	NA	370 U	NA	NA
1,4-Dichlorobenzene	330	NA	NA	97 J	NA	NA
2,2'-oxybis(1-Chloropropane)	330	NA	NA	370 U	NA	NA
2,4,5-Trichlorophenol	800	NA	NA	890 U	NA	NA
2,4,6-Trichlorophenol	330	NA	NA	370 U	NA	NA
2,4-Dichlorophenol	330	NA	NA	370 U	NA	NA
2,4-Dimethylphenol	330	NA	NA	370 U	NA	NA
2,4-Dinitrophenol	800	NA	NA	890 U	NA	NA
2,4-Dinitrotoluene	330	NA	NA	370 U	NA	NA
2,6-Dinitrotoluene	330	NA	NA	370 U	NA	NA
2-Chloronaphthalene	330	NA	NA	370 U	NA	NA
2-Chlorophenol	330	NA	NA	370 U	NA	NA
2-Methylnaphthalene	330	NA	NA	700	NA	NA
2-Methylphenol	330	NA	NA	370 U	NA	NA
2-Nitroaniline	800	NA	NA	890 U	NA	NA
2-Nitrophenol	330	NA	NA	370 U	NA	NA
3,3'-Dichlorobenzidine	330	NA	NA	370 U	NA	NA
3-Nitroaniline	800	NA	NA	890 U	NA	NA
4,6-Dinitro-2-methylphenol	800	NA	NA	890 U	NA	NA
4-Bromophenyl-phenylether	330	NA	NA	370 U	NA	NA
4-Chloro-3-methylphenol	330	NA	NA	370 U	NA	NA
4-Chloroaniline	330	NA	NA	370 U	NA	NA
4-Chlorophenyl-phenylether	330	NA	NA	370 U	NA	NA
4-Methylphenol	330	NA	NA	260 J	NA	NA
4-Nitroaniline	800	NA	NA	890 U	NA	NA
4-Nitrophenol	800	NA	NA	890 U	NA	NA
Acenaphthene	330	NA	NA	370 U	NA	NA
Acenaphthylene	330	NA	NA	370 U	NA	NA
Anthracene	330	NA	NA	370 U	NA	NA
Benzo(a)anthracene	330	NA	NA	63 J	NA	NA
Benzo(a)pyrene	330	NA	NA	370 U	NA	NA
Benzo(b)fluoranthene	330	NA	NA	370 U	NA	NA
Benzo(g,h,i)perylene	330	NA	NA	370 U	NA	NA
Benzo(k)fluoranthene	330	NA	NA	370 U	NA	NA
Butylbenzylphthalate	330	NA	NA	96 J	NA	NA
Carbazole	330	NA	NA	370 U	NA	NA
Chrysene	330	NA	NA	84 J	NA	NA
Di-n-butylphthalate	330	NA	NA	320 J	NA	NA

LOCATION NAME:		BH-06	MW-14-01	MW-14-01	MW-14-01	MW-14-01
SITE LOCATION:		BULKY WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		8.0- 10	4.0-6.0	4.0-8.0	4.0- 14	14- 16
M&E SAMPLE ID:		BH-06-08-10-NX-B-136-2	BH-07-04-06-NX-B-138-2	BH-07-04-08-NX-B-138-2	BH-07-04-14-NX-B-138-2	BH-07-14-16-NX-B-137-2
DATE SAMPLED:		08/23/91	08/26/91	08/26/91	08/26/91	08/26/91
REMARKS:						
Di-n-octylphthalate	330	NA	NA	370 U	NA	NA
Dibenz(a,h)anthracene	330	NA	NA	370 U	NA	NA
Dibenzofuran	330	NA	NA	370 U	NA	NA
Diethylphthalate	330	NA	NA	140 J	NA	NA
Dimethylphthalate	330	NA	NA	370 U	NA	NA
Fluoranthene	330	NA	NA	140 J	NA	NA
Fluorene	330	NA	NA	370 U	NA	NA
Hexachlorobenzene	330	NA	NA	370 U	NA	NA
Hexachlorobutadiene	330	NA	NA	370 U	NA	NA
Hexachlorocyclopentadiene	330	NA	NA	370 U	NA	NA
Hexachloroethane	330	NA	NA	370 U	NA	NA
Indeno(1,2,3-cd)pyrene	330	NA	NA	370 U	NA	NA
Isophorone	330	NA	NA	370 U	NA	NA
N-Nitroso-di-n-propylamine	330	NA	NA	370 U	NA	NA
N-Nitrosodiphenylamine	330	NA	NA	370 U	NA	NA
Naphthalene	330	NA	NA	200 J	NA	NA
Nitrobenzene	330	NA	NA	370 U	NA	NA
Pentachlorophenol	800	NA	NA	890 U	NA	NA
Phenanthrene	330	NA	NA	150 J	NA	NA
Phenol	330	NA	NA	370 U	NA	NA
Pyrene	330	NA	NA	160 J	NA	NA
bis(2-Chloroethoxy)methane	330	NA	NA	370 U	NA	NA
bis(2-Chloroethyl) ether	330	NA	NA	370 U	NA	NA
bis(2-Ethylhexyl)phthalate	330	NA	NA	2000	NA	NA
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	NA	NA	3.7 U	NA	NA
4,4'-DDE	3.3	NA	NA	31.0	NA	NA
4,4'-DDT	3.3	NA	NA	3.7 U	NA	NA
Aldrin	1.7	NA	NA	1.9 U	NA	NA
Aroclor-1016	33.0	NA	NA	37.0 U	NA	NA
Aroclor-1221	67.0	NA	NA	75.0 U	NA	NA
Aroclor-1232	33.0	NA	NA	37.0 U	NA	NA
Aroclor-1242	33.0	NA	NA	37.0 U	NA	NA
Aroclor-1248	33.0	NA	NA	37.0 U	NA	NA
Aroclor-1254	33.0	NA	NA	270.0	NA	NA
Aroclor-1260	33.0	NA	NA	37.0 U	NA	NA
Dieldrin	3.3	NA	NA	3.7 U	NA	NA

LOCATION NAME:		BH-06	MW-14-01	MW-14-01	MW-14-01	MW-14-01
SITE LOCATION:		BULKY WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		8.0- 10	4.0-6.0	4.0-8.0	4.0- 14	14- 16
M&E SAMPLE ID:		BH-06-08-10-NX-B-136-2	BH-07-04-06-NX-B-138-2	BH-07-04-08-NX-B-138-2	BH-07-04-14-NX-B-138-2	BH-07-14-16-NX-B-137-2
DATE SAMPLED:		08/23/91	08/26/91	08/26/91	08/26/91	08/26/91
REMARKS:						
Endosulfan I	1.7	NA	NA	1.9 U	NA	NA
Endosulfan II	3.3	NA	NA	3.7 U	NA	NA
Endosulfan Sulfate	3.3	NA	NA	3.7 U	NA	NA
Endrin	3.3	NA	NA	3.7 U	NA	NA
Endrin Aldehyde	3.3	NA	NA	3.7 U	NA	NA
Endrin Ketone	3.3	NA	NA	3.7 U	NA	NA
Heptachlor	1.7	NA	NA	1.9 U	NA	NA
Heptachlor Epoxide	1.7	NA	NA	1.9 U	NA	NA
Methoxychlor	17.0	NA	NA	19.0 U	NA	NA
Toxaphene	170.0	NA	NA	190.0 U	NA	NA
alpha-BHC	1.7	NA	NA	1.9 U	NA	NA
alpha-Chlordane	1.7	NA	NA	1.9 U	NA	NA
beta-BHC	1.7	NA	NA	1.9 U	NA	NA
delta-BHC	1.7	NA	NA	1.9 U	NA	NA
gamma-BHC(Lindane)	1.7	NA	NA	1.9 U	NA	NA
gamma-Chlordane	1.7	NA	NA	1.9 U	NA	NA
METALS	CRDL(mg/kg)					
Aluminum	200	NA	NA	5250	NA	NA
Antimony	60	NA	NA	6.0 J	NA	NA
Arsenic	10	NA	NA	0.86 U	NA	NA
Barium	200	NA	NA	22.9	NA	NA
Beryllium	5	NA	NA	0.7	NA	NA
Cadmium	5	NA	NA	0.65 U	NA	NA
Calcium	5000	NA	NA	1720 UJ	NA	NA
Chromium	10	NA	NA	5.5	NA	NA
Cobalt	50	NA	NA	3.3	NA	NA
Copper	25	NA	NA	18.9	NA	NA
Iron	100	NA	NA	7540	NA	NA
Lead	3	NA	NA	20.2	NA	NA
Magnesium	5000	NA	NA	1090	NA	NA
Manganese	15	NA	NA	82.5 U	NA	NA
Mercury	0.2	NA	NA	0.39 J	NA	NA
Nickel	40	NA	NA	5.4 UJ	NA	NA
Potassium	5000	NA	NA	780	NA	NA
Selenium	5	NA	NA	0.86 U	NA	NA
Silver	10	NA	NA	0.87 U	NA	NA
Sodium	5000	NA	NA	67.4 U	NA	NA

LOCATION NAME:		BH-06	MW-14-01	MW-14-01	MW-14-01	MW-14-01
SITE LOCATION:		BULKY WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE	SOLID WASTE
SAMPLE DEPTH (FT):		8.0- 10	4.0-6.0	4.0-8.0	4.0- 14	14- 16
M&E SAMPLE ID:		BH-06-08-10-NX-B-136-2	BH-07-04-06-NX-B-138-2	BH-07-04-08-NX-B-138-2	BH-07-04-14-NX-B-138-2	BH-07-14-16-NX-B-137-2
DATE SAMPLED:		08/23/91	08/26/91	08/26/91	08/26/91	08/26/91
REMARKS:						
Thallium	10	NA	NA	0.21 U	NA	NA
Vanadium	50	NA	NA	9.3	NA	NA
Zinc	20	NA	NA	45.5	NA	NA
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	NA	NA	0.28 U	NA	NA
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	NA	NA	NA	13.0	NA
Organic Content	(%)	NA	NA	NA	3.8	NA
Solids Content	(%)	NA	NA	NA	87.1	NA
GRAIN SIZE						
Clay	(%)	NA	NA	NA	3.5	NA
Gravel	(%)	NA	NA	NA	8.1	NA
Sand	(%)	NA	NA	NA	60.7	NA
Silt	(%)	NA	NA	NA	27.6	NA
ATTERBERG LIMITS						
Liquid Limit	--	NA	NA	NA	--	NA
Plastic Limit	--	NA	NA	NA	NP	NA

LOCATION NAME: MW-14-01
SITE LOCATION: SOLID WASTE
SAMPLE DEPTH (FT): 14- 18
M&E SAMPLE ID: BH-07-14-18-NX-B-137-2
DATE SAMPLED: 08/26/91

REMARKS:

VOLATILE ORGANICS-CLP	CRQL(ug/kg)	
1,1,1-Trichloroethane	10	NA
1,1,2,2-Tetrachloroethane	10	NA
1,1,2-Trichloroethane	10	NA
1,1-Dichloroethane	10	NA
1,1-Dichloroethene	10	NA
1,2-Dichloroethane	10	NA
1,2-Dichloroethene(total)	10	NA
1,2-Dichloropropane	10	NA
2-Butanone	10	NA
2-Hexanone	10	NA
4-Methyl-2-pentanone	10	NA
Acetone	10	NA
Benzene	10	NA
Bromodichloromethane	10	NA
Bromoform	10	NA
Bromomethane	10	NA
Carbon Disulfide	10	NA
Carbon Tetrachloride	10	NA
Chlorobenzene	10	NA
Chloroethane	10	NA
Chloroform	10	NA
Chloromethane	10	NA
Dibromochloromethane	10	NA
Ethylbenzene	10	NA
Methylene Chloride	10	NA
Styrene	10	NA
Tetrachloroethene	10	NA
Toluene	10	NA
Total Xylenes	10	NA
Trichloroethene	10	NA
Vinyl Chloride	10	NA
cis-1,3-Dichloropropene	10	NA
trans-1,3-Dichloropropene	10	NA

SEMIVOLATILE ORGANICS	CRQL(ug/kg)	
1,2,4-Trichlorobenzene	330	3600 U

LOCATION NAME: MW-14-01
SITE LOCATION: SOLID WASTE
SAMPLE DEPTH (FT): 14- 18
M&E SAMPLE ID: BH-07-14-18-NX-B-137-2
DATE SAMPLED: 08/26/91

REMARKS:

1,2-Dichlorobenzene	330	3600 U
1,3-Dichlorobenzene	330	3600 U
1,4-Dichlorobenzene	330	3600 U
2,2'-oxybis(1-Chloropropane)	330	3600 U
2,4,5-Trichlorophenol	800	8800 U
2,4,6-Trichlorophenol	330	3600 U
2,4-Dichlorophenol	330	3600 U
2,4-Dimethylphenol	330	3600 U
2,4-Dinitrophenol	800	8800 U
2,4-Dinitrotoluene	330	3600 U
2,6-Dinitrotoluene	330	3600 U
2-Chloronaphthalene	330	3600 U
2-Chlorophenol	330	3600 U
2-Methylnaphthalene	330	3300 J
2-Methylphenol	330	4000
2-Nitroaniline	800	8800 U
2-Nitrophenol	330	3600 U
3,3'-Dichlorobenzidine	330	3600 U
3-Nitroaniline	800	8800 U
4,6-Dinitro-2-methylphenol	800	8800 U
4-Bromophenyl-phenylether	330	3600 U
4-Chloro-3-methylphenol	330	3600 U
4-Chloroaniline	330	3600 U
4-Chlorophenyl-phenylether	330	3600 U
4-Methylphenol	330	3600 U
4-Nitroaniline	800	8800 U
4-Nitrophenol	800	8800 U
Acenaphthene	330	3600 U
Acenaphthylene	330	3600 U
Anthracene	330	3600 U
Benzo(a)anthracene	330	3600 U
Benzo(a)pyrene	330	3600 U
Benzo(b)fluoranthene	330	3600 U
Benzo(g,h,i)perylene	330	3600 U
Benzo(k)fluoranthene	330	3600 U
Butylbenzylphthalate	330	18000
Carbazole	330	3600 U
Chrysene	330	3600 U
Di-n-butylphthalate	330	2300 J

LOCATION NAME: MW-14-01
SITE LOCATION: SOLID WASTE
SAMPLE DEPTH (FT): 14- 18
M&E SAMPLE ID: BH-07-14-18-NX-B-137-2
DATE SAMPLED: 08/26/91

REMARKS:

Di-n-octylphthalate	330	3600 J
Dibenz(a,h)anthracene	330	3600 U
Dibenzofuran	330	3600 U
Diethylphthalate	330	790 J
Dimethylphthalate	330	3600 U
Fluoranthene	330	3600 U
Fluorene	330	3600 U
Hexachlorobenzene	330	3600 U
Hexachlorobutadiene	330	3600 U
Hexachlorocyclopentadiene	330	3600 U
Hexachloroethane	330	3600 U
Indeno(1,2,3-cd)pyrene	330	3600 U
Isophorone	330	3600 U
N-Nitroso-di-n-propylamine	330	3600 U
N-Nitrosodiphenylamine	330	3600 U
Naphthalene	330	2200 J
Nitrobenzene	330	3600 U
Pentachlorophenol	800	8800 U
Phenanthrene	330	920 J
Phenol	330	3600 U
Pyrene	330	3600 U
bis(2-Chloroethoxy)methane	330	3600 U
bis(2-Chloroethyl) ether	330	3600 U
bis(2-Ethylhexyl)phthalate	330	3600 U

PESTICIDES/PCBs	CRQL(ug/kg)	
4,4'-DDD	3.3	26.0
4,4'-DDE	3.3	12.0
4,4'-DDT	3.3	3.6 U
Aldrin	1.7	1.9 U
Aroclor-1016	33.0	36.0 U
Aroclor-1221	67.0	74.0 U
Aroclor-1232	33.0	36.0 U
Aroclor-1242	33.0	310.0
Aroclor-1248	33.0	36.0 U
Aroclor-1254	33.0	36.0 U
Aroclor-1260	33.0	36.0 U
Dieldrin	3.3	14.0

LOCATION NAME: MW-14-01
SITE LOCATION: SOLID WASTE
SAMPLE DEPTH (FT): 14- 18
M&E SAMPLE ID: BH-07-14-18-NX-B-137-2
DATE SAMPLED: 08/26/91

REMARKS:

Endosulfan I	1.7	1.9 U
Endosulfan II	3.3	3.6 U
Endosulfan Sulfate	3.3	3.6 U
Endrin	3.3	3.6 U
Endrin Aldehyde	3.3	3.6 U
Endrin Ketone	3.3	3.6 U
Heptachlor	1.7	1.9 U
Heptachlor Epoxide	1.7	1.9 U
Methoxychlor	17.0	19.0 U
Toxaphene	170.0	190.0 U
alpha-BHC	1.7	1.9 U
alpha-Chlordane	1.7	17.0
beta-BHC	1.7	1.9 U
delta-BHC	1.7	1.9 U
gamma-BHC(Lindane)	1.7	1.9 U
gamma-Chlordane	1.7	15.0
METALS	CRDL(mg/kg)	
Aluminum	200	3620
Antimony	60	3.8 UJ
Arsenic	10	0.89 U
Barium	200	16.0
Beryllium	5	0.39
Cadmium	5	0.66 U
Calcium	5000	803 UJ
Chromium	10	5.5
Cobalt	50	1.8
Copper	25	7.4
Iron	100	4800
Lead	3	19.4
Magnesium	5000	738
Manganese	15	58.3 U
Mercury	0.2	0.18 J
Nickel	40	5.4 UJ
Potassium	5000	618
Selenium	5	0.89 U
Silver	10	0.89 U
Sodium	5000	81.7 U

LOCATION NAME: MW-14-01
SITE LOCATION: SOLID WASTE
SAMPLE DEPTH (FT): 14- 18
M&E SAMPLE ID: BH-07-14-18-NX-B-137-2
DATE SAMPLED: 08/26/91

REMARKS:

Thallium	10	0.22 U
Vanadium	50	5.5
Zinc	20	68.2

SOIL QUALITY PARAMETERS

CYANIDE	CRDL(mg/kg)	
Cyanide	20	0.28 U
TOTAL COMBUSTIBLE ORGANICS		
Moisture Content	(%)	NA
Organic Content	(%)	NA
Solids Content	(%)	NA
GRAIN SIZE		
Clay	(%)	NA
Gravel	(%)	NA
Sand	(%)	NA
Silt	(%)	NA
ATTERBERG LIMITS		
Liquid Limit	--	NA
Plastic Limit	--	NA

D-8 COMPLETE ANALYTICAL DATA, LEACHATE

- JUNE 1991
- APRIL 1992

LEACHATE - JUNE 1991

LEACHATE - JUNE 1991 (06/20/91-06/27/91)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		LE-01	LE-02	LE-03	LE-04
SITE LOCATION:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-01-0.8-1.0-NX-06-24-L-075	LE-02-0.8-1.0-NX-06-25-L-076	LE-03-0.8-1.0-NX-06-24-L-077	LE-04-0-0-FD-06-24-L-086
DATE SAMPLED:		06/24/91	06/25/91	06/24/91	06/24/91
REMARKS:					Field Duplicate
VOLATILE ORGANICS-CLP	CRQL(ug/L)				
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	2 J	2 J
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U
1,2-Dichloroethene(total)	5	44	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U
2-Butanone	10	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	10 U
Benzene	5	5 U	5 U	5 U	5 U
Bromodichloromethane	5	5 U	5 U	5 U	5 U
Bromoform	5	5 U	5 U	5 U	5 U
Bromomethane	10	10 U	10 U	10 U	10 U
Carbon Disulfide	5	12	3 J	5 U	5 U
Carbon Tetrachloride	5	5 U	5 U	5 U	5 U
Chlorobenzene	5	5 U	5 U	2 J	2 J
Chloroethane	10	10 U	10 U	8 J	6 J
Chloroform	5	5 U	5 U	5 U	5 U
Chloromethane	10	10 U	10 U	10 U	10 U
Dibromochloromethane	5	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U	5 U
Methylene Chloride	5	5 U	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U	5 U
Tetrachloroethene	5	5 U	5 U	5 U	5 U
Toluene	5	5 U	5 U	50	28
Total Xylenes	5	5 U	5 U	5 U	5 U
Trichloroethene	5	4 J	5 U	5 U	5 U
Vinyl Acetate	10	10 U	10 U	10 U	10 U
Vinyl Chloride	10	1 J	10 U	10 U	10 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)				
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U

LOCATION NAME:		LE-01	LE-02	LE-03	LE-04
SITE LOCATION:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-01-0.8-1.0-NX-06-24-L-075	LE-02-0.8-1.0-NX-06-25-L-076	LE-03-0.8-1.0-NX-06-24-L-077	LE-04-0-0-FD-06-24-L-086
DATE SAMPLED:		06/24/91	06/25/91	06/24/91	06/24/91
REMARKS:					Field Duplicate
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	R	R
2,4,6-Trichlorophenol	10	10 U	10 U	R	R
2,4-Dichlorophenol	10	10 U	10 U	R	R
2,4-Dimethylphenol	10	10 U	10 U	R	R
2,4-Dinitrophenol	50	50 U	50 U	R	R
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	R	R
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	R	R
2-Nitroaniline	50	50 U	50 U	50 U	50 U
2-Nitrophenol	10	10 U	10 U	R	R
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U	20 U
3-Nitroaniline	50	50 UJ	50 U	50 U	50 U
4,6-Dinitro-2-methylphenol	50	50 U	50 U	R	R
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	R	R
4-Chloroaniline	10	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	R	R
4-Nitroaniline	50	50 U	50 U	50 U	50 U
4-Nitrophenol	50	50 U	50 U	R	R
Acenaphthene	10	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U
Benzoic Acid	50	50 U	50 U	R	R
Benzyl Alcohol	10	10 U	10 U	R	R
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U

LOCATION NAME:		LE-01	LE-02	LE-03	LE-04
SITE LOCATION:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-01-0.8-1.0-NX-06-24-L-075	LE-02-0.8-1.0-NX-06-25-L-076	LE-03-0.8-1.0-NX-06-24-L-077	LE-04-0-0-FD-06-24-L-086
DATE SAMPLED:		06/24/91	06/25/91	06/24/91	06/24/91
REMARKS:					Field Duplicate
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 UJ	10 UJ	10 UJ
Hexachloroethane	10	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U
Pentachlorophenol	50	50 U	50 U	R	R
Phenanthrene	10	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	R	R
Pyrene	10	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)				
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		LE-01	LE-02	LE-03	LE-04
SITE LOCATION:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-01-0.8-1.0-NX-06-24-L-075	LE-02-0.8-1.0-NX-06-25-L-076	LE-03-0.8-1.0-NX-06-24-L-077	LE-04-0-0-FD-06-24-L-086
DATE SAMPLED:		06/24/91	06/25/91	06/24/91	06/24/91
REMARKS:					Field Duplicate
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U	1.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U
METALS-UNFILTERED	CRDL(ug/L)				
Aluminum	200	60500 J	9220 J	184 J	55.6 U
Antimony	60	11 U	55.6 U	13.6 U	11 U
Arsenic	10	3.7	4 U	2 U	2 U
Barium	200	328 J	2120	58.3	56.6
Beryllium	5	11.2	8.7	1 U	1 U
Cadmium	5	R	3 U	2.5 U	2.2 U
Calcium	5000	14900	59000	10000	9940
Chromium	10	23.9	7 U	2 U	2 U
Cobalt	50	6.7 U	295	3.3 U	3.3 U
Copper	25	37.8 J	11 U	3 U	3 U
Iron	100	133000 J	1370000 J	75600 J	59200 J
Lead	3	150	174 J	5.4 U	3.9 U
Magnesium	5000	5610	16100	2420	2460
Manganese	15	814	14700 J	9420	8910
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	15.8	13.6	4 U	4 U
Potassium	5000	3620	44800	2840	2870
Selenium	5	4.0 UJ	4 U	4.0 UJ	4.0 UJ
Silver	10	2 U	4 U	2 U	2 U
Sodium	5000	9300 J	55400	5560	5720

LOCATION NAME:		LE-01	LE-02	LE-03	LE-04
SITE LOCATION:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-01-0.8-1.0-NX-06-24-L-075	LE-02-0.8-1.0-NX-06-25-L-076	LE-03-0.8-1.0-NX-06-24-L-077	LE-04-0-0-FD-06-24-L-086
DATE SAMPLED:		06/24/91	06/25/91	06/24/91	06/24/91
REMARKS:					Field Duplicate
Thallium	10	3.0 UJ	1.0 UJ	3.0 UJ	3.0 UJ
Vanadium	50	49.8	65.2	2 U	2 U
Zinc	20	209 J	133 J	34.3	1710 U
METALS-FILTERED	CRDL(ug/L)				
Aluminum	200	335 U	75.8 U	27 U	27 U
Antimony	60	17 U	11 U	17 U	17 U
Arsenic	10	4 U	4 U	4 U	4 U
Barium	200	21.5	6.4 U	57.6	57.6
Beryllium	5	1.1 U	1 U	1 U	1.1 U
Cadmium	5	3 U	3.0 U	3 U	3 U
Calcium	5000	4400	4500	10400	10200
Chromium	10	7 U	2 U	7 U	7 U
Cobalt	50	4 U	3.6 U	4 U	5.0
Copper	25	11 U	3 U	11 U	11 U
Iron	100	1260 J	743	64100 J	53600 J
Lead	3	3.6 U	1.9 U	3.5 U	3.7 U
Magnesium	5000	1360	1420	2600	2590
Manganese	15	184 J	246	9700 J	9370 J
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	6 U	4 U	6 U	6 U
Potassium	5000	1440	1000	3180	3120
Selenium	5	4 U	4 U	4 U	4 U
Silver	10	4 U	2 U	4 U	4 U
Sodium	5000	11600	9780	7850	6310
Thallium	10	1.0 UJ	1 U	1.0 UJ	1.0 UJ
Vanadium	50	3 U	2 U	4.0 U	3 U
Zinc	20	33.9 U	17.6 U	19.7 U	17.2 U
WATER QUALITY PARAMETERS					
CYANIDE	CRDL(ug/L)				
Cyanide	10	10.0 U	36.1	10.0 U	10.0 U
TOTAL ORGANIC CARBON	QL(mg/L)				
Total Organic Carbon	1.0	8.4 J	48 J	2.8 UJ	2.4 UJ

LOCATION NAME:		LE-01	LE-02	LE-03	LE-04
SITE LOCATION:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-01-0.8-1.0-NX-06-24-L-075	LE-02-0.8-1.0-NX-06-25-L-076	LE-03-0.8-1.0-NX-06-24-L-077	LE-04-0-0-FD-06-24-L-086
DATE SAMPLED:		06/24/91	06/25/91	06/24/91	06/24/91
REMARKS:					Field Duplicate
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)				
Biochemical Oxygen Demand	2.4	6.0 U	51	10 U	10 U
OTHER					
Hardness	(mg/L)	60	214	35	35
pH	--	5.35	7.07	6.40	NA
Specific Conductance	(umhos)	100	1000	380	NA

LOCATION NAME:	LE-04	LE-05	LE-06
SITE LOCATION:	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	LE-04-0-0-NX-06-24-L-078	LE-05-0.8-1.0-NX-06-24-L-079	LE-06-0-0.5-NX-06-25-L-080
DATE SAMPLED:	06/24/91	06/24/91	06/25/91
REMARKS:			

VOLATILE ORGANICS-CLP	CRQL(ug/L)			
1,1,1-Trichloroethane	5	5 U	R	5 U
1,1,2,2-Tetrachloroethane	5	5 U	R	5 U
1,1,2-Trichloroethane	5	5 U	R	5 U
1,1-Dichloroethane	5	2 J	2 J	5 U
1,1-Dichloroethene	5	5 U	R	5 U
1,2-Dichloroethane	5	5 U	R	5 U
1,2-Dichloroethene(total)	5	5 U	R	5 U
1,2-Dichloropropane	5	5 U	R	5 U
2-Butanone	10	10 U	R	10 U
2-Hexanone	10	10 U	R	10 U
4-Methyl-2-pentanone	10	10 U	R	10 U
Acetone	10	10 U	R	10 U
Benzene	5	5 U	R	5 U
Bromodichloromethane	5	5 U	R	5 U
Bromoform	5	5 U	R	5 U
Bromomethane	10	10 U	R	10 U
Carbon Disulfide	5	5 U	R	5 U
Carbon Tetrachloride	5	5 U	R	5 U
Chlorobenzene	5	5 U	2 J	5 U
Chloroethane	10	6 J	5 J	10 U
Chloroform	5	5 U	R	5 U
Chloromethane	10	10 U	R	10 U
Dibromochloromethane	5	5 U	R	5 U
Ethylbenzene	5	5 U	R	5 U
Methylene Chloride	5	5 U	5 U	5 U
Styrene	5	5 U	R	5 U
Tetrachloroethene	5	5 U	R	5 U
Toluene	5	30	27 J	5 U
Total Xylenes	5	5 U	R	5 U
Trichloroethene	5	5 U	R	5 U
Vinyl Acetate	10	10 U	R	10 U
Vinyl Chloride	10	10 U	R	10 U
cis-1,3-Dichloropropene	5	5 U	R	5 U
trans-1,3-Dichloropropene	5	5 U	R	5 U
SEMIVOLATILE ORGANICS	**CRQL(ug/L)**			
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U

LOCATION NAME:		LE-04	LE-05	LE-06
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-04-0-0-NX-06-24-L-078	LE-05-0.8-1.0-NX-06-24-L-079	LE-06-0-0.5-NX-06-25-L-080
DATE SAMPLED:		06/24/91	06/24/91	06/25/91
REMARKS:				
1,2-Dichlorobenzene	10	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	R	50 U	R
2,4,6-Trichlorophenol	10	R	10 U	R
2,4-Dichlorophenol	10	R	10 U	R
2,4-Dimethylphenol	10	R	10 U	R
2,4-Dinitrophenol	50	R	50 U	R
2,4-Dinitrotoluene	10	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U
2-Chlorophenol	10	R	10 U	R
2-Methylnaphthalene	10	10 U	10 U	10 U
2-Methylphenol	10	R	10 U	R
2-Nitroaniline	50	50 U	50 U	50 U
2-Nitrophenol	10	R	10 U	R
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U
3-Nitroaniline	50	50 U	50 U	50 U
4,6-Dinitro-2-methylphenol	50	R	50 U	R
4-Bromophenyl-phenylether	10	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	R	10 U	R
4-Chloroaniline	10	10 U	10 U	10 UJ
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U
4-Methylphenol	10	R	10 U	R
4-Nitroaniline	50	50 U	50 U	50 U
4-Nitrophenol	50	R	50 U	R
Acenaphthene	10	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U
Benzoic Acid	50	R	50 U	50 U
Benzyl Alcohol	10	R	10 U	R
Butylbenzylphthalate	10	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U

LOCATION NAME:		LE-04	LE-05	LE-06
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-04-0-0-NX-06-24-L-078	LE-05-0.8-1.0-NX-06-24-L-079	LE-06-0-0.5-NX-06-25-L-080
DATE SAMPLED:		06/24/91	06/24/91	06/25/91
REMARKS:				
Di-n-octylphthalate	10	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 UJ	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U
Pentachlorophenol	50	R	50 U	R
Phenanthrene	10	10 U	10 U	10 U
Phenol	10	R	10 U	R
Pyrene	10	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	230 J
PESTICIDES/PCBs	CRQL(ug/L)			
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U

LOCATION NAME:		LE-04	LE-05	LE-06
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-04-0-0-NX-06-24-L-078	LE-05-0.8-1.0-NX-06-24-L-079	LE-06-0-0.5-NX-06-25-L-080
DATE SAMPLED:		06/24/91	06/24/91	06/25/91
REMARKS:				
Dieldrin	0.10	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U
METALS-UNFILTERED	CRDL(ug/L)			
Aluminum	200	1340 J	383 J	27 U
Antimony	60	28.2 U	17 U	17 U
Arsenic	10	2 U	R	4 U
Barium	200	209	392	22.2
Beryllium	5	1 U	2.2 U	1 U
Cadmium	5	R	3 U	3 U
Calcium	5000	12200	41000	15200
Chromium	10	2 U	7 U	7 U
Cobalt	50	12.3	7.4	5.6
Copper	25	R	11 U	11 U
Iron	100	173000 J	287000 J	15200 J
Lead	3	17.9 U	6.2 U	4.9 U
Magnesium	5000	2560	11000	5620
Manganese	15	11300	2490 J	4930 J
Mercury	0.2	0.2 U	0.2 U	0.2 U
Nickel	40	5.0	8.4 U	6 U
Potassium	5000	3040	25400	2000
Selenium	5	4.0 UJ	R	4 U
Silver	10	2 U	4.0 UJ	4 U
Sodium	5000	5670 J	39100	9910

LOCATION NAME:		LE-04	LE-05	LE-06
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-04-0-0-NX-06-24-L-078	LE-05-0.8-1.0-NX-06-24-L-079	LE-06-0-0.5-NX-06-25-L-080
DATE SAMPLED:		06/24/91	06/24/91	06/25/91
REMARKS:				
Thallium	10	3.0 UJ	1 U	1.0 UJ
Vanadium	50	2.1 U	22.2	3 U
Zinc	20	R	R	8 U
METALS-FILTERED	CRDL(ug/L)			
Aluminum	200	27 U	27 U	10.7 U
Antimony	60	17 U	17 U	11 U
Arsenic	10	4 U	4 U	4 U
Barium	200	56.7	143	22.5
Beryllium	5	1 U	1.1 U	1 U
Cadmium	5	3 U	3 U	2.0 U
Calcium	5000	10500	41500	15200
Chromium	10	7 U	7 U	2 U
Cobalt	50	4 U	4 U	6.0 U
Copper	25	11 U	11 U	3 U
Iron	100	53000 J	12100 J	12500
Lead	3	2.8 U	2.1 U	3.2 U
Magnesium	5000	2690	11500	5850
Manganese	15	9290 J	1410 J	5040
Mercury	0.2	0.2 U	0.2 U	0.2 U
Nickel	40	6 U	6 U	4 U
Potassium	5000	3190	26700	2120
Selenium	5	4 U	4 U	4 U
Silver	10	4 U	4 U	2 U
Sodium	5000	7880	42600	10500
Thallium	10	1.0 UJ	5.0 UJ	1 U
Vanadium	50	3 U	3 U	2 U
Zinc	20	41.6 U	8 U	5.3 U
WATER QUALITY PARAMETERS				
CYANIDE	CRDL(ug/L)			
Cyanide	10	10.0 U	10.0 U	41.7
TOTAL ORGANIC CARBON	QL(mg/L)			
Total Organic Carbon	1.0	2.6 UJ	18 J	19 J

LOCATION NAME:		LE-04	LE-05	LE-06
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-04-0-0-NX-06-24-L-078	LE-05-0.8-1.0-NX-06-24-L-079	LE-06-0-0.5-NX-06-25-L-080
DATE SAMPLED:		06/24/91	06/24/91	06/25/91
REMARKS:				
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)			
Biochemical Oxygen Demand	2.4	20 U	10 U	7.5
OTHER				
Hardness	(mg/L)	41	148	61
pH	--	6.26	6.58	6.23
Specific Conductance	(umhos)	320	1800	250

LEACHATE - APRIL 1992

LOCATION NAME:		LE-05	LE-05	LE-05	LE-05
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-05-0.0-0.5-NX-L-684-4	LE-05-0.0-0.3-NX-L-685-4	LE-05-0.0-0.3-FD-L-687-4	LE-05-0.0-0.3-NX-L-686-4
DATE SAMPLED:		04/07/92	04/08/92	04/10/92	04/10/92
REMARKS:				Field Duplicate	
VOLATILE ORGANICS-CLP	CRQL(ug/L)				
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	1 J	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 UJ	10 U	10 U
Benzene	10	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	2 J	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U
Ethylbenzene	10	1 J	2 J	2 J	2 J
Methylene Chloride	10	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	3 J	2 J	2 J
Trichloroethene	10	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)				
Acrylonitrile	50	50 U	50 U	50 U	50 U

LOCATION NAME:		LE-05	LE-05	LE-05	LE-05
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-05-0.0-0.5-NX-L-684-4	LE-05-0.0-0.3-NX-L-685-4	LE-05-0.0-0.3-FD-L-687-4	LE-05-0.0-0.3-NX-L-686-4
DATE SAMPLED:		04/07/92	04/08/92	04/10/92	04/10/92
REMARKS:				Field Duplicate	
Ethyl Urethane	100	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	118 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)				
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U

LOCATION NAME:		LE-05	LE-05	LE-05	LE-05
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-05-0.0-0.5-NX-L-684-4	LE-05-0.0-0.3-NX-L-685-4	LE-05-0.0-0.3-FD-L-687-4	LE-05-0.0-0.3-NX-L-686-4
DATE SAMPLED:		04/07/92	04/08/92	04/10/92	04/10/92
REMARKS:				Field Duplicate	
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U
Diethylphthalate	10	4 J	11	10 U	4 J
Dimethylphthalate	10	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U
Naphthalene	10	0.9 J	0.7 J	0.7 J	0.7 J
Nitrobenzene	10	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)				
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:	LE-05	LE-05	LE-05	LE-05
SITE LOCATION:	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	LE-05-0.0-0.5-NX-L-684-4	LE-05-0.0-0.3-NX-L-685-4	LE-05-0.0-0.3-FD-L-687-4	LE-05-0.0-0.3-NX-L-686-4
DATE SAMPLED:	04/07/92	04/08/92	04/10/92	04/10/92
REMARKS:			Field Duplicate	
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.05 U	0.05 U	0.050 U	0.050 U
beta-BHC	0.05	0.05 U	0.05 U	0.050 U	0.050 U
delta-BHC	0.05	0.05 U	0.05 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.05 U	0.05 U	0.050 U	0.050 U
METALS-UNFILTERED	CRDL(mg/L)				
Aluminum	200	116 U	623	175 UJ	390
Antimony	60	16 U	16 U	16 U	11 UJ
Arsenic	10	1.2 U	1 U	1 U	1 U
Barium	200	97.4 J	293 J	127	163
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	2 U	0 R	2 UJ	1 U
Calcium	5000	16700	23000	20800	21400
Chromium	10	3 U	3 U	3 UJ	8.2
Cobalt	50	3.2 U	7 U	3 U	3.2 U
Copper	25	3.6 U	2 U	2 U	4 U
Iron	100	49800	283000	79400 J	114000 J
Lead	3	3.8 U	10.5 J	6.2 UJ	5.4 U
Magnesium	5000	5710	7220	6880	6830

LOCATION NAME:		LE-05	LE-05	LE-05	LE-05
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-05-0.0-0.5-NX-L-684-4	LE-05-0.0-0.3-NX-L-685-4	LE-05-0.0-0.3-FD-L-687-4	LE-05-0.0-0.3-NX-L-686-4
DATE SAMPLED:		04/07/92	04/08/92	04/10/92	04/10/92
REMARKS:				Field Duplicate	
Manganese	15	1490	2410	1570	1780
Mercury	0.2	0.2	0.2 U	0.2 UJ	0.2 U
Nickel	40	3 U	0 R	4.2 U	0 R
Potassium	5000	12000	15200	14800	14500
Selenium	5	0 R	0 R	4 UJ	0 R
Silver	10	0 R	0 R	2 U	3 UJ
Sodium	5000	20800	24700 J	23900	23400
Thallium	10	1 UJ	1 UJ	2 UJ	1 U
Vanadium	50	2.5 U	10.7 U	3.7 U	2 UJ
Zinc	20	11 UJ	0 R	12.2 J	8 UJ
METALS-FILTERED	CRDL(ug/L)				
Aluminum	200	71.8 U	29.7 U	22 U	22 U
Antimony	60	11 U	11 U	16 U	16 U
Arsenic	10	2 U	2 U	2 U	2 U
Barium	200	81.5	80.3	82.6	82.4
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	2.2 U	2 U
Calcium	5000	17100	21800	21600	21600
Chromium	10	5 UJ	5 UJ	3 U	3 U
Cobalt	50	2 U	4.7 U	4.8 U	5.4 U
Copper	25	4 U	4 U	2 U	2 U
Iron	100	27500	13800	19900	19700
Lead	3	2.6 U	1.7 U	6.1 UJ	3.4 U
Magnesium	5000	5730	7530	7160	7200
Manganese	15	1410	1570	1550	1550
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	5 U	5 U	3 U	4.9 U
Potassium	5000	12200	16100	15400	15500
Selenium	5	20 UJ	4 UJ	4 UJ	4 UJ
Silver	10	3 U	3 U	2.8 U	2 U
Sodium	5000	22900	27700	25100	25200
Thallium	10	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	50	2 U	2 U	2 U	2 U
Zinc	20	8 UJ	8 UJ	11 UJ	11 UJ
WATER QUALITY PARAMETERS					
CYANIDE	CRDL(mg/L)				
Cyanide	10	10 U	10 U	10 UJ	10 U

LEACHATE - APRIL 1992 (04/07/92-04/15/92)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		LE-05	LE-05	LE-05	LE-05
SITE LOCATION:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		LE-05-0.0-0.5-NX-L-684-4	LE-05-0.0-0.3-NX-L-685-4	LE-05-0.0-0.3-FD-L-687-4	LE-05-0.0-0.3-NX-L-686-4
DATE SAMPLED:		04/07/92	04/08/92	04/10/92	04/10/92
REMARKS:				Field Duplicate	
AMMONIA	QL(mg/L)				
Ammonia	0.03	5.06	10.9	22.6	20.9
TOTAL ORGANIC CARBON	QL(mg/L)				
Total Organic Carbon	0.5	30.9	49.9	39.3	43.5
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)				
Biochemical Oxygen Demand	1.0	4.1 J	1.5	3.5	4.2
OTHER					
Hardness	(mg/L)	65	87	80	82
pH	--	NA	6.49	NA	NA
Specific Conductance	(umhos/cm)	NA	412	NA	NA

ROSE HILL
Binder #: 3.6
Other: # 9082

D-9 COMPLETE ANALYTICAL DATA, GROUNDWATER (MONITORING WELLS)

- JUNE 1991
- SEPTEMBER/OCTOBER 1991
- JANUARY/FEBRUARY 1992
- APRIL 1992

GROUNDWATER (MONITORING WELLS) - JUNE 1991

LOCATION NAME:		MW-I	MW-II	MW-III	MW-III	MW-IV
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		EMW-01-0-NX-06-20-G-004	EMW-02-0-NX-06-20-G-005	EMW-03-0-FD-06-26-G-018	EMW-03-0-NX-06-26-G-006	EMW-04-0-NX-06-26-G-007
DATE SAMPLED:		06/20/91	06/20/91	06/26/91	06/26/91	06/26/91
REMARKS:				Field Duplicate		
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
1,1,2-Trichloroethane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
1,1-Dichloroethane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
1,1-Dichloroethene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
1,2-Dichloroethane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
1,2-Dichloroethene(total)	5	5 U	5 U	5 UJ	5 UJ	5 UJ
1,2-Dichloropropane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
2-Butanone	10	10 U	10 U	R	R	R
2-Hexanone	10	10 U	10 U	10 UJ	10 UJ	10 UJ
4-Methyl-2-pentanone	10	10 U	10 U	10 UJ	10 UJ	10 UJ
Acetone	10	10 U	10 U	10 UJ	10 UJ	10 UJ
Benzene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Bromodichloromethane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Bromoform	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Bromomethane	10	10 U	10 U	10 UJ	10 UJ	10 UJ
Carbon Disulfide	5	49	50	5 UJ	7 J	2 J
Carbon Tetrachloride	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Chlorobenzene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Chloroethane	10	10 U	10 U	10 UJ	10 UJ	10 UJ
Chloroform	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Chloromethane	10	10 U	10 U	10 UJ	10 UJ	10 UJ
Dibromochloromethane	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Ethylbenzene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Methylene Chloride	5	5 U	5 U	5 UJ	5 UJ	5 U
Styrene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Tetrachloroethene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Toluene	5	5 U	64	5 UJ	5 UJ	5 UJ
Total Xylenes	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Trichloroethene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
Vinyl Acetate	10	10 U	10 U	10 UJ	10 UJ	10 UJ
Vinyl Chloride	10	10 U	10 U	10 UJ	10 UJ	10 UJ
cis-1,3-Dichloropropene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
trans-1,3-Dichloropropene	5	5 U	5 U	5 UJ	5 UJ	5 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	R	10 U	10 U

LOCATION NAME:		MW-I	MW-II	MW-III	MW-III	MW-IV
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		EMW-01-0-NX-06-20-G-004	EMW-02-0-NX-06-20-G-005	EMW-03-0-FD-06-26-G-018	EMW-03-0-NX-06-26-G-006	EMW-04-0-NX-06-26-G-007
DATE SAMPLED:		06/20/91	06/20/91	06/26/91	06/26/91	06/26/91
REMARKS:				Field Duplicate		
1,2-Dichlorobenzene	10	10 U	10 U	R	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	R	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	R	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	R	50 U	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	R	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	R	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	R	10 U	10 U
2,4-Dinitrophenol	50	50 U	50 U	R	50 U	50 U
2,4-Dinitrotoluene	10	10 U	10 U	R	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	R	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	R	10 U	10 U
2-Chlorophenol	10	10 U	10 U	R	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	R	10 U	10 U
2-Methylphenol	10	10 U	10 U	R	10 U	10 U
2-Nitroaniline	50	50 U	50 U	R	50 U	50 U
2-Nitrophenol	10	10 U	10 U	R	10 U	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U	R	20 U	20 U
3-Nitroaniline	50	50 U	50 U	R	50 U	50 UJ
4,6-Dinitro-2-methylphenol	50	50 U	50 U	R	50 U	50 U
4-Bromophenyl-phenylether	10	10 U	10 U	R	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	R	10 U	10 U
4-Chloroaniline	10	10 U	10 U	R	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	R	10 U	10 U
4-Methylphenol	10	10 U	10 U	R	10 U	10 U
4-Nitroaniline	50	50 U	50 U	R	50 U	50 UJ
4-Nitrophenol	50	50 U	50 U	R	50 U	50 U
Acenaphthene	10	10 U	10 U	R	10 U	10 U
Acenaphthylene	10	10 U	10 U	R	10 U	10 U
Anthracene	10	10 U	10 U	R	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	R	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	R	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	R	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	R	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	R	10 U	10 U
Benzoic Acid	50	50 U	50 U	R	50 U	50 U
Benzyl Alcohol	10	10 U	10 U	R	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	R	10 U	10 U
Chrysene	10	10 U	10 U	R	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	R	10 U	10 U

LOCATION NAME:		MW-I	MW-II	MW-III	MW-III	MW-IV
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		EMW-01-0-NX-06-20-G-004	EMW-02-0-NX-06-20-G-005	EMW-03-0-FD-06-26-G-018	EMW-03-0-NX-06-26-G-006	EMW-04-0-NX-06-26-G-007
DATE SAMPLED:		06/20/91	06/20/91	06/26/91	06/26/91	06/26/91
REMARKS:				Field Duplicate		
Di-n-octylphthalate	10	10 U	10 U	R	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	R	10 U	10 U
Dibenzofuran	10	10 U	10 U	R	10 U	10 U
Diethylphthalate	10	10 U	10 U	R	10 U	10 U
Dimethylphthalate	10	10 U	10 U	R	10 U	10 U
Fluoranthene	10	10 U	10 U	R	10 U	10 U
Fluorene	10	10 U	10 U	R	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	R	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	R	10 U	10 U
Hexachlorocyclopentadiene	10	10 UJ	10 UJ	R	10 U	10 U
Hexachloroethane	10	10 U	10 U	R	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	R	10 U	10 U
Isophorone	10	10 U	10 U	R	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	R	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	R	10 U	10 U
Naphthalene	10	10 U	10 U	R	10 U	10 U
Nitrobenzene	10	10 U	10 U	R	10 U	10 U
Pentachlorophenol	50	50 U	50 U	R	50 U	50 U
Phenanthrene	10	10 U	10 U	R	10 U	10 U
Phenol	10	10 U	10 U	R	10 U	10 U
Pyrene	10	10 U	10 U	R	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	R	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	R	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	R	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	R	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-I	MW-II	MW-III	MW-III	MW-IV
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		EMW-01-0-NX-06-20-G-004	EMW-02-0-NX-06-20-G-005	EMW-03-0-FD-06-26-G-018	EMW-03-0-NX-06-26-G-006	EMW-04-0-NX-06-26-G-007
DATE SAMPLED:		06/20/91	06/20/91	06/26/91	06/26/91	06/26/91
REMARKS:				Field Duplicate		
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	663 J	627 J	16200 J	25100 J	2400 J
Antimony	60	21.8 U	11 U	17 U	17 U	17 U
Arsenic	10	2 U	2.7	4 U	4 U	4 U
Barium	200	7.7 U	26.0	88.3	123	19.5
Beryllium	5	1 U	1 U	3.1	2.0	1 U
Cadmium	5	2.2 U	3.0 U	3 U	3 U	19.4
Calcium	5000	1020	8460	7460	9240	3430
Chromium	10	4.1 U	2.6 U	15.3	30.6	7 U
Cobalt	50	3.9 U	7.8 U	12.6	19.6	21.0
Copper	25	3 U	5.6 U	59.2	91.7	45.5
Iron	100	794 J	73600 J	26400 J	41600 J	50800 J
Lead	3	3.2 U	5.2 U	49.3 J	94.4	10.9 U
Magnesium	5000	887	4030	5480	7760	1660
Manganese	15	44.0	3850	1150 J	1650 J	4340 J
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	5.4	5.4	18.6	28.4	19.9
Potassium	5000	499	3390	4120	5820	2030
Selenium	5	4.0 UJ	4.0 UJ	4 U	4 U	4 U
Silver	10	2 U	2 U	4 U	4 U	4 U
Sodium	5000	3040	4740	6020	6860	6790

LOCATION NAME:		MW-I	MW-II	MW-III	MW-III	MW-IV
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		EMW-01-0-NX-06-20-G-004	EMW-02-0-NX-06-20-G-005	EMW-03-0-FD-06-26-G-018	EMW-03-0-NX-06-26-G-006	EMW-04-0-NX-06-26-G-007
DATE SAMPLED:		06/20/91	06/20/91	06/26/91	06/26/91	06/26/91
REMARKS:				Field Duplicate		
Thallium	10	3.0 UJ	3.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3.6 U	2.5 U	22.5	33.2	7.6 U
Zinc	20	28.9 U	32.5	104 J	171 J	210 J
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	27 U	27 U	50.5 U	55.5 U	10 U
Antimony	60	17 U	17 U	11 U	11 U	11 U
Arsenic	10	4 U	4 U	4 U	4 U	4 U
Barium	200	3.7 U	21.5	14.3	15.1	10.6
Beryllium	5	1 U	1.6 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	1.8 U	1.6 U	1 U
Calcium	5000	1060 U	8210	6080	6220	3570
Chromium	10	7 U	7 U	2.0 U	2 U	2 U
Cobalt	50	4 U	5.0	2 U	2 U	16.7 U
Copper	25	11 U	11 U	3 U	3 U	3 U
Iron	100	18 U	64300 J	28.4 U	13.8 U	32000
Lead	3	2.3 U	55.4 U	6.4 U	4.2 U	1.7 U
Magnesium	5000	716	3940	2040	2060	1220
Manganese	15	9 U	3780 J	519	529	4160
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	6 U	6 U	4 U	4 U	7.8
Potassium	5000	260	3370	669	729	1540
Selenium	5	4 U	4.0 UJ	4 U	4 U	4 U
Silver	10	4 U	4 U	2 U	2 U	2 U
Sodium	5000	3410	6030	5220	5510	8280
Thallium	10	1.0 UJ	1.0 UJ	1 U	1 U	3.0 UJ
Vanadium	50	3 U	4.6 U	2 U	2 U	2 U
Zinc	20	8 U	39.1	53.8 U	66.6	57.5
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	2.70	0.64	0.05 J	1.60 J	0.81
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 U	10.0 U	2 U	2 U	2 U

LOCATION NAME:		MW-I	MW-II	MW-III	MW-III	MW-IV
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		EMW-01-0-NX-06-20-G-004	EMW-02-0-NX-06-20-G-005	EMW-03-0-FD-06-26-G-018	EMW-03-0-NX-06-26-G-006	EMW-04-0-NX-06-26-G-007
DATE SAMPLED:		06/20/91	06/20/91	06/26/91	06/26/91	06/26/91
REMARKS:				Field Duplicate		
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	1.0	1.5 UJ	4.8 UJ	2.0 UJ	2.8 UJ	2.3 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	2.4	2.4 U	8.0	3.0 U	3.0 U	10 U
OTHER						
Hardness	(mg/L)	6	38	41	55	15
pH	--	6.15	6.5	NA	6.94	6.82
Specific Conductance	(umhos)	21	260	NA	51	195

LOCATION NAME:	MW-V	OW-25	OW-27	OW-30
FLOW ZONE:	SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:	EMW-05-0-NX-06-27-G-008	EOW-25-0-NX-06-27-G-001	EOW-27-0-NX-06-27-G-002	EOW-30-0-NX-06-27-G-003
DATE SAMPLED:	06/27/91	06/27/91	06/27/91	06/27/91
REMARKS:				

VOLATILE ORGANICS-CLP	CRQL(ug/L)				
1,1,1-Trichloroethane	5	5 U	5 U	5 U	34
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	1 J	220 J
1,1-Dichloroethene	5	2 J	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U
1,2-Dichloroethene(total)	5	5 U	3 J	13	730
1,2-Dichloropropane	5	5 U	3 J	5 U	2 J
2-Butanone	10	10 U	10 U	10 U	140
2-Hexanone	10	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	31
Acetone	10	10 U	10 U	24 U	49 U
Benzene	5	5 U	28	7	20
Bromodichloromethane	5	5 U	5 U	5 U	5 U
Bromoform	5	5 U	5 U	5 U	5 U
Bromomethane	10	10 U	10 U	10 U	10 U
Carbon Disulfide	5	5 U	87	52	3 J
Carbon Tetrachloride	5	5 U	5 U	5 U	5 U
Chlorobenzene	5	5 U	13	2 J	5 U
Chloroethane	10	10 U	10 U	4 J	86
Chloroform	5	5 U	5 U	5 U	5 U
Chloromethane	10	10 U	10 U	10 U	10 U
Dibromochloromethane	5	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	72	25	17
Methylene Chloride	5	6 U	5 U	5 U	8 U
Styrene	5	5 U	5 U	5 U	5 U
Tetrachloroethene	5	5 U	5 U	5 U	5 U
Toluene	5	5 U	120	5 U	150
Total Xylenes	5	5 U	210	66	39
Trichloroethene	5	5 U	5 U	5 U	5 U
Vinyl Acetate	10	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	3 J	9 J	690 J
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U
SEMIVOLATILE ORGANICS	**CRQL(ug/L)**				
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-V	OW-25	OW-27	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-0-NX-06-27-G-008	EOW-25-0-NX-06-27-G-001	EOW-27-0-NX-06-27-G-002	EOW-30-0-NX-06-27-G-003
DATE SAMPLED:		06/27/91	06/27/91	06/27/91	06/27/91
REMARKS:					
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	25	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	50 U	R
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	R
2,4-Dichlorophenol	10	10 U	10 U	10 U	R
2,4-Dimethylphenol	10	10 U	10 U	10 U	R
2,4-Dinitrophenol	50	50 U	50 U	50 U	R
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	R
2-Methylnaphthalene	10	2 J	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	R
2-Nitroaniline	50	50 U	50 U	50 U	50 U
2-Nitrophenol	10	10 U	10 U	10 U	R
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U	20 U
3-Nitroaniline	50	50 UJ	50 UJ	50 UJ	50 UJ
4,6-Dinitro-2-methylphenol	50	50 U	50 U	50 U	R
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	R
4-Chloroaniline	10	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Methylphenol	10	7 J	10 U	10 U	51 J
4-Nitroaniline	50	50 UJ	50 UJ	50 UJ	50 UJ
4-Nitrophenol	50	50 U	50 U	50 U	R
Acenaphthene	10	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U
Benzoic Acid	50	50 U	50 U	50 U	12 J
Benzyl Alcohol	10	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-V	OW-25	OW-27	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-0-NX-06-27-G-008	EOW-25-0-NX-06-27-G-001	EOW-27-0-NX-06-27-G-002	EOW-30-0-NX-06-27-G-003
DATE SAMPLED:		06/27/91	06/27/91	06/27/91	06/27/91
REMARKS:					
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 J
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U
Pentachlorophenol	50	50 U	50 U	50 U	R
Phenanthrene	10	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	R
Pyrene	10	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)				
4,4'-DDD	0.10	0.10 U	NA	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	NA	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	NA	0.10 U	0.10 U
Aldrin	0.05	0.05 U	NA	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	NA	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	NA	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	NA	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	NA	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	NA	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	NA	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	NA	1.0 U	1.0 U

LOCATION NAME:		MW-V	OW-25	OW-27	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-0-NX-06-27-G-008	EOW-25-0-NX-06-27-G-001	EOW-27-0-NX-06-27-G-002	EOW-30-0-NX-06-27-G-003
DATE SAMPLED:		06/27/91	06/27/91	06/27/91	06/27/91
REMARKS:					
Dieldrin	0.10	0.10 U	NA	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	NA	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	NA	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	NA	0.10 U	0.10 U
Endrin	0.10	0.10 U	NA	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	NA	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	NA	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	NA	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	NA	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	NA	1.0 U	1.0 U
alpha-BHC	0.05	0.05 U	NA	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	NA	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	NA	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	NA	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	NA	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	NA	0.50 U	0.50 U
METALS - UNFILTERED	CRDL(mg/L)				
Aluminum	200	2570 J	22700 J	21400 J	917 J
Antimony	60	17 U	17.7 U	23.3 U	17 U
Arsenic	10	R	8.6 J	4.8 J	R
Barium	200	20.5	217	238	52.6 J
Beryllium	5	2.7 U	4.3 U	4.3 U	1.6 U
Cadmium	5	3 U	3 U	40.0 J	3 U
Calcium	5000	3340	168000	84000	56800
Chromium	10	7 U	62.5 J	44.8 J	7 U
Cobalt	50	4 U	29.4	33.1	4 U
Copper	25	11 U	107	49.4 U	11 U
Iron	100	4050 J	123000 J	157000 J	114000 J
Lead	3	5.9 U	181 J	173 J	4.2 U
Magnesium	5000	1350	62000	5990	6200
Manganese	15	132 J	1620 J	1020 J	2970 J
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	8.4 U	67.9	79.0	6 U
Potassium	5000	1580	170000	9770	12000
Selenium	5	R	R	R	R
Silver	10	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
Sodium	5000	5450	501000	8910 J	11400

LOCATION NAME:		MW-V	OW-25	OW-27	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-0-NX-06-27-G-008	EOW-25-0-NX-06-27-G-001	EOW-27-0-NX-06-27-G-002	EOW-30-0-NX-06-27-G-003
DATE SAMPLED:		06/27/91	06/27/91	06/27/91	06/27/91
REMARKS:					
Thallium	10	1 U	10.0 U	1 U	1 U
Vanadium	50	4.2 U	45.2	36.7	9.6 U
Zinc	20	38.1 U	645 J	5980 J	R
METALS - FILTERED	CRDL(ug/L)				
Aluminum	200	24.6 U	64.4 U	25.2 U	29.4 U
Antimony	60	11 U	19.4	11 U	11 U
Arsenic	10	4 U	4 U	4 U	4 U
Barium	200	7.2 U	87.9	69.5	47.5 J
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	1 U	2.5 U	1 U	R
Calcium	5000	3420	137000	73800	59800
Chromium	10	2 U	2 U	2 U	2.0 UJ
Cobalt	50	2 U	4.9 U	2 U	3.7 UJ
Copper	25	3 U	3 U	3 U	3 U
Iron	100	34.6 U	20800	93400	115000
Lead	3	1.2 U	1.3 U	1.7 U	1.8 U
Magnesium	5000	951	59800	3070	6210
Manganese	15	7.5 U	191	619	2850 J
Mercury	0.2	0.2 U	0.63	0.2 U	0.2 U
Nickel	40	4 U	9.2	4 U	4 U
Potassium	5000	718	171000	5780	11900
Selenium	5	4 U	4 U	4 U	4 U
Silver	10	2 U	2 U	2 U	2 U
Sodium	5000	6300	540000	10200	13100 J
Thallium	10	3.0 UJ	15.0 UJ	3.0 UJ	3.0 UJ
Vanadium	50	2 U	2 U	2 U	2 U
Zinc	20	11.8 U	43.9	19.2	R
WATER QUALITY PARAMETERS					
SULFIDE	CRQL(mg/L)				
Sulfide	0.05	2.40	1.70	3.30	1.70
CYANIDE	CRDL(mg/L)				
Cyanide	10	10.0 U	NA	10.0 U	10.0 U

LOCATION NAME:		MW-V	OW-25	OW-27	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-0-NX-06-27-G-008	EOW-25-0-NX-06-27-G-001	EOW-27-0-NX-06-27-G-002	EOW-30-0-NX-06-27-G-003
DATE SAMPLED:		06/27/91	06/27/91	06/27/91	06/27/91
REMARKS:					
TOTAL ORGANIC CARBON	QL(mg/L)				
Total Organic Carbon	1.0	1.0 UJ	NA	24 J	65 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)				
Biochemical Oxygen Demand	2.4	2.4 U	NA	10 U	120
OTHER					
Hardness	(mg/L)	14	675	234	167
pH	--	7.11	6.64	6.58	6.80
Specific Conductance	(umhos)	140	5600	810	750

GROUNDWATER (MONITORING WELLS) - SEPTEMBER/OCTOBER 1991

GROUNDWATER - SEPTEMBER/OCTOBER 1991 (09/24/91-10/09/91)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-02-02
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-181-2	NMW-01-02-NX-G-182-2	NMW-02-01-FD-G-318-2	NMW-02-01-NX-G-183-2	NMW-02-02-NX-G-184-2
DATE SAMPLED:		10/01/91	10/02/91	10/08/91	10/08/91	10/08/91
REMARKS:				Field Duplicate		
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	R	R	64 U
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	3 J	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 U	67 UJ	50 UJ	73 UJ	50 UJ

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-02-02
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-181-2	NMW-01-02-NX-G-182-2	NMW-02-01-FD-G-318-2	NMW-02-01-NX-G-183-2	NMW-02-02-NX-G-184-2
DATE SAMPLED:		10/01/91	10/02/91	10/08/91	10/08/91	10/08/91
REMARKS:				Field Duplicate		
Acrylamide	200	200 U	200 U	R	R	200 UJ
Acrylonitrile	50	50 UJ	50 U	50 UJ	50 UJ	50 UJ
Ethyl Urethane	100	100 U	100 U	100 UJ	100 UJ	100 UJ
N,N-DMF	50	50 U	50 U	50 UJ	50 UJ	50 UJ
Urethane	1000	1000 U	1000 U	1000 UJ	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	NA	NA	NA
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 UJ	10 UJ	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 UJ	25 UJ	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-02-02
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-181-2	NMW-01-02-NX-G-182-2	NMW-02-01-FD-G-318-2	NMW-02-01-NX-G-183-2	NMW-02-02-NX-G-184-2
DATE SAMPLED:		10/01/91	10/02/91	10/08/91	10/08/91	10/08/91
REMARKS:				Field Duplicate		
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	NA	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-02-02
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-181-2	NMW-01-02-NX-G-182-2	NMW-02-01-FD-G-318-2	NMW-02-01-NX-G-183-2	NMW-02-02-NX-G-184-2
DATE SAMPLED:		10/01/91	10/02/91	10/08/91	10/08/91	10/08/91
REMARKS:				Field Duplicate		
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Aldrin	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 UJ	2.0 UJ	2.0 UJ
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Dieldrin	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endosulfan I	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
Endosulfan II	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endrin	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Heptachlor	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
Methoxychlor	0.50	0.50 U	0.50 U	0.50 UJ	0.50 UJ	0.50 UJ
Toxaphene	5.0	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 UJ
alpha-BHC	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
alpha-Chlordane	0.05	0.050 U	0.050 U	0.0026 J	0.0023 J	0.050 UJ
beta-BHC	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
delta-BHC	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	19700 J	201 J	53500	57700	2340
Antimony	60	25 U	25 U	60.5	87.8	47 U
Arsenic	10	1.1	1 U	2.0 UJ	2.0 UJ	2.0 UJ
Barium	200	113	7.0 U	252	279	17.8 U
Beryllium	5	3.0 U	1 U	10.6 UJ	11.1 UJ	1.0 UJ
Cadmium	5	3 U	3 U	3.0 UJ	3.0 UJ	3.0 UJ
Calcium	5000	15600	17200	12100	12500	9550
Chromium	10	28.9 U	8 U	53.6 J	55.4 J	10.2 UJ
Cobalt	50	27.7	6 U	57.9 U	61.3 U	51.1 U
Copper	25	51.0 U	4 U	95.4	96.0	30.9 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-02-02
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-181-2	NMW-01-02-NX-G-182-2	NMW-02-01-FD-G-318-2	NMW-02-01-NX-G-183-2	NMW-02-02-NX-G-184-2
DATE SAMPLED:		10/01/91	10/02/91	10/08/91	10/08/91	10/08/91
REMARKS:				Field Duplicate		
Iron	100	31500	7630 UJ	114000	122000	4750
Lead	3	23.6	2.1 UJ	72.8	92.0	4.7 U
Magnesium	5000	3770	1670	13200	14300	1740
Manganese	15	4080	54.5 J	5230	5780	731
Mercury	0.2	0.2 U	0.2 U	0.20 UJ	0.20 UJ	0.20 UJ
Nickel	40	23.3	16 U	80.7 U	87.4	36.3 U
Potassium	5000	8310	1570	12700	13300	1890 U
Selenium	5	1.0 UJ	1.0 UJ	R	R	R
Silver	10	3 U	3 U	4.0 UJ	4.0 UJ	4.0 UJ
Sodium	5000	15400	8190	7260	7320	8140
Thallium	10	1 U	1.0 UJ	4 U	4 U	4 U
Vanadium	50	15.9	3 U	99.9	102	6.5
Zinc	20	77.3 U	13.6 U	343 J	381	19.0 UJ
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	47.1 U	165 J	61.9 U	23.5 U	19.6 U
Antimony	60	25 U	25 U	14 U	14 U	14 U
Arsenic	10	1 U	1 U	2 U	2 U	2.0 UJ
Barium	200	15.9	3.9 U	6.9 U	8.9 U	2.5 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	1 U	1 U	1 U
Calcium	5000	11000	17300	9030	9280	9620
Chromium	10	8 U	8 U	2 U	2 U	2 U
Cobalt	50	12.8	6 U	4.2 U	2.4 U	34.0 U
Copper	25	5.4 U	11.6	2 U	2 U	2 U
Iron	100	3150 J	83.7 UJ	2710 J	5230 J	262 J
Lead	3	2.6 U	2.7 UJ	1.4 U	2.3 U	1.3 U
Magnesium	5000	1890	1750	2490	2450	1460
Manganese	15	3560 J	10.9 UJ	1470 J	2140 J	630 J
Mercury	0.2	0.2 U	0.2 U	0.20 UJ	0.20 UJ	0.20 UJ
Nickel	40	16 U	16 U	5 U	5.0 U	23.1
Potassium	5000	3930	1740	1640 U	1600 U	1310 U
Selenium	5	1 U	1.0 UJ	R	R	R
Silver	10	3 U	3 U	5 U	5 U	5 U
Sodium	5000	15400	8280	5230 U	5350 U	7940
Thallium	10	1 U	1.0 UJ	1 U	1 U	1.0 UJ
Vanadium	50	3 U	3 U	2 U	2 U	2 U
Zinc	20	12.2 U	26.2 U	6.5 J	6.9 J	8.4 J

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-02-02
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-181-2	NMW-01-02-NX-G-182-2	NMW-02-01-FD-G-318-2	NMW-02-01-NX-G-183-2	NMW-02-02-NX-G-184-2
DATE SAMPLED:		10/01/91	10/02/91	10/08/91	10/08/91	10/08/91
REMARKS:				Field Duplicate		
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	2.4 U	0.4 U	0.4 UJ	0.4 UJ	0.4 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	19.0 J	1.7 UJ	70.0	57.8	2.7 U
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	3.9 U	1.3 UJ	3.0 UJ	2.1 UJ	1.0 U
OTHER						
Hardness	(mg/L)	54	50	85	90	31
pH	--	6.21	7.1	NA	6.64	7.26
Specific Conductance	(umhos/cm)	200	110	NA	50	80

LOCATION NAME:		MW-03-01	MW-03-02	MW-03-03	MW-03-03	MW-04-01
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-03-01-NX-G-185-2	NMW-03-02-NX-G-186-2	NMW-03-03-FD-G-320-2	NMW-03-03-NX-G-187-2	NMW-04-01-NX-G-188-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91
REMARKS:				Field Duplicate		
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	1 J	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 UJ	27 J	10 U
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	3 J	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	1 J	1 J	10 U
Total Xylenes	10	4 J	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 UJ	50 U	50 UJ	50 UJ	50 UJ

LOCATION NAME:		MW-03-01	MW-03-02	MW-03-03	MW-03-03	MW-04-01
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-03-01-NX-G-185-2	NMW-03-02-NX-G-186-2	NMW-03-03-FD-G-320-2	NMW-03-03-NX-G-187-2	NMW-04-01-NX-G-188-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91
REMARKS:				Field Duplicate		
Acrylamide	200	200 U	200 U	200 UJ	200 UJ	200 UJ
Acrylonitrile	50	50 U	50 U	50 UJ	50 UJ	50 UJ
Ethyl Urethane	100	100 U	100 U	100 UJ	100 UJ	100 UJ
N,N-DMF	50	183	50 U	50 UJ	50 UJ	50 UJ
Urethane	1000	1000 U	1000 U	1000 UJ	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 UJ	10 UJ	10 UJ
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-03-01	MW-03-02	MW-03-03	MW-03-03	MW-04-01
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-03-01-NX-G-185-2	NMW-03-02-NX-G-186-2	NMW-03-03-FD-G-320-2	NMW-03-03-NX-G-187-2	NMW-04-01-NX-G-188-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91
REMARKS:				Field Duplicate		
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	13 U	12 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		MW-03-01	MW-03-02	MW-03-03	MW-03-03	MW-04-01
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-03-01-NX-G-185-2	NMW-03-02-NX-G-186-2	NMW-03-03-FD-G-320-2	NMW-03-03-NX-G-187-2	NMW-04-01-NX-G-188-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91
REMARKS:				Field Duplicate		
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	12700	1790	223 U	155 U	24300
Antimony	60	25 U	25 U	25 U	25 U	25 U
Arsenic	10	2.3	1 U	1 U	1.6	1.7
Barium	200	234	16.2 U	9.1	9.1	244
Beryllium	5	4.5 U	1 U	1 U	1 U	4.4 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	35100	9620	8500 J	8420 J	20600 J
Chromium	10	10.5 U	19.2	12.1	8 U	22.2
Cobalt	50	20.7	6 U	6 U	6 U	23.4
Copper	25	16.3 U	18.5	28.9 UJ	21.9 UJ	66.1 UJ

LOCATION NAME:		MW-03-01	MW-03-02	MW-03-03	MW-03-03	MW-04-01
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-03-01-NX-G-185-2	NMW-03-02-NX-G-186-2	NMW-03-03-FD-G-320-2	NMW-03-03-NX-G-187-2	NMW-04-01-NX-G-188-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91
REMARKS:				Field Duplicate		
Iron	100	24000	1920 J	5080 J	5210 UJ	51400
Lead	3	10.8 U	4.5 UJ	7.6 UJ	5.7 UJ	27.8 U
Magnesium	5000	8290	1560	1140 J	1140 J	4000 J
Manganese	15	3000	2270 J	42.9 J	43.6 J	9790
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	35.4	16 U	16 U	21.4
Potassium	5000	18200	2870	2340 U	1830 U	5410
Selenium	5	1.0 UJ	1.0 UJ	1.3 U	1 U	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	33000	9490	12700	12700	12800
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	13.7	3 U	3 U	3 U	30.2
Zinc	20	65.4 U	103	88.5 J	109 UJ	133 J
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	63.5 U	132 J	13 U	28.3 U	124 U
Antimony	60	25 U	25 U	25 U	25 U	34.1
Arsenic	10	1 U	1 U	1 U	1 U	1.2 J
Barium	200	55.6	5.0 U	5.0	5.0	24.6
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	21300	9550	8570 J	8140 J	17200 J
Chromium	10	8 U	8 U	8 U	8 U	8 U
Cobalt	50	8.3	6 U	6 U	6 U	6 U
Copper	25	22.1 U	26.3	4.4 UJ	18.3 UJ	9.4 UJ
Iron	100	13400 J	141 UJ	6.0 UJ	8.3 UJ	15500
Lead	3	1 U	2.9 UJ	1.0 UJ	3.8 UJ	1.9 U
Magnesium	5000	5270	1460	1130 J	1050 J	1980 J
Manganese	15	2350 J	2110 J	2.0 UJ	2.0 J	6660
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	27.2	16 U	16 U	16 U
Potassium	5000	11700	2280	1970 U	1710 U	2260 U
Selenium	5	1 U	1.0 UJ	1 U	1 U	1 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	27100	9030	12700	12200	11500
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	22.4 U	81.5 U	6.0 UJ	23.7 UJ	17.6 UJ

LOCATION NAME:		MW-03-01	MW-03-02	MW-03-03	MW-03-03	MW-04-01
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-03-01-NX-G-185-2	NMW-03-02-NX-G-186-2	NMW-03-03-FD-G-320-2	NMW-03-03-NX-G-187-2	NMW-04-01-NX-G-188-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91	10/03/91
REMARKS:				Field Duplicate		
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	1.2 UJ	0.4 UJ	0.4 UJ	0.4 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10.0 UJ	10 U	10 U	10 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	12.9	0.7 UJ	2.5 UJ	3.2 UJ	26.1 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	6.0 UJ	1.0 U	1.0 U	1.0 U	2.9 U
OTHER						
Hardness	(mg/L)	122	30	26 J	26 J	68 J
pH	--	6.7	7.19	NA	7.5	6.9
Specific Conductance	(umhos/cm)	440	800	NA	140	290

LOCATION NAME:		MW-04-02	MW-04-03	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		DEEP OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-04-02-NX-G-189-2	NMW-04-03-NX-G-190-2	NMW-05-01-NX-G-191-2	NMW-05-02-NX-G-192-2	NMW-06-01-NX-G-193-2
DATE SAMPLED:		10/03/91	10/07/91	10/07/91	10/07/91	10/04/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	2 J	7 J	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10	10 U	1 J	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	130	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	3 J	10 U	10 U	10 U
Acetone	10	10 U	120	15 U	10 U	10 U
Benzene	10	5 J	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	48 J	8 J	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	2 J	1 J	10 U	10 U	10 U
Methylene Chloride	10	10 U	13 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	1 J	10 U	10 U	10 U
Toluene	10	10 U	10	10 U	10 U	10 U
Total Xylenes	10	10 J	4 J	10 U	10 U	10 U
Trichloroethene	10	10 U	3 J	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 UJ	108 UJ	101 UJ	50 UJ	50 U

LOCATION NAME:		MW-04-02	MW-04-03	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		DEEP OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-04-02-NX-G-189-2	NMW-04-03-NX-G-190-2	NMW-05-01-NX-G-191-2	NMW-05-02-NX-G-192-2	NMW-06-01-NX-G-193-2
DATE SAMPLED:		10/03/91	10/07/91	10/07/91	10/07/91	10/04/91
REMARKS:						
Acrylamide	200	229 J	200 UJ	200 UJ	200 UJ	200 U
Acrylonitrile	50	50 UJ	50 UJ	50 UJ	R	50 U
Ethyl Urethane	100	100 UJ	100 UJ	100 UJ	100 UJ	100 U
N,N-DMF	50	50 UJ	537 J	50 UJ	50 UJ	50 U
Urethane	1000	1000 UJ	1000 UJ	1000 UJ	1000 UJ	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 UJ	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 UJ	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 UJ	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 UJ	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 UJ	NA	NA	NA	NA
2,4,5-Trichlorophenol	25	25 U	25 U	25 UJ	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 UJ	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 UJ	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 UJ	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 UJ	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 UJ	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 UJ	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 UJ	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 UJ	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 UJ	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 UJ	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 UJ	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 UJ	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 UJ	10 UJ	10 UJ	10 U
3-Nitroaniline	25	25 U	25 U	25 UJ	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 UJ	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 UJ	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 UJ	10 U	10 U
4-Chloroaniline	10	10 U	10 UJ	10 UJ	10 UJ	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 UJ	10 U	10 U
4-Methylphenol	10	10 U	1 J	10 UJ	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 UJ	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 UJ	25 U	25 U
Acenaphthene	10	10 U	10 U	10 UJ	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 UJ	10 U	10 U
Anthracene	10	10 U	10 U	10 UJ	10 U	10 U

LOCATION NAME:		MW-04-02	MW-04-03	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		DEEP OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-04-02-NX-G-189-2	NMW-04-03-NX-G-190-2	NMW-05-01-NX-G-191-2	NMW-05-02-NX-G-192-2	NMW-06-01-NX-G-193-2
DATE SAMPLED:		10/03/91	10/07/91	10/07/91	10/07/91	10/04/91
REMARKS:						
Benzo(a)anthracene	10	10 U	10 U	10 UJ	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 UJ	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 UJ	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 UJ	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 UJ	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 UJ	10 U	10 U
Carbazole	10	10 U	10 U	10 UJ	10 U	10 U
Chrysene	10	10 U	10 U	10 UJ	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 UJ	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 UJ	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 UJ	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 UJ	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 UJ	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 UJ	10 U	10 U
Fluoranthene	10	10 U	10 U	10 UJ	10 U	10 U
Fluorene	10	10 U	10 U	10 UJ	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 UJ	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 UJ	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 UJ	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 UJ	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 UJ	10 U	10 U
Isophorone	10	10 U	10 U	10 UJ	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 UJ	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 UJ	10 U	10 U
Naphthalene	10	1 J	10 U	10 UJ	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 UJ	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 UJ	25 U	25 U
Phenanthrene	10	10 U	10 U	10 UJ	10 U	10 U
Phenol	10	10 U	5 J	10 UJ	10 U	10 U
Pyrene	10	10 U	10 U	10 UJ	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 UJ	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 UJ	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	10 U	10 UJ	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	36	10 UJ	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U
4,4'-DDE	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U

LOCATION NAME:		MW-04-02	MW-04-03	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		DEEP OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-04-02-NX-G-189-2	NMW-04-03-NX-G-190-2	NMW-05-01-NX-G-191-2	NMW-05-02-NX-G-192-2	NMW-06-01-NX-G-193-2
DATE SAMPLED:		10/03/91	10/07/91	10/07/91	10/07/91	10/04/91
REMARKS:						
4,4'-DDT	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U
Aldrin	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
Aroclor-1016	1.0	1.2 U	1.1 UJ	1.0 UJ	1.0 UJ	1.0 U
Aroclor-1221	2.0	2.5 U	2.1 UJ	2.0 UJ	2.0 UJ	2.0 U
Aroclor-1232	1.0	1.2 U	1.1 UJ	1.0 UJ	1.0 UJ	1.0 U
Aroclor-1242	1.0	1.2 U	1.1 UJ	1.0 UJ	1.0 UJ	1.0 U
Aroclor-1248	1.0	1.2 U	1.1 UJ	1.0 UJ	1.0 UJ	1.0 U
Aroclor-1254	1.0	1.2 U	1.1 UJ	1.0 UJ	1.0 UJ	1.0 U
Aroclor-1260	1.0	1.2 U	1.1 UJ	0.24 J	1.0 UJ	1.0 U
Dieldrin	0.10	0.12 U	0.0035 J	0.10 UJ	0.10 UJ	0.10 U
Endosulfan I	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
Endosulfan II	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U
Endosulfan Sulfate	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U
Endrin	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U
Endrin Aldehyde	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U
Endrin Ketone	0.10	0.12 U	0.11 UJ	0.10 UJ	0.10 UJ	0.10 U
Heptachlor	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
Heptachlor Epoxide	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
Methoxychlor	0.50	0.62 U	0.53 UJ	0.50 UJ	0.50 UJ	0.50 U
Toxaphene	5.0	6.2 U	5.3 UJ	5.0 UJ	5.0 UJ	5.0 U
alpha-BHC	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
alpha-Chlordane	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
beta-BHC	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
delta-BHC	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
gamma-BHC(Lindane)	0.05	0.062 U	0.0057 J	0.050 UJ	0.050 UJ	0.050 U
gamma-Chlordane	0.05	0.062 U	0.053 UJ	0.050 UJ	0.050 UJ	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	2680 J	86.8 U	18600	12700	1390 J
Antimony	60	25 U	47 U	47 U	47 U	25 U
Arsenic	10	1.5	2.0 UJ	2.0 UJ	2.0 UJ	1 U
Barium	200	144	2 U	67.5	67.5	56.5
Beryllium	5	1 U	2.1 UJ	4.8 UJ	2.6 UJ	1 U
Cadmium	5	3 U	3.0 UJ	3.0 UJ	3.0 UJ	3 U
Calcium	5000	30000 J	46100	6080	7970	6260
Chromium	10	17.5	6.0 UJ	24.0 UJ	8.3 UJ	12.4 U
Cobalt	50	15.1	13.6 U	10.2 U	13.6 U	6 U
Copper	25	46.6 UJ	10.9 U	104	68.7	9.8 U

LOCATION NAME:		MW-04-02	MW-04-03	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		DEEP OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-04-02-NX-G-189-2	NMW-04-03-NX-G-190-2	NMW-05-01-NX-G-191-2	NMW-05-02-NX-G-192-2	NMW-06-01-NX-G-193-2
DATE SAMPLED:		10/03/91	10/07/91	10/07/91	10/07/91	10/04/91
REMARKS:						
Iron	100	66900	2490	29700	14700	3640
Lead	3	13.5 U	3.9 U	32.8	7.9 U	2.7 U
Magnesium	5000	11400 J	4290	5230	5500	2140
Manganese	15	3860	658	756	709	261
Mercury	0.2	0.2 U	0.20 UJ	0.20 UJ	0.20 UJ	0.2 U
Nickel	40	26.8	12.1 U	28.2 U	25.6 U	16 U
Potassium	5000	13800	1560 U	4440	5480	17700
Selenium	5	1.0 UJ	R	R	R	1.0 UJ
Silver	10	3 U	4.0 UJ	4.0 UJ	4.0 UJ	3 U
Sodium	5000	44900	16300	8600	9430	19900
Thallium	10	1.0 UJ	4.0 UJ	4 U	4 U	1.0 UJ
Vanadium	50	3 U	5 U	29.7	14.0	3 U
Zinc	20	41.3 UJ	16.1 UJ	65.5 U	67.3 U	27.5 UJ
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	49.5 UJ	27.6 U	17.0 U	22.9 U	96.8 UJ
Antimony	60	25 U	14 U	14 U	14 U	25 U
Arsenic	10	1 U	2 U	2 U	2.0 UJ	1 U
Barium	200	118	3.1 U	1.4 U	1.7 U	48.2
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	1 U	1 U	1 U	3 U
Calcium	5000	30900 J	46500	5050	6150	5890
Chromium	10	8 U	2 U	2 U	2 U	8 U
Cobalt	50	6 U	2.1 U	2 U	2.7 U	6 U
Copper	25	11.5 UJ	5.0 U	2 U	4.7 U	9.8 U
Iron	100	63300	55.8 UJ	7.0 UJ	27.8 UJ	1430 J
Lead	3	1.1 UJ	1.9 U	1.6 U	1 U	1 U
Magnesium	5000	11100 J	4240	1610	1910	1830
Manganese	15	3750	603 J	38.1 J	27.4 UJ	237 J
Mercury	0.2	0.2 U	0.20 UJ	0.20 UJ	0.20 UJ	0.2 U
Nickel	40	16 U	5.0	5 U	10.0	16 U
Potassium	5000	12900	1760 U	890 U	935 U	17600
Selenium	5	1.0 UJ	R	R	R	1.0 UJ
Silver	10	3 U	5 U	5 U	5 U	3 U
Sodium	5000	43600	16200	7900	8380	20000
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1 U	1.0 UJ
Vanadium	50	3 U	2 U	2 U	2 U	3 U
Zinc	20	21.2 UJ	5.8 UJ	5 U	5.3 UJ	20.4 UJ

LOCATION NAME:		MW-04-02	MW-04-03	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		DEEP OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-04-02-NX-G-189-2	NMW-04-03-NX-G-190-2	NMW-05-01-NX-G-191-2	NMW-05-02-NX-G-192-2	NMW-06-01-NX-G-193-2
DATE SAMPLED:		10/03/91	10/07/91	10/07/91	10/07/91	10/04/91
REMARKS:						
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 UJ	32 J	0.4 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10.0 UJ	10.0 UJ	10.0 UJ	10 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	15.8 J	7.8 J	7.3	2.1 U	8.5 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	6.6 U	1.3 UJ	1.0 U	1.0 U	4.0 J
OTHER						
Hardness	(mg/L)	122 J	133	37	43	24
pH	--	7.22	7.55	6.2	6.25	6.62
Specific Conductance	(umhos/cm)	1000	340	72	84	210

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-02	MW-08-01	MW-08-02
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-06-02-NX-G-194-2	NMW-07-01-NX-G-192-2	NMW-07-02-NX-G-196-2	NMW-08-01-NX-G-197-2	NMW-08-02-NX-G-198-2
DATE SAMPLED:		10/04/91	10/04/91	10/08/91	10/07/91	10/07/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	3 J	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	16	24	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	2 J	10 U	10 U
1,2-Dichloroethane	10	1 J	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	5 J	79	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	44 U	15 U	37 U
Benzene	10	9 J	8 J	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	3 J	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	72	13	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	17	23	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	18	2 J	10 U	10 U
Total Xylenes	10	11	49	1 J	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	8 J	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 UJ	50 U	500 UJ	61 UJ	86 UJ

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-02	MW-08-01	MW-08-02
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-06-02-NX-G-194-2	NMW-07-01-NX-G-192-2	NMW-07-02-NX-G-196-2	NMW-08-01-NX-G-197-2	NMW-08-02-NX-G-198-2
DATE SAMPLED:		10/04/91	10/04/91	10/08/91	10/07/91	10/07/91
REMARKS:						
Acrylamide	200	200 UJ	200 U	2000 UJ	200 UJ	200 UJ
Acrylonitrile	50	50 UJ	50 U	500 UJ	50 UJ	50 UJ
Ethyl Urethane	100	100 UJ	100 U	1000 UJ	100 UJ	100 UJ
N,N-DMF	50	50 UJ	50 U	1390 J	50 UJ	50 UJ
Urethane	1000	1000 UJ	1000 U	10000 UJ	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	2 J	2 J	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	2 J	5 J	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	0.9 J	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 UJ	10 UJ
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	1 J	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 UJ	10 UJ
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-02	MW-08-01	MW-08-02
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-06-02-NX-G-194-2	NMW-07-01-NX-G-192-2	NMW-07-02-NX-G-196-2	NMW-08-01-NX-G-197-2	NMW-08-02-NX-G-198-2
DATE SAMPLED:		10/04/91	10/04/91	10/08/91	10/07/91	10/07/91
REMARKS:						
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	9 J	17	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	2 J	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	16 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-02	MW-08-01	MW-08-02
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-06-02-NX-G-194-2	NMW-07-01-NX-G-192-2	NMW-07-02-NX-G-196-2	NMW-08-01-NX-G-197-2	NMW-08-02-NX-G-198-2
DATE SAMPLED:		10/04/91	10/04/91	10/08/91	10/07/91	10/07/91
REMARKS:						
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Aldrin	0.05	0.050 U	0.050 U	0.003 J	0.050 UJ	0.050 UJ
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 UJ	2.0 UJ	2.0 UJ
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 UJ	0.16 J	0.13 J
Dieldrin	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endosulfan I	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
Endosulfan II	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endrin	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 UJ	0.10 UJ	0.10 UJ
Heptachlor	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
Methoxychlor	0.50	0.50 U	0.50 U	0.50 UJ	0.50 UJ	0.50 UJ
Toxaphene	5.0	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 UJ
alpha-BHC	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
beta-BHC	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
delta-BHC	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.011 J	0.050 UJ	0.050 UJ
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 UJ	0.050 UJ	0.050 UJ
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	12300 J	96400 J	193 U	416 U	1410
Antimony	60	25 U	25 U	47 U	47 U	47.0 U
Arsenic	10	1.8	6.1	2.0 UJ	2.0 UJ	2.0 UJ
Barium	200	287	454	42.6	26.6	133
Beryllium	5	1 U	10.9	1.0 UJ	1.6 UJ	2.1 UJ
Cadmium	5	3 U	3.2 U	3.0 UJ	3.0 UJ	3.0 UJ
Calcium	5000	68300	56400	88300	8700	27800
Chromium	10	38.7 U	141 J	103 J	6.0 UJ	6.0 UJ
Cobalt	50	14.0	53.8	10.2 U	10.2 U	8 U
Copper	25	94.1	310	19.6 U	5 U	9.0 U

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-02	MW-08-01	MW-08-02
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-06-02-NX-G-194-2	NMW-07-01-NX-G-192-2	NMW-07-02-NX-G-196-2	NMW-08-01-NX-G-197-2	NMW-08-02-NX-G-198-2
DATE SAMPLED:		10/04/91	10/04/91	10/08/91	10/07/91	10/07/91
REMARKS:						
Iron	100	59300	238000	213 U	8720	4830
Lead	3	6.5 U	95.1	4.5 U	2.6 U	3.6 U
Magnesium	5000	24800	25700	1360	2090	2100
Manganese	15	1880	4590	12.0 U	1590	1350
Mercury	0.2	0.2 U	0.2 U	0.20 UJ	0.20 UJ	0.20 UJ
Nickel	40	20.6 U	125	14.8 U	12.1 U	9.4 U
Potassium	5000	45700	40200	102000	3160 U	5360
Selenium	5	1.0 UJ	10.0 UJ	R	R	R
Silver	10	3 U	3 U	6.3 UJ	4.0 UJ	4.0 UJ
Sodium	5000	108000	31600	53700	9770	10500
Thallium	10	10.0 UJ	1.0 UJ	20.0 UJ	4 U	4.0 UJ
Vanadium	50	10.8 U	127	9.8	5 U	5 U
Zinc	20	79.3 U	553	9.7 UJ	8.9 UJ	19.2 UJ
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	36.6 UJ	64.8 UJ	17.6 U	51.4 U	17.0 U
Antimony	60	25 U	25 U	14 U	14 U	14 U
Arsenic	10	1 U	2.4	2 U	2 U	2 U
Barium	200	217	53.9	40.3	25.3	108
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	1 U	1 U	1 U
Calcium	5000	67200	42400	88400	9230	27300
Chromium	10	8 U	8 U	94.3	2 U	2 U
Cobalt	50	6 U	6 U	2 U	2 U	2 U
Copper	25	6.6 U	R	2 U	2 U	2 U
Iron	100	47300 J	111000 J	7.0 UJ	7140 J	12.0 UJ
Lead	3	1.1 UJ	1 U	2.1 U	2.1 U	1.3 U
Magnesium	5000	22000	5780	404	2330	1750
Manganese	15	1470 J	1470 J	2.1 UJ	1630 J	369 J
Mercury	0.2	0.2 U	0.2 U	0.20 UJ	0.20 UJ	0.20 UJ
Nickel	40	16 U	16 U	5 U	5 U	5 U
Potassium	5000	41800	17900	104000	3160 U	5260
Selenium	5	1.0 UJ	1.0 UJ	R	R	R
Silver	10	3 U	3 U	5 U	5 U	5 U
Sodium	5000	106000	23600	56300	9860	10400
Thallium	10	1.0 UJ	1.0 UJ	5.0 UJ	1 U	1.0 UJ
Vanadium	50	6.0 U	R	3.0	2 U	2 U
Zinc	20	19.5 UJ	39.5 UJ	5 U	7.0 UJ	5 U

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-02	MW-08-01	MW-08-02
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-06-02-NX-G-194-2	NMW-07-01-NX-G-192-2	NMW-07-02-NX-G-196-2	NMW-08-01-NX-G-197-2	NMW-08-02-NX-G-198-2
DATE SAMPLED:		10/04/91	10/04/91	10/08/91	10/07/91	10/07/91
REMARKS:						
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10.0 UJ	10.0 UJ	10.0 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	25.0 J	41.2 J	6.9 U	3.6 UJ	2.3 U
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	11.0 J	23.5 J	1.1 U	1.3 U	1.3 U
OTHER						
Hardness	(mg/L)	273	247	226	30	78
pH	--	7	6.35	12.54	7.1	8.47
Specific Conductance	(umhos/cm)	1600	590	1200	170	210

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-09-01-NX-G-199-2	NMW-10-01-NX-G-200-2	NMW-11-01-NX-G-201-2	NMW-11-02-NX-G-202-2	NMW-11-03-NX-G-203-2
DATE SAMPLED:		10/09/91	10/08/91	10/03/91	10/04/91	10/04/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	50 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	50 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	50 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	50 U	3 J	2 J	10 U
1,1-Dichloroethene	10	10 U	50 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	50 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	50 U	3 J	3 J	10 U
1,2-Dichloropropane	10	10 U	50 U	10 U	10 U	10 U
2-Butanone	10	10 U	50 U	10 U	10 U	10 U
2-Hexanone	10	10 U	50 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	50 U	10 U	10 U	10 U
Acetone	10	10 U	R	10 U	10 U	10 U
Benzene	10	10 U	50 U	13	9 J	10 U
Bromodichloromethane	10	10 U	50 U	10 U	10 U	10 U
Bromoform	10	10 U	50 U	10 U	10 U	10 U
Bromomethane	10	10 U	50 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	50 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	50 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	50 U	10 U	5 J	10 U
Chloroethane	10	10 U	50 U	27	60	10 U
Chloroform	10	10 U	50 U	10 U	10 U	10 U
Chloromethane	10	10 U	50 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	50 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	50 U	16	19	10 U
Methylene Chloride	10	10 U	50 U	10 U	10 U	10 U
Styrene	10	10 U	50 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	50 U	10 U	10 U	10 U
Toluene	10	10 U	50 U	1 J	1 J	10 U
Total Xylenes	10	10 U	50 U	5 J	11	10 U
Trichloroethene	10	10 U	50 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	50 U	5 J	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	50 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	50 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 U	142 UJ	50 UJ	50 UJ	50 UJ

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-09-01-NX-G-199-2	NMW-10-01-NX-G-200-2	NMW-11-01-NX-G-201-2	NMW-11-02-NX-G-202-2	NMW-11-03-NX-G-203-2
DATE SAMPLED:		10/09/91	10/08/91	10/03/91	10/04/91	10/04/91
REMARKS:						
Acrylamide	200	200 U	200 UJ	200 UJ	200 UJ	200 UJ
Acrylonitrile	50	50 U	50 UJ	50 UJ	50 UJ	50 UJ
Ethyl Urethane	100	100 U	100 UJ	100 UJ	100 UJ	100 UJ
N,N-DMF	50	50 U	50 UJ	50 UJ	50 UJ	50 UJ
Urethane	1000	1000 U	1000 UJ	1000 UJ	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	2 J	2 J	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	3 J	3 J	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	NA	10 UJ	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	3 J	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	1 J	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	3 J	10 U
4-Chloroaniline	10	10 U	10 UJ	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 UJ	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-09-01-NX-G-199-2	NMW-10-01-NX-G-200-2	NMW-11-01-NX-G-201-2	NMW-11-02-NX-G-202-2	NMW-11-03-NX-G-203-2
DATE SAMPLED:		10/09/91	10/08/91	10/03/91	10/04/91	10/04/91
REMARKS:						
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10	0.7 J
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	3 J	5 J	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	10 U	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-09-01-NX-G-199-2	NMW-10-01-NX-G-200-2	NMW-11-01-NX-G-201-2	NMW-11-02-NX-G-202-2	NMW-11-03-NX-G-203-2
DATE SAMPLED:		10/09/91	10/08/91	10/03/91	10/04/91	10/04/91
REMARKS:						
4,4'-DDT	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.1 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.1 UJ	2.0 UJ	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.1 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.1 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.1 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.1 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.1 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.11 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.53 UJ	0.50 UJ	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.3 UJ	5.0 UJ	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.0028 J	0.050 UJ	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.053 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	17400	10600	6630	13500	1570
Antimony	60	47 U	47 U	25 U	25 U	25 U
Arsenic	10	2.0 UJ	2.0 UJ	2.5	1.1	1 U
Barium	200	92.4	46.2	290	343	108
Beryllium	5	3.2 UJ	3.2 UJ	1.4 U	1 U	1 U
Cadmium	5	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ
Calcium	5000	9540	5230	63100	91900	34200
Chromium	10	12.9 UJ	8.3 UJ	8 U	8 U	8 U
Cobalt	50	44.3 U	13.6 U	19.3	16.2	6 U
Copper	25	123	37.3	22.5 U	43.3 U	13.8 U

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-09-01-NX-G-199-2	NMW-10-01-NX-G-200-2	NMW-11-01-NX-G-201-2	NMW-11-02-NX-G-202-2	NMW-11-03-NX-G-203-2
DATE SAMPLED:		10/09/91	10/08/91	10/03/91	10/04/91	10/04/91
REMARKS:						
Iron	100	21900	13500	65600	53600	1270
Lead	3	10.9	7.5 U	5.4 U	32.0	6.9 U
Magnesium	5000	5500	5620	19300	28600	4020
Manganese	15	1160	728	3250	4330	338
Mercury	0.2	0.20 UJ	0.20 UJ	0.20 UJ	0.2 U	0.2 U
Nickel	40	76.6	17.5 U	16 U	16 U	16 U
Potassium	5000	7020	4030	22800	42400	3270 U
Selenium	5	R	R	1 U	1 U	1 U
Silver	10	4.0 UJ	4.0 UJ	3 U	3 U	3 U
Sodium	5000	11300	9180	75100	114000	59500
Thallium	10	4.0 UJ	4.0 UJ	1.0 UJ	10.0 UJ	1.0 UJ
Vanadium	50	21.4	14.6	9.2 U	13.3 U	3 U
Zinc	20	208	70.8 U	30.9 U	165	37.6 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	31.5 U	27.6 U	73.5 U	68.9 U	97.1 U
Antimony	60	14 U	14 U	25 U	25 U	25 U
Arsenic	10	2.0 UJ	2.0 UJ	1.7	1 U	1 U
Barium	200	2.3 U	1.7 U	251	267	80.2
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1.2 U	1 U	3 U	3 U	3 U
Calcium	5000	7190	4520	61700	88200	30800
Chromium	10	2 U	2 U	8 U	8 U	8 U
Cobalt	50	19.7 U	3.6 U	12.1	7.6	6 U
Copper	25	2 U	3.1 U	14.5 U	12.0 U	18.8 U
Iron	100	47.4 UJ	13.3 UJ	56900 J	39800 J	26.9 U
Lead	3	2.3	1.5 U	1 U	1 U	1.9 U
Magnesium	5000	1640	1490	18400	25300	3510
Manganese	15	395 J	65.8 J	3090 J	3530 J	248 J
Mercury	0.2	0.20 UJ	0.20 UJ	0.20 UJ	0.2 U	0.2 U
Nickel	40	31.5	5 U	16 U	16 U	16 U
Potassium	5000	1340 U	694 U	21400	37700	2510 U
Selenium	5	R	R	1 U	1 U	1 U
Silver	10	5 U	5 U	3 U	3 U	3 U
Sodium	5000	9560	8580	73600	111000	55800
Thallium	10	1 U	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	2 U	2 U	3 U	3 U	3 U
Zinc	20	54.2 J	11.2 J	37.4 U	20.3 U	24.8 U

LOCATION NAME:		MW-09-01	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-09-01-NX-G-199-2	NMW-10-01-NX-G-200-2	NMW-11-01-NX-G-201-2	NMW-11-02-NX-G-202-2	NMW-11-03-NX-G-203-2
DATE SAMPLED:		10/09/91	10/08/91	10/03/91	10/04/91	10/04/91
REMARKS:						
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10.0 UJ	10 U	10 U	10.0 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	19.3 J	3.2 U	34.2 J	36.6 J	1.2 U
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.0 U	10.0	5.0 UJ	R
OTHER						
Hardness	(mg/L)	46	36	237	347	102
pH	--	6.76	6.6	6.6	6.75	7.86
Specific Conductance	(umhos/cm)	90	50	100	1150	295

LOCATION NAME:		MW-12-01	MW-12-02	MW-12-02	MW-13-01	MW-13-02
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-12-01-NX-G-204-2	NMW-12-02-FD-G-319-2	NMW-12-02-NX-G-205-2	NMW-13-01-NX-G-206-2	NMW-13-02-NX-G-207-2
DATE SAMPLED:		10/08/91	10/08/91	10/08/91	10/08/91	10/08/91
REMARKS:			Field Duplicate			
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	6 J	4 J	10 U	6 J
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	3 J	5 J	4 J	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	9 J
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	5 J
Acetone	10	38 U	130 J	22 UJ	R	R
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	6 J	4 J	10 U	10 U
Chloroethane	10	10 U	16	16	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	3 J	2 J	10 U	2 J
Methylene Chloride	10	15 U	24 U	14 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	27	20	2 J	13
Total Xylenes	10	10 U	10 J	7 J	10 U	4 J
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ

LOCATION NAME:		MW-12-01	MW-12-02	MW-12-02	MW-13-01	MW-13-02
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-12-01-NX-G-204-2	NMW-12-02-FD-G-319-2	NMW-12-02-NX-G-205-2	NMW-13-01-NX-G-206-2	NMW-13-02-NX-G-207-2
DATE SAMPLED:		10/08/91	10/08/91	10/08/91	10/08/91	10/08/91
REMARKS:			Field Duplicate			
Acrylamide	200	200 UJ	200 UJ	200 UJ	200 UJ	200 UJ
Acrylonitrile	50	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ
Ethyl Urethane	100	100 UJ	100 UJ	100 UJ	100 UJ	100 UJ
N,N-DMF	50	50 UJ	50 UJ	50 UJ	50 J	202 J
Urethane	1000	1000 UJ	1000 UJ	1000 UJ	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	20 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	20 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	20 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	20 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	25	50 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	20 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	20 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	20 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	50 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	20 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	20 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	20 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	20 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	20 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	20 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	50 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	20 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	20 U	10 U	10 UJ	10 U	10 U
3-Nitroaniline	25	50 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	50 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	20 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	20 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	20 U	10 U	10 UJ	10 U	10 UJ
4-Chlorophenyl-phenylether	10	20 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	20 U	10 U	10 U	10 U	17
4-Nitroaniline	25	50 U	25 U	25 U	25 U	25 UJ
4-Nitrophenol	25	50 U	25 U	25 U	25 U	25 U
Acenaphthene	10	20 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	20 U	10 U	10 U	10 U	10 U
Anthracene	10	20 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-12-01	MW-12-02	MW-12-02	MW-13-01	MW-13-02
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-12-01-NX-G-204-2	NMW-12-02-FD-G-319-2	NMW-12-02-NX-G-205-2	NMW-13-01-NX-G-206-2	NMW-13-02-NX-G-207-2
DATE SAMPLED:		10/08/91	10/08/91	10/08/91	10/08/91	10/08/91
REMARKS:			Field Duplicate			
Benzo(a)anthracene	10	20 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	20 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	20 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	20 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	20 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	20 U	10 U	10 U	10 U	10 U
Carbazole	10	20 U	10 U	10 U	10 U	10 U
Chrysene	10	20 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	20 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	20 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	20 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	20 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	20 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	20 U	10 U	10 U	10 U	10 U
Fluoranthene	10	20 U	10 U	10 U	10 U	10 U
Fluorene	10	20 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	20 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	20 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	20 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	20 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	20 U	10 U	10 U	10 U	10 U
Isophorone	10	20 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	20 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	20 U	10 U	10 U	10 U	10 U
Naphthalene	10	20 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	20 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	50 U	25 U	25 U	3 J	25 U
Phenanthrene	10	20 U	10 U	10 U	10 U	10 U
Phenol	10	20 U	10 U	10 U	10 U	10 U
Pyrene	10	20 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	20 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	20 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	20 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	90 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
4,4'-DDE	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ

LOCATION NAME:		MW-12-01	MW-12-02	MW-12-02	MW-13-01	MW-13-02
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-12-01-NX-G-204-2	NMW-12-02-FD-G-319-2	NMW-12-02-NX-G-205-2	NMW-13-01-NX-G-206-2	NMW-13-02-NX-G-207-2
DATE SAMPLED:		10/08/91	10/08/91	10/08/91	10/08/91	10/08/91
REMARKS:			Field Duplicate			
4,4'-DDT	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
Aldrin	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
Aroclor-1016	1.0	1.0 UJ	1.0 UJ	1.1 UJ	1.0 UJ	1.0 UJ
Aroclor-1221	2.0	2.0 UJ	2.0 UJ	2.2 UJ	2.0 UJ	2.0 UJ
Aroclor-1232	1.0	1.0 UJ	1.0 UJ	1.1 UJ	1.0 UJ	1.0 UJ
Aroclor-1242	1.0	1.0 UJ	1.0 UJ	1.1 UJ	1.0 UJ	1.0 UJ
Aroclor-1248	1.0	1.0 UJ	1.0 UJ	1.1 UJ	1.0 UJ	1.0 UJ
Aroclor-1254	1.0	1.0 UJ	1.0 UJ	1.1 UJ	1.0 UJ	1.0 UJ
Aroclor-1260	1.0	1.0 UJ	1.0 UJ	1.1 UJ	1.0 UJ	1.0 UJ
Dieldrin	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
Endosulfan I	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
Endosulfan II	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
Endosulfan Sulfate	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
Endrin	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
Endrin Aldehyde	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
Endrin Ketone	0.10	0.10 UJ	0.10 UJ	0.11 UJ	0.10 UJ	0.10 UJ
Heptachlor	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
Heptachlor Epoxide	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
Methoxychlor	0.50	0.50 UJ	0.500 UJ	0.56 UJ	0.50 UJ	0.50 UJ
Toxaphene	5.0	5.0 UJ	5.0 UJ	5.6 UJ	5.0 UJ	5.0 UJ
alpha-BHC	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
alpha-Chlordane	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
beta-BHC	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
delta-BHC	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
gamma-BHC(Lindane)	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
gamma-Chlordane	0.05	0.050 UJ	0.050 UJ	0.056 UJ	0.050 UJ	0.050 UJ
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	2880	53400	68600	6600	23600
Antimony	60	47 U	87.7	122	47 U	47 U
Arsenic	10	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
Barium	200	26.6	401	458	76.4	169
Beryllium	5	2.1 UJ	12.2 UJ	14.8 J	2.1 UJ	5.3 UJ
Cadmium	5	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ
Calcium	5000	6610	15600	15600	9100	23600
Chromium	10	6.0 UJ	49.9 J	83.2 J	16.6 UJ	24.0 UJ
Cobalt	50	13.6 U	57.9 U	44.3 U	13.6 U	20.4 U
Copper	25	43.4	76.9	97.6	27.6 U	46.0

LOCATION NAME:		MW-12-01	MW-12-02	MW-12-02	MW-13-01	MW-13-02
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-12-01-NX-G-204-2	NMW-12-02-FD-G-319-2	NMW-12-02-NX-G-205-2	NMW-13-01-NX-G-206-2	NMW-13-02-NX-G-207-2
DATE SAMPLED:		10/08/91	10/08/91	10/08/91	10/08/91	10/08/91
REMARKS:			Field Duplicate			
Iron	100	15400	142000	165000	28700	80300
Lead	3	5.3 U	299	314	13.0 U	22.7
Magnesium	5000	1760	8870	11200	2180	9990
Manganese	15	1660	9690	10300	1540	3340
Mercury	0.2	0.20 UJ	0.20 UJ	0.20 UJ	0.20 UJ	0.20 UJ
Nickel	40	71.3	47.1 U	71.3 U	18.8 U	37.6 U
Potassium	5000	2600 U	11800	13400	3040 U	7770
Selenium	5	R	R	R	R	R
Silver	10	4.5 UJ	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
Sodium	5000	7470	7680	7640	11700	10400
Thallium	10	4 U	4 U	4 U	4 U	4 U
Vanadium	50	6.5	77.9	104	11.0	52.4
Zinc	20	215	R	R	56.0 UJ	179
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	22.6 U	22.0 U	17.0 U	38.8 U	30.6 U
Antimony	60	14 U	17.0	14 U	14 U	14.0 U
Arsenic	10	2 U	2 U	2.0	2 U	2 U
Barium	200	2.6 U	76.0	78.8	17.2	28.7
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	1 U	1 U	1 U
Calcium	5000	5910	14500	14600	9140	21600
Chromium	10	2 U	2 U	2 U	2 U	2 U
Cobalt	50	3.3 U	6.1 U	6.1 U	2.7 U	7.9 U
Copper	25	2 U	2 U	2 U	2 U	2 U
Iron	100	5190 J	70100 J	70200 J	23100 J	44300 J
Lead	3	1.9 U	1.8 U	1.3 U	1.2 U	1.6 U
Magnesium	5000	1090	2730	2720	1810	5730
Manganese	15	1410 J	7370 J	7410 J	1820 J	2830 J
Mercury	0.2	0.20 UJ	0.20 UJ	0.20 UJ	0.20 UJ	0.20 UJ
Nickel	40	50.0	5 U	5 U	5 U	5 U
Potassium	5000	1820 U	4470	4470	1890 U	2650 U
Selenium	5	R	R	R	R	R
Silver	10	5 U	5 U	5 U	5 U	5 U
Sodium	5000	7040 U	6300 U	6330 U	10800	9050
Thallium	10	1 U	1 U	1 U	1 U	1 U
Vanadium	50	2 U	2 U	2 U	2 U	2 U
Zinc	20	131	10.4 UJ	10.0 UJ	10.4 UJ	11.9 UJ

LOCATION NAME:		MW-12-01	MW-12-02	MW-12-02	MW-13-01	MW-13-02
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-12-01-NX-G-204-2	NMW-12-02-FD-G-319-2	NMW-12-02-NX-G-205-2	NMW-13-01-NX-G-206-2	NMW-13-02-NX-G-207-2
DATE SAMPLED:		10/08/91	10/08/91	10/08/91	10/08/91	10/08/91
REMARKS:			Field Duplicate			
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	6.4 U	59.4 J	53.1 J	20.0	21.7
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	12.7	19.0 J	25.5 J	5.1	19.5
OTHER						
Hardness	(mg/L)	24	75	85	32	100
pH	--	6.09	NA	6.54	7.01	6.43
Specific Conductance	(umhos/cm)	120	NA	420	175	330

LOCATION NAME:		MW-14-01	MW-I	MW-II	MW-III	MW-IV
FLOW ZONE:		DEEP OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-14-01-NX-G-208-2	EMW-01-00-NX-G-176-2	EMW-02-00-NX-G-177-2	EMW-03-00-NX-G-178-2	EMW-04-00-NX-G-179-2
DATE SAMPLED:		10/01/91	10/01/91	10/02/91	10/02/91	10/02/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	2 J	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	41	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	2 J	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	13 U	10 U	41 U	10 U	10 U
Benzene	10	31	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	4 J	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	16	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	170	10 U	10 U	10 U	10 U
Total Xylenes	10	44	10 U	10 U	10 U	10 U
Trichloroethene	10	2 J	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 UJ	50 UJ	50 U	50 U	50 U

LOCATION NAME:		MW-14-01	MW-I	MW-II	MW-III	MW-IV
FLOW ZONE:		DEEP OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-14-01-NX-G-208-2	EMW-01-00-NX-G-176-2	EMW-02-00-NX-G-177-2	EMW-03-00-NX-G-178-2	EMW-04-00-NX-G-179-2
DATE SAMPLED:		10/01/91	10/01/91	10/02/91	10/02/91	10/02/91
REMARKS:						
Acrylamide	200	304 UJ	200 UJ	200 U	200 U	200 U
Acrylonitrile	50	50 UJ	50 UJ	50 U	50 U	50 U
Ethyl Urethane	100	100 U	100 U	100 U	100 U	100 U
N,N-DMF	50	596	50 U	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	6 J	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	3 J	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-14-01	MW-I	MW-II	MW-III	MW-IV
FLOW ZONE:		DEEP OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-14-01-NX-G-208-2	EMW-01-00-NX-G-176-2	EMW-02-00-NX-G-177-2	EMW-03-00-NX-G-178-2	EMW-04-00-NX-G-179-2
DATE SAMPLED:		10/01/91	10/01/91	10/02/91	10/02/91	10/02/91
REMARKS:						
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	0.5 J	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	8 J	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		MW-14-01	MW-I	MW-II	MW-III	MW-IV
FLOW ZONE:		DEEP OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-14-01-NX-G-208-2	EMW-01-00-NX-G-176-2	EMW-02-00-NX-G-177-2	EMW-03-00-NX-G-178-2	EMW-04-00-NX-G-179-2
DATE SAMPLED:		10/01/91	10/01/91	10/02/91	10/02/91	10/02/91
REMARKS:						
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	10300 J	41400 J	23500 J	11300 J	1010 J
Antimony	60	25 U	25 U	25 U	25 U	25 U
Arsenic	10	9.7	5.4	5.5	1 U	1 U
Barium	200	286	284	149	107	19.3
Beryllium	5	1 U	5.5 U	3.5 U	1.3 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	13.8 U
Calcium	5000	61000	7830	12200	4120	5170
Chromium	10	17.8 U	44.9 U	32.7 U	23.8 U	8 U
Cobalt	50	17.5	45.0	37.2	10.2	20.3
Copper	25	43.9 U	73.9 U	75.7	99.9	15.3

LOCATION NAME:		MW-14-01	MW-I	MW-II	MW-III	MW-IV
FLOW ZONE:		DEEP OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-14-01-NX-G-208-2	EMW-01-00-NX-G-176-2	EMW-02-00-NX-G-177-2	EMW-03-00-NX-G-178-2	EMW-04-00-NX-G-179-2
DATE SAMPLED:		10/01/91	10/01/91	10/02/91	10/02/91	10/02/91
REMARKS:						
Iron	100	67800	41400	84700	12600	54700
Lead	3	16.7	42.7	72.8	25.7	6.4 U
Magnesium	5000	52000	7280	5680	2200	2080
Manganese	15	489	1450	4230	636	6230
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.22
Nickel	40	33.3	34.9	36.0	19.0	16 U
Potassium	5000	139000	11200	8080	2380 U	1830 U
Selenium	5	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	124000	7900 U	7230 U	4570	9020 U
Thallium	10	1.0 UJ	1 U	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	24.1	44.3	33.9	11.1 U	3 U
Zinc	20	75.5 U	152	243	71.8 U	97.2 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	143 U	90.5 U	127 UJ	49.4 UJ	163 UJ
Antimony	60	25 U	25 U	25 U	25 U	25 U
Arsenic	10	7.7	1 U	2.0	1 U	1 U
Barium	200	218	1 U	21.4	3.4 U	13.2
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	55000	1150 U	8370	3110	5260
Chromium	10	8.4 U	8 U	8.1 U	8 U	8 U
Cobalt	50	8.6	6 U	13.0	6 U	21.4
Copper	25	20.3 U	21.7 U	19.7	7.2	30.0
Iron	100	39000 J	19.0 U	42800	100 UJ	54000
Lead	3	1.7 U	2.0 U	2.2 U	3.0 U	1.3 U
Magnesium	5000	48900	660	2530	1110	2130
Manganese	15	214 J	2 U	2290	654	6010
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	18.9	16 U	16 U	16 U	16 U
Potassium	5000	139000	442 U	2770 U	544 U	1770 U
Selenium	5	1.0 UJ	1 U	1.0 UJ	1.0 UJ	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	146000	5230 U	5420 U	6310 U	10000 U
Thallium	10	1.0 UJ	1 U	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	7.0 U	3 U	4.3 U	3 U	3 U
Zinc	20	27.2 U	23.4 U	43.6 U	16.6 U	54.5 UJ

LOCATION NAME:		MW-14-01	MW-I	MW-II	MW-III	MW-IV
FLOW ZONE:		DEEP OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-14-01-NX-G-208-2	EMW-01-00-NX-G-176-2	EMW-02-00-NX-G-177-2	EMW-03-00-NX-G-178-2	EMW-04-00-NX-G-179-2
DATE SAMPLED:		10/01/91	10/01/91	10/02/91	10/02/91	10/02/91
REMARKS:						
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 U	0.4 U	0.4 U
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10.0 UJ	10.0 UJ	10.0 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	117.5 J	6.2 UJ	15.9 J	13.8 J	7.3 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	35.0	1.0 U	4.0 UJ	R	3.0 UJ
OTHER						
Hardness	(mg/L)	366	50	54	19	21
pH	--	6.3	8.25	6.78	6.80	6.65
Specific Conductance	(umhos/cm)	2150	120	230	26	260

LOCATION NAME:		MW-V	OW-27	OW-30	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-00-NX-G-180-2	EOW-27-00-NX-G-174-2	EOW-30-00-FD-G-315-2	EOW-30-00-NX-G-175-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91
REMARKS:				Field Duplicate	
VOLATILE ORGANICS-CLP	CRQL(ug/L)				
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	2 J	13	13
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	26	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	10 U
Benzene	10	10 U	2 J	8 J	8 J
Bromodichloromethane	10	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	7 J	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	2 J	64 J	62 J
Chloroform	10	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	8 J	9 J	9 J
Methylene Chloride	10	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U
Toluene	10	10 U	1 J	14	14
Total Xylenes	10	10 U	20	19	19
Trichloroethene	10	10 U	5 J	10 U	10 U
Vinyl Chloride	10	10 U	19	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)				
Acetonitrile	50	59 UJ	50 U	50 UJ	50 UJ

LOCATION NAME:		MW-V	OW-27	OW-30	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-00-NX-G-180-2	EOW-27-00-NX-G-174-2	EOW-30-00-FD-G-315-2	EOW-30-00-NX-G-175-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91
REMARKS:				Field Duplicate	
Acrylamide	200	200 U	200 U	200 UJ	200 UJ
Acrylonitrile	50	50 U	50 U	50 UJ	50 UJ
Ethyl Urethane	100	100 U	100 U	100 UJ	100 UJ
N,N-DMF	50	50 U	50 U	105 J	78 J
Urethane	1000	1000 U	1000 U	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)				
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	2 J	2 J
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 UJ	10 UJ
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	2 J	10 U	10 U
2-Methylphenol	10	10 U	10 U	1 J	0.8 J
2-Nitroaniline	25	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	3 J	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	2 J	2 J
4-Nitroaniline	25	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-V	OW-27	OW-30	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-00-NX-G-180-2	EOW-27-00-NX-G-174-2	EOW-30-00-FD-G-315-2	EOW-30-00-NX-G-175-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91
REMARKS:				Field Duplicate	
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	0.6 J	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10	10	7 J
Dimethylphthalate	10	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	2 J	4 J	3 J
Nitrobenzene	10	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	0.9 J	1 J
Pyrene	10	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)				
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		MW-V	OW-27	OW-30	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-00-NX-G-180-2	EOW-27-00-NX-G-174-2	EOW-30-00-FD-G-315-2	EOW-30-00-NX-G-175-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91
REMARKS:				Field Duplicate	
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)				
Aluminum	200	3830 J	26600 J	776 J	2110 J
Antimony	60	25 U	25 U	25 U	25 U
Arsenic	10	1 U	5.6	3.8	3.8
Barium	200	29.6	213	97.0	103
Beryllium	5	1 U	2.4 U	1 U	1 U
Cadmium	5	3 U	39.9	3 U	3 U
Calcium	5000	3300	49400	62500 J	64400 J
Chromium	10	8 U	50.4	8 U	8 U
Cobalt	50	6 U	47.9	6 U	6 U
Copper	25	12.4	46.0	6.0 U	18.2 UJ

LOCATION NAME:		MW-V	OW-27	OW-30	OW-30
FLOW ZONE:		SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EMW-05-00-NX-G-180-2	EOW-27-00-NX-G-174-2	EOW-30-00-FD-G-315-2	EOW-30-00-NX-G-175-2
DATE SAMPLED:		10/02/91	10/02/91	10/03/91	10/03/91
REMARKS:				Field Duplicate	
Iron	100	5320	95500	87400	92200
Lead	3	5.8 U	126	1.4 UJ	4.4 UJ
Magnesium	5000	1480	5370	7900 UJ	8210 J
Manganese	15	201	719	1450	1580
Mercury	0.2	0.2 U	0.28	0.2 U	0.2 U
Nickel	40	16 U	75.4	16 U	16 U
Potassium	5000	2190 U	8670	24000	24300
Selenium	5	1.0 UJ	1.0 UJ	1 U	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U
Sodium	5000	6030 U	11900 U	34900	35800
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3.8 U	35.4	3 U	5.2
Zinc	20	19.6 U	7360	19.5 UJ	37.9 UJ
METALS - FILTERED	CRDL(ug/L)				
Aluminum	200	95.2 UJ	121 UJ	111 UJ	13.0 UJ
Antimony	60	25 U	25 U	28.2	25 U
Arsenic	10	1 U	1 U	2.3	2.8
Barium	200	11.1 U	57.3	94.3	94.3
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U
Calcium	5000	3380	44500	64300 J	65600 J
Chromium	10	8 U	8 U	8 U	8 U
Cobalt	50	6 U	6 U	6 U	6 U
Copper	25	15	20.3	28.7 UJ	5.1 UJ
Iron	100	89.0 J	65100	87200	88300
Lead	3	2.9 U	2.5 U	1.2 UJ	1.4 UJ
Magnesium	5000	960	2360	8000 J	8030 J
Manganese	15	8.7 U	457	1410	1430
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U
Potassium	5000	1160 U	4330	24400	24700
Selenium	5	1.0 UJ	1.0 UJ	1.3 UJ	1 U
Silver	10	3 U	3 U	3.4 U	3 U
Sodium	5000	6620 U	11000 U	35400	35500
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3.5 U	4.0 U	3 U	3 U
Zinc	20	57.5 U	43.0 U	37.7 UJ	14.5 UJ

LOCATION NAME:	MW-V	OW-27	OW-30	OW-30
FLOW ZONE:	SHALLOW OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:	EMW-05-00-NX-G-180-2	EOW-27-00-NX-G-174-2	EOW-30-00-FD-G-315-2	EOW-30-00-NX-G-175-2
DATE SAMPLED:	10/02/91	10/02/91	10/03/91	10/03/91
REMARKS:			Field Duplicate	

WATER QUALITY PARAMETERS

SULFIDE	CRQL(mg/L)				
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
CYANIDE	CRDL(mg/L)				
Cyanide	10	11.1 J	10.0 UJ	10 U	10 U
TOTAL ORGANIC CARBON	QL(mg/L)				
Total Organic Carbon	0.5	1.8 UJ	29.7 J	22.7 J	19.3 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)				
Biochemical Oxygen Demand	1.0	R	7.0 J	8.4	7.6
OTHER					
Hardness	(mg/L)	14	145	172 J	195 J
pH	--	5.85	6.39	NA	6.62
Specific Conductance	(umhos/cm)	40	420	NA	860

GROUNDWATER (MONITORING WELLS) - JANUARY/FEBRUARY 1992

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-03-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-505-3	NMW-01-02-NX-G-506-3	NMW-02-01-FD-G-565-3	NMW-02-01-NX-G-507-3	NMW-03-01-NX-G-508-3
DATE SAMPLED:		02/04/92	02/05/92	01/30/92	01/30/92	02/04/92
REMARKS:				Field Duplicate		
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 UJ	10 UJ	16 U	22 U	10 UJ
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 UJ	10 UJ	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	2 J	2 J	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	1 J
Methylene Chloride	10	10 U	37 U	110 U	46 U	18 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	1 J	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	2 J
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-03-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-505-3	NMW-01-02-NX-G-506-3	NMW-02-01-FD-G-565-3	NMW-02-01-NX-G-507-3	NMW-03-01-NX-G-508-3
DATE SAMPLED:		02/04/92	02/05/92	01/30/92	01/30/92	02/04/92
REMARKS:				Field Duplicate		
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	145 U	50 U	50 U	129 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 UJ	10 UJ	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 UJ	25 U	25 U	25 U	25 UJ
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 UJ	10 U	10 UJ	10 UJ	10 UJ
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-03-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-505-3	NMW-01-02-NX-G-506-3	NMW-02-01-FD-G-565-3	NMW-02-01-NX-G-507-3	NMW-03-01-NX-G-508-3
DATE SAMPLED:		02/04/92	02/05/92	01/30/92	01/30/92	02/04/92
REMARKS:				Field Duplicate		
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	7 J
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.0050 J	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-03-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-505-3	NMW-01-02-NX-G-506-3	NMW-02-01-FD-G-565-3	NMW-02-01-NX-G-507-3	NMW-03-01-NX-G-508-3
DATE SAMPLED:		02/04/92	02/05/92	01/30/92	01/30/92	02/04/92
REMARKS:				Field Duplicate		
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.0023 J	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	43300	433	19500	22500	50900
Antimony	60	8 U	8 U	31.0 UJ	31.0 UJ	8 U
Arsenic	10	5.0 U	2 U	2 U	2 U	2 U
Barium	200	213	12.8	83.8	105	370
Beryllium	5	5.1 J	1.0 UJ	3.1	3.3	9.2 J
Cadmium	5	1 U	1 U	1 U	1.1 U	1 U
Calcium	5000	18700	20600	9780	10600	30700
Chromium	10	57.5	4.0 UJ	17.9 U	18.2 U	27.8 J
Cobalt	50	101	3 U	8.9	11.1	27.2
Copper	25	115	3 U	31.6 J	35.7 J	36.9
Iron	100	71200	13700	36000	40900	75600
Lead	3	64.4	3.2 UJ	23.8 U	26.6	36.2
Magnesium	5000	7540	1900	6050	6240	10300

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-03-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-505-3	NMW-01-02-NX-G-506-3	NMW-02-01-FD-G-565-3	NMW-02-01-NX-G-507-3	NMW-03-01-NX-G-508-3
DATE SAMPLED:		02/04/92	02/05/92	01/30/92	01/30/92	02/04/92
REMARKS:				Field Duplicate		
Manganese	15	1600	113	2170	2850	3240
Mercury	0.2	R	R	0.2 U	0.2 U	R
Nickel	40	30.0	4 U	20.9	24.4	24.8
Potassium	5000	11700	2250	6080	6670	16000
Selenium	5	20.0 UJ	4.0 UJ	R	4.0 UJ	20.0 UJ
Silver	10	2 U	2 U	5 U	5 U	2 U
Sodium	5000	16400	10700	6210	6710	21600
Thallium	10	2.0 UJ	2.0 UJ	2 U	2 U	2.0 UJ
Vanadium	50	36.3	2 U	25.9	28.4	47.7
Zinc	20	139	4 U	106	120	171
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	96.9	66 U	66 U	66 U	66 U
Antimony	60	31 U	31 U	31.0 UJ	31.0 UJ	31 U
Arsenic	10	2 U	2 U	2 U	2 U	2.2 U
Barium	200	3.7 U	4.7 U	6.9 U	7.6 U	49.6
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1.4 U	1 U	1 U	1 U
Calcium	5000	5030	19500	8650	8890	17700
Chromium	10	7.6 U	2 U	2 U	2 U	2 U
Cobalt	50	6.2 U	3 U	3 U	3 U	7.0 U
Copper	25	3 U	3 U	3 U	3 U	3 U
Iron	100	251 J	45.7 J	650 J	877 J	7730 J
Lead	3	3.3 U	1.3 U	1.9 U	5.4 U	1.9 U
Magnesium	5000	832	1690	2380	2410	5310
Manganese	15	159	31.2	1270	1400	1580
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4.3 U	4 U	4 U	4 U	4.8 U
Potassium	5000	2390	1910	1930	2100	11700
Selenium	5	4.0 UJ	20.0 UJ	4.0 UJ	20.0 UJ	4 U
Silver	10	5 U	5 U	5 U	5 U	5 U
Sodium	5000	12400	9920	5340	5300	25200
Thallium	10	10 U	2.0 UJ	2 U	2 U	2.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	11 U	11 U	11 U	11 U	11 U
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-02-01	MW-02-01	MW-03-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-505-3	NMW-01-02-NX-G-506-3	NMW-02-01-FD-G-565-3	NMW-02-01-NX-G-507-3	NMW-03-01-NX-G-508-3
DATE SAMPLED:		02/04/92	02/05/92	01/30/92	01/30/92	02/04/92
REMARKS:				Field Duplicate		
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10.0 UJ	10 U	10 U	10.0 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	15	11	41	43	28
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.0 U	3.2 U	2.4 U	3.2 U
OTHER						
Hardness	(mg/L)	78	59	49	52	119
pH	--	6.25	7.80	NA	6.3	6.16
Specific Conductance	(umhos/cm)	68	150	NA	280	350

LOCATION NAME:	MW-03-03	MW-04-01	MW-04-02	MW-04-03	MW-07-01
FLOW ZONE:	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:	NMW-03-03-NX-G-510-3	NMW-04-01-NX-G-511-3	NMW-04-02-NX-G-512-3	NMW-04-03-NX-G-513-3	NMW-07-01-NX-G-514-3
DATE SAMPLED:	02/05/92	01/29/92	01/29/92	02/05/92	01/31/92
REMARKS:					
VOLATILE ORGANICS-CLP	CRQL(ug/L)				
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	5 J	5 J
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	7 J	9 J
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	150 J	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 UJ	45 U	58 U	86 U	27 U
Benzene	10	10 U	10 U	4 J	5 J	4 J
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	9 J	43	5 J	11
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10
Methylene Chloride	10	10 U	11 U	18 U	19 U	27 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	8 J	8 J
Total Xylenes	10	10 U	10 U	8 J	2 J	22
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		MW-03-03	MW-04-01	MW-04-02	MW-04-03	MW-07-01
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-03-03-NX-G-510-3	NMW-04-01-NX-G-511-3	NMW-04-02-NX-G-512-3	NMW-04-03-NX-G-513-3	NMW-07-01-NX-G-514-3
DATE SAMPLED:		02/05/92	01/29/92	01/29/92	02/05/92	01/31/92
REMARKS:						
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	469	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	1 J	10 U	2 J
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	2 J	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 UJ	10 UJ	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 UJ	10 UJ	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-03-03	MW-04-01	MW-04-02	MW-04-03	MW-07-01
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-03-03-NX-G-510-3	NMW-04-01-NX-G-511-3	NMW-04-02-NX-G-512-3	NMW-04-03-NX-G-513-3	NMW-07-01-NX-G-514-3
DATE SAMPLED:		02/05/92	01/29/92	01/29/92	02/05/92	01/31/92
REMARKS:						
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	2 J	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	4 J	1 J	7 J
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	2 J	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	11 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	20 U	10 U	10 U	24 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U

LOCATION NAME:		MW-03-03	MW-04-01	MW-04-02	MW-04-03	MW-07-01
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-03-03-NX-G-510-3	NMW-04-01-NX-G-511-3	NMW-04-02-NX-G-512-3	NMW-04-03-NX-G-513-3	NMW-07-01-NX-G-514-3
DATE SAMPLED:		02/05/92	01/29/92	01/29/92	02/05/92	01/31/92
REMARKS:						
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.2 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.0034 J	0.11 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.0026 J	0.11 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.56 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.6 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.0051 J
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	28.5	55100	3050	228	110000
Antimony	60	8 U	31.0 UJ	31.0 UJ	8 U	31.0 UJ
Arsenic	10	2 U	2 U	2 U	2 U	2 U
Barium	200	4 U	292	207	7.0	508
Beryllium	5	1.0 UJ	7.9	1 U	1.0 UJ	13.7
Cadmium	5	1 U	3.0 U	1.1 U	1 U	6.6 U
Calcium	5000	9670	15300	36000	42000	44100
Chromium	10	4.0 UJ	51.6	6.8 U	4.0 UJ	154
Cobalt	50	3 U	31.6	14.7	3 U	53.8
Copper	25	3 U	73.3 J	34.9 J	3 U	367
Iron	100	37100	114000	59400	16200	268000
Lead	3	3.5 U	53.0	6.5 U	5.6 U	40.1
Magnesium	5000	1650	9700	13100	4080	29000

LOCATION NAME:		MW-03-03	MW-04-01	MW-04-02	MW-04-03	MW-07-01
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-03-03-NX-G-510-3	NMW-04-01-NX-G-511-3	NMW-04-02-NX-G-512-3	NMW-04-03-NX-G-513-3	NMW-07-01-NX-G-514-3
DATE SAMPLED:		02/05/92	01/29/92	01/29/92	02/05/92	01/31/92
REMARKS:						
Manganese	15	103	9130	2830	651	5610
Mercury	0.2	R	0.2 U	0.2 U	R	0.2 U
Nickel	40	4 U	34.2	14.6	8.0	99.4
Potassium	5000	1020	8950	19900	1650	37600
Selenium	5	20.0 UJ	20.0 UJ	4.0 UJ	4.0 UJ	R
Silver	10	2 U	5 U	5 U	2 U	5 U
Sodium	5000	10900	14000	55300	17200	23200 J
Thallium	10	2.0 UJ	2.0 UJ	10.0 UJ	2.0 UJ	2 U
Vanadium	50	2 U	67.2 J	3.7	2 U	142 J
Zinc	20	10.1 U	210 J	25.7 J	4.5 U	674 J
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	66 U	1610	66 U	66 U	66 U
Antimony	60	31 U	31.0 UJ	31.0 UJ	31 U	31 U
Arsenic	10	2.0 UJ	2 U	2 U	2.8 U	3.3 U
Barium	200	1 U	39.9	183	2.3 U	42.6
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	2.1 U	1.4 U	1 U	1 U
Calcium	5000	9570	11200	35500	42000	29100
Chromium	10	2 U	2 U	2 U	2 U	2 U
Cobalt	50	3 U	9.9	13.8	3 U	3 U
Copper	25	3 U	5.4 U	3 U	3 U	3 U
Iron	100	310 J	29900 J	53600 J	124 J	87500 J
Lead	3	2.5 U	5.7 UJ	2.0 UJ	7.9 U	1.4 U
Magnesium	5000	1600	2400	12500	4050	3520
Manganese	15	55.2	5290	2600	547	1220
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.29	0.20 UJ
Nickel	40	4 U	4 U	4 U	4 U	4 U
Potassium	5000	1020	3000	18700	1630	12200
Selenium	5	20.0 UJ	4.0 UJ	4.0 UJ	4 U	4.0 UJ
Silver	10	5 U	5 U	5 U	5 U	5 U
Sodium	5000	10600	13100	53900	16700	16500
Thallium	10	2.0 UJ	2.6 UJ	4.1 UJ	2.0 UJ	2.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	11 U	13.7	11 U	11 U	12.0
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-03-03	MW-04-01	MW-04-02	MW-04-03	MW-07-01
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-03-03-NX-G-510-3	NMW-04-01-NX-G-511-3	NMW-04-02-NX-G-512-3	NMW-04-03-NX-G-513-3	NMW-07-01-NX-G-514-3
DATE SAMPLED:		02/05/92	01/29/92	01/29/92	02/05/92	01/31/92
REMARKS:						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10 U	10 U	10.0 UJ	10 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	3.8 U	33	94 J	34	44
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.7 UJ	18 J	17	3.8 UJ
OTHER						
Hardness	(mg/L)	31	78	144	122	230
pH	--	6.98	6.77	6.91	6.2	6.4
Specific Conductance	(umhos/cm)	130	780	1700	225	600

LOCATION NAME:		MW-07-02	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		BEDROCK	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-07-02-NX-G-515-3	NMW-10-01-NX-G-516-3	NMW-11-01-NX-G-517-3	NMW-11-02-NX-G-518-3	NMW-11-03-NX-G-519-3
DATE SAMPLED:		01/31/92	01/30/92	01/31/92	01/31/92	01/31/92
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	3 J	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	24	10 U	3 J	2 J	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	1 J	10 U	10 U
1,2-Dichloroethene(total)	10	97	10 U	2 J	1 J	10 U
1,2-Dichloropropane	10	10 U	10 U	3 J	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	48 U	10 U	10 U	10 U	10 U
Benzene	10	4 J	10 U	11	7 J	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	1 J	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	2 J	4 J	10 U
Chloroethane	10	10 U	10 U	27	62	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	13	13	10 U
Methylene Chloride	10	10 U	12 U	10 U	26 U	13 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	1 J	10 U
Total Xylenes	10	1 J	10 U	5 J	8 J	10 U
Trichloroethene	10	3 J	10 U	10 U	10 U	10 U
Vinyl Chloride	10	24	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		MW-07-02	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		BEDROCK	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-07-02-NX-G-515-3	NMW-10-01-NX-G-516-3	NMW-11-01-NX-G-517-3	NMW-11-02-NX-G-518-3	NMW-11-03-NX-G-519-3
DATE SAMPLED:		01/31/92	01/30/92	01/31/92	01/31/92	01/31/92
REMARKS:						
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	1440 J	50 U	140 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	3 J	2 J	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	5 J	3 J	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 UJ	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-07-02	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		BEDROCK	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-07-02-NX-G-515-3	NMW-10-01-NX-G-516-3	NMW-11-01-NX-G-517-3	NMW-11-02-NX-G-518-3	NMW-11-03-NX-G-519-3
DATE SAMPLED:		01/31/92	01/30/92	01/31/92	01/31/92	01/31/92
REMARKS:						
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	3 J	10 U	10 U	1 J	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	5 J	6 J	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	4 J	6 J	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U

LOCATION NAME:		MW-07-02	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		BEDROCK	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-07-02-NX-G-515-3	NMW-10-01-NX-G-516-3	NMW-11-01-NX-G-517-3	NMW-11-02-NX-G-518-3	NMW-11-03-NX-G-519-3
DATE SAMPLED:		01/31/92	01/30/92	01/31/92	01/31/92	01/31/92
REMARKS:						
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.2 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.0028 J	0.0032 J	0.11 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.013 J	0.56 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.6 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
gamma-BHC(Lindane)	0.05	0.024 J	0.050 U	0.050 U	0.050 U	0.056 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.056 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	906	12300	20400	5690	865
Antimony	60	8 U	31.0 UJ	31.0 UJ	31.0 UJ	31.0 UJ
Arsenic	10	2 U	2 U	2 U	2 U	2 U
Barium	200	38.4	50.1	323	270	87.7
Beryllium	5	1.0 UJ	1 U	2.6	1 U	1 U
Cadmium	5	1 U	1 U	1.8 U	1 U	1 U
Calcium	5000	82500	5430	64300	81300	27400
Chromium	10	13.0 J	3.2 U	15.9 U	2 U	2 U
Cobalt	50	3 U	5.3	19.6	9.8	3 U
Copper	25	5.1 U	21.5 U	18.6 U	15.9 U	3 U
Iron	100	858	13000	88000	44000	1160
Lead	3	8.5 U	6.7 U	15.0 U	19.4 U	6.0 U
Magnesium	5000	2980	5290	21500	25100	3380

LOCATION NAME:		MW-07-02	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		BEDROCK	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-07-02-NX-G-515-3	NMW-10-01-NX-G-516-3	NMW-11-01-NX-G-517-3	NMW-11-02-NX-G-518-3	NMW-11-03-NX-G-519-3
DATE SAMPLED:		01/31/92	01/30/92	01/31/92	01/31/92	01/31/92
REMARKS:						
Manganese	15	22.8	623	3420	3590	206
Mercury	0.2	R	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	19.3	6.0	4 U
Potassium	5000	76500	4340	23700	38800	4750
Selenium	5	4.0 UJ	20.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
Silver	10	2 U	5 U	5 U	5 U	5 U
Sodium	5000	58800	10500	69700	106000	56500
Thallium	10	2.0 UJ	2 U	2.0 UJ	2.0 UJ	2.0 UJ
Vanadium	50	8.6	7.3	27.6	5.0	3 U
Zinc	20	4 U	72.9	73.5	90.8	13.2 J
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	66 U	66 U	66 U	131	75.0
Antimony	60	31 U	31.0 UJ	31 U	31 U	31 U
Arsenic	10	3.7 U	2 U	2.3 U	2 U	2 U
Barium	200	34.0	2.6 U	222	246	69.0
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	1 U	1 U	1.2 U
Calcium	5000	57300	4220	60900	81100	26300
Chromium	10	16.6 J	2 U	2 U	2 U	2 U
Cobalt	50	3 U	3 U	13.2 U	9.0 U	3 U
Copper	25	6.4 U	3.3	3 U	3 U	3 U
Iron	100	257 J	35 U	58000 J	37200 J	114 J
Lead	3	2.9 U	1.7 U	1.9 U	1.9 U	1.4 U
Magnesium	5000	551	1550	18400	23900	3240
Manganese	15	6.1 U	11.4	3020	3100	144
Mercury	0.2	0.23 J	0.2 U	0.20 UJ	0.20 UJ	0.20 UJ
Nickel	40	4.0 U	4 U	9.1 U	8.8 U	4 U
Potassium	5000	79500	600	20500	38300	4770
Selenium	5	4.0 UJ	4.0 UJ	4.0 UJ	4 U	4 U
Silver	10	5 U	5 U	5 U	5 U	5 U
Sodium	5000	61300	9310	68400	107000	57100
Thallium	10	10.0 UJ	2 U	2.0 UJ	2.0 UJ	10.0 UJ
Vanadium	50	5.8	3 U	3.7	3 U	3 U
Zinc	20	11 U	11 U	11 U	11 U	11 U
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-07-02	MW-10-01	MW-11-01	MW-11-02	MW-11-03
FLOW ZONE:		BEDROCK	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN	BEDROCK
M&E SAMPLE ID:		NMW-07-02-NX-G-515-3	NMW-10-01-NX-G-516-3	NMW-11-01-NX-G-517-3	NMW-11-02-NX-G-518-3	NMW-11-03-NX-G-519-3
DATE SAMPLED:		01/31/92	01/30/92	01/31/92	01/31/92	01/31/92
REMARKS:						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10 U	10 U	10 U	10 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	16	10	105	76	6.3
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.0 U	19 J	1.0 UJ	1.0 U
OTHER						
Hardness	(mg/L)	218	35	249	306	82
pH	--	11.2	6.6	6	6.6	8
Specific Conductance	(umhos/cm)	1500	125	1300	1800	550

LOCATION NAME:		MW-13-02	MW-13-02	MW-14-01	OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-13-02-FD-G-567-3	NMW-13-02-NX-G-520-3	NMW-14-01-NX-G-521-3	EOW-27-00-NX-G-503-3	EOW-30-00-NX-G-504-3
DATE SAMPLED:		01/30/92	01/30/92	02/04/92	01/31/92	01/31/92
REMARKS:		Field Duplicate				
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	6 J	8 J	10 U	2 J	12
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	6 J	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	8 J	8 J	10 U	10 U	10 U
Acetone	10	30 U	24 U	17 U	10 U	10 U
Benzene	10	2 J	2 J	27	7 J	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 UJ	1 J	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	5 J	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	12
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	2 J	2 J	19	29	10 U
Methylene Chloride	10	26 U	66 U	33 U	16 U	13 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	22	22	52	2 J	10 U
Total Xylenes	10	6 J	6 J	58	78	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		MW-13-02	MW-13-02	MW-14-01	OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-13-02-FD-G-567-3	NMW-13-02-NX-G-520-3	NMW-14-01-NX-G-521-3	EOW-27-00-NX-G-503-3	EOW-30-00-NX-G-504-3
DATE SAMPLED:		01/30/92	01/30/92	02/04/92	01/31/92	01/31/92
REMARKS:		Field Duplicate				
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	260 J	254	495	76 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	5 J	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	2 J	10 U
2,2'-oxybis(1-Chloropropane)	10	10 UJ	10 UJ	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	6 J	3 J	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	5 J	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 UJ	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 UJ	10 UJ	10 UJ	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	70	73	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-13-02	MW-13-02	MW-14-01	OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-13-02-FD-G-567-3	NMW-13-02-NX-G-520-3	NMW-14-01-NX-G-521-3	EOW-27-00-NX-G-503-3	EOW-30-00-NX-G-504-3
DATE SAMPLED:		01/30/92	01/30/92	02/04/92	01/31/92	01/31/92
REMARKS:		Field Duplicate				
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	2 J	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	1 J	1 J	10 U	16	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	9 J	5 J	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.016 J	0.10 U	0.11 U
Aldrin	0.05	0.050 U	0.050 U	0.0043 J	0.050 U	0.053 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U

LOCATION NAME:		MW-13-02	MW-13-02	MW-14-01	OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-13-02-FD-G-567-3	NMW-13-02-NX-G-520-3	NMW-14-01-NX-G-521-3	EOW-27-00-NX-G-503-3	EOW-30-00-NX-G-504-3
DATE SAMPLED:		01/30/92	01/30/92	02/04/92	01/31/92	01/31/92
REMARKS:		Field Duplicate				
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.1 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.053 U
Endosulfan II	0.10	0.10 U	0.10 U	0.0066 J	0.10 U	0.11 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.11 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.0066 J	0.11 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.053 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.0063 J	0.050 U	0.053 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.53 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.3 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.053 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.0036 J	0.050 U	0.053 U
beta-BHC	0.05	0.050 U	0.050 U	0.094 J	0.050 U	0.053 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.053 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.053 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.053 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	15300	15300	5110	23400	9700
Antimony	60	31.0 UJ	31.0 UJ	8 U	31.0 UJ	8 U
Arsenic	10	2 U	2 U	7.0 U	2 U	2.6 U
Barium	200	123	124	141	233	48.9
Beryllium	5	3.1	3.1	1.0 UJ	1.8	1.5 J
Cadmium	5	1.4 U	1.3 U	1 U	33.8 J	1 U
Calcium	5000	24500	24700	58100	87600	17900
Chromium	10	8.9 U	9.6 U	5.6 J	66.9	6.8 J
Cobalt	50	9.3	9.3	8.2	35.1	3 U
Copper	25	25.2 U	26.3 J	35.8	53.0 J	19.8 U
Iron	100	81600	81700	59700	153000	46300
Lead	3	15.7 U	17.3 U	13.4 U	148	15.9
Magnesium	5000	8430	8390	44700	7110	3260

LOCATION NAME:		MW-13-02	MW-13-02	MW-14-01	OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-13-02-FD-G-567-3	NMW-13-02-NX-G-520-3	NMW-14-01-NX-G-521-3	EOW-27-00-NX-G-503-3	EOW-30-00-NX-G-504-3
DATE SAMPLED:		01/30/92	01/30/92	02/04/92	01/31/92	01/31/92
REMARKS:		Field Duplicate				
Manganese	15	4240	4320	290	969	1090
Mercury	0.2	0.2 U	0.2 U	R	0.29	R
Nickel	40	10.4	10.1	14.4	81.0	9.2
Potassium	5000	5850	6050	119000	10600	8310
Selenium	5	4.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ	4.0 UJ
Silver	10	5 U	5 U	2 U	5 U	2 U
Sodium	5000	11200	11500	101000	9990 J	6470
Thallium	10	2 U	2.0 UJ	2.0 UJ	2 U	2.0 UJ
Vanadium	50	23.3	22.9	15.6	27.4 J	6.5
Zinc	20	119	117	28.8 U	6320	35.5 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	66 U	66 U	66 U	66 U	66 U
Antimony	60	31.0 UJ	31.0 UJ	31 U	31.5	31 U
Arsenic	10	2 U	2 U	6.6 U	2.1 U	2 U
Barium	200	39.1	37.5	112	79.6 J	13.4 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1.2 U	3.3 U	1 U	1 U	1 U
Calcium	5000	22700	22600	59200	75500	17300
Chromium	10	2 U	2 U	8.5 UJ	183 J	3.6 U
Cobalt	50	7.9	9.4	7.0 U	3.7 U	3.0 U
Copper	25	3 U	3 U	3 U	R	3 U
Iron	100	56400 J	56400 J	49400 J	101000 J	20900 J
Lead	3	2.3 U	2.2 U	3.1 U	2.9 U	2.3 UJ
Magnesium	5000	6070	6020	44200	3450	1670
Manganese	15	3860	3850	145	620	397
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.20 UJ	0.20 U
Nickel	40	4 U	4 U	14.2 U	102 J	4.3 U
Potassium	5000	2780	2750	116000	6630	6760
Selenium	5	4.0 UJ	4.0 UJ	20.0 UJ	4 U	4.0 UJ
Silver	10	5 U	5 U	5 U	5 U	5.0 U
Sodium	5000	9970	9930	100000	11300 J	7880
Thallium	10	2 U	2 U	10.0 UJ	2.0 UJ	2.0 UJ
Vanadium	50	3 U	3 U	9.3	4.0	3.0 U
Zinc	20	11 U	11.9	11.4	R	11 U
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	1.0 U	1.0 U	4.94	1.0 U	1.0 U

LOCATION NAME:		MW-13-02	MW-13-02	MW-14-01	OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-13-02-FD-G-567-3	NMW-13-02-NX-G-520-3	NMW-14-01-NX-G-521-3	EOW-27-00-NX-G-503-3	EOW-30-00-NX-G-504-3
DATE SAMPLED:		01/30/92	01/30/92	02/04/92	01/31/92	01/31/92
REMARKS:		Field Duplicate				
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10.0 UJ	10 U	10.0 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	44 J	73 J	220	75	12
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	36 J	41	20	8.7	1.0 UJ
OTHER						
Hardness	(mg/L)	96	96	329	248	58
pH	--	NA	6.7	6.7	6.4	6.8
Specific Conductance	(umhos/cm)	NA	550	1600	700	175

GROUNDWATER (MONITORING WELLS) - APRIL 1992

LOCATION NAME:		MW-01-01	MW-01-02	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-602-4	NMW-01-02-NX-G-603-4	NMW-05-01-NX-G-605-4	NMW-05-02-NX-G-606-4	NMW-06-01-NX-G-607-4
DATE SAMPLED:		04/08/92	04/08/92	04/10/92	04/10/92	04/08/92
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	32 U	10 U	10 U	10 UJ
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	1 J	11	10 U	10 U	3 J
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-602-4	NMW-01-02-NX-G-603-4	NMW-05-01-NX-G-605-4	NMW-05-02-NX-G-606-4	NMW-06-01-NX-G-607-4
DATE SAMPLED:		04/08/92	04/08/92	04/10/92	04/10/92	04/08/92
REMARKS:						
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-602-4	NMW-01-02-NX-G-603-4	NMW-05-01-NX-G-605-4	NMW-05-02-NX-G-606-4	NMW-06-01-NX-G-607-4
DATE SAMPLED:		04/08/92	04/08/92	04/10/92	04/10/92	04/08/92
REMARKS:						
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	7 J	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-602-4	NMW-01-02-NX-G-603-4	NMW-05-01-NX-G-605-4	NMW-05-02-NX-G-606-4	NMW-06-01-NX-G-607-4
DATE SAMPLED:		04/08/92	04/08/92	04/10/92	04/10/92	04/08/92
REMARKS:						
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
alpha-Chlordane	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
beta-BHC	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
gamma-Chlordane	0.05	0.05 U	0.05 U	0.050 U	0.050 U	0.05 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	10800	155 U	18400 J	7870 J	2780
Antimony	60	16 U	16 U	17.5	16 U	16 U
Arsenic	10	2.7 U	1 U	1 U	1 U	1 U
Barium	200	79.8 J	18.6 J	61.2	34.7	60.8 J
Beryllium	5	1.4	1 U	2.7	1 U	1 U
Cadmium	5	2 U	2.2 U	2 UJ	2 UJ	2 U
Calcium	5000	11500	14100	6230	5760	6350
Chromium	10	11.5	3 U	22.3 J	5.7 UJ	4.2
Cobalt	50	31.6	3 U	10.1	3.7	3.7 U
Copper	25	24.4	2.1 U	55.9	28.7	7.4 U
Iron	100	12100	30900	28000 J	9210 J	10900
Lead	3	22.1	5.8 UJ	24 J	6.8 UJ	4.8 U
Magnesium	5000	2940	1500	4880	3760	2400

LOCATION NAME:		MW-01-01	MW-01-02	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-602-4	NMW-01-02-NX-G-603-4	NMW-05-01-NX-G-605-4	NMW-05-02-NX-G-606-4	NMW-06-01-NX-G-607-4
DATE SAMPLED:		04/08/92	04/08/92	04/10/92	04/10/92	04/08/92
REMARKS:						
Manganese	15	444	330	636	338	220
Mercury	0.2	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Nickel	40	9.3	4.8	14.4 U	7.4 U	3.6
Potassium	5000	4370	2590	4330	3460	16500
Selenium	5	0 R	0 R	20 UJ	20 UJ	0 R
Silver	10	0 R	0 R	2 U	2 U	0 R
Sodium	5000	13000	13600	8130	8060	15000
Thallium	10	1 UJ	1 UJ	2 UJ	2 UJ	1 UJ
Vanadium	50	6.4 U	2.9 U	24	8.8 U	5.7 U
Zinc	20	28.2 J	11 UJ	75.1 J	48.4 J	11 UJ
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	55 U	23.4 U	22 U	22 U	84.8 U
Antimony	60	15.3 U	11 U	16 U	16 U	11 U
Arsenic	10	2 UJ	2 U	2 U	2 UJ	2 U
Barium	200	7.6 U	8.9 U	2.3 U	1 U	47.1
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	2 U	2 U	1 U
Calcium	5000	4190	14500	5230	5150	5980
Chromium	10	5 UJ	5 UJ	3 U	3 U	5 UJ
Cobalt	50	7.8 U	2 U	3 U	3 U	3.9 U
Copper	25	4 U	4 U	2 U	2 U	4 U
Iron	100	25 U	83.7 U	23 U	23 U	3040
Lead	3	1.8 U	1.9 U	4.8 U	1.5 U	2.5 U
Magnesium	5000	756	1560	1670	1590	1810
Manganese	15	47.4	64.8	26.4	9 U	172
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	5 U	5 U	3 U	3 U	5 U
Potassium	5000	1950	2820	747	787	16400
Selenium	5	4 UJ	20 UJ	4 UJ	4 UJ	4 UJ
Silver	10	3 U	3 U	2 U	2 U	3 U
Sodium	5000	14000	14300	7800	7770	15300
Thallium	10	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	50	2 U	2 U	2 U	2 U	2 U
Zinc	20	8 UJ	8 UJ	11 UJ	18.4 J	8 UJ
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10 UJ	10 UJ	10 U

LOCATION NAME:		MW-01-01	MW-01-02	MW-05-01	MW-05-02	MW-06-01
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		NMW-01-01-NX-G-602-4	NMW-01-02-NX-G-603-4	NMW-05-01-NX-G-605-4	NMW-05-02-NX-G-606-4	NMW-06-01-NX-G-607-4
DATE SAMPLED:		04/08/92	04/08/92	04/10/92	04/10/92	04/08/92
REMARKS:						
AMMONIA	QL(mg/L)					
Ammonia	0.03	0.0300 U	0.0750	0.0300 U	0.0300 U	0.320
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	9.3	12.7	7.9	9.7	29.3
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	2.2	1.0 U	1.0	4.9
OTHER						
Hardness	(mg/L)	41	41	36	30	26
pH	--	7.7	8.35	5.87	6.25	6.37
Specific Conductance	(umhos/cm)	100	150	78	77	2500

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-01	MW-07-02	MW-08-01
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-06-02-NX-G-608-4	NMW-07-01-FD-G-669-4	NMW-07-01-NX-G-609-4	NMW-07-02-NX-G-610-4	NMW-08-01-NX-G-611-4
DATE SAMPLED:		04/08/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:			Field Duplicate			
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	2 J	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	20	18	22	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	1 J	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	1 J	140	120	78	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	11	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 UJ	10 U	10 UJ	50 U	10 U
Benzene	10	8 J	6 J	6 J	5 J	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	18 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	4 J	10 U	10 U	10 U	10 U
Chloroethane	10	58	15	15	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	12	19	19	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	48	46	10 U	10 U
Total Xylenes	10	6 J	43	42	2 J	10 U
Trichloroethene	10	10 U	10 U	10 U	2 J	10 U
Vinyl Chloride	10	10 U	180	170	12	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-01	MW-07-02	MW-08-01
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-06-02-NX-G-608-4	NMW-07-01-FD-G-669-4	NMW-07-01-NX-G-609-4	NMW-07-02-NX-G-610-4	NMW-08-01-NX-G-611-4
DATE SAMPLED:		04/08/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:			Field Duplicate			
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	1270	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	1 J	1 J	1 J	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	3 J	4 J	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	4 J	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	0.9 J	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	5 J	8 J	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-01	MW-07-02	MW-08-01
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-06-02-NX-G-608-4	NMW-07-01-FD-G-669-4	NMW-07-01-NX-G-609-4	NMW-07-02-NX-G-610-4	NMW-08-01-NX-G-611-4
DATE SAMPLED:		04/08/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:			Field Duplicate			
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	7 J	11	12	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	4 J	2 J	2 J	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	0.9 J	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-01	MW-07-02	MW-08-01
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-06-02-NX-G-608-4	NMW-07-01-FD-G-669-4	NMW-07-01-NX-G-609-4	NMW-07-02-NX-G-610-4	NMW-08-01-NX-G-611-4
DATE SAMPLED:		04/08/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:			Field Duplicate			
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
delta-BHC	0.05	0.05 U	0.0056 J	0.05 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	3660	32800 J	18900 J	278 J	6990 J
Antimony	60	16 U	16 U	16 U	16 U	16 U
Arsenic	10	2.3 U	1.7 U	1.9 U	1 U	1.4 U
Barium	200	232 J	183	118	25.8	77.8
Beryllium	5	1 U	4.3	2.4	1 U	1.1
Cadmium	5	2.8 U	2 UJ	2 UJ	2 UJ	2 UJ
Calcium	5000	65000	29400	29000	40500	9150
Chromium	10	18.6	43.5 J	23.3 J	7.2 UJ	8.9 UJ
Cobalt	50	11.8 U	16.6	11	3 U	3.2
Copper	25	41.3	86 J	51.5 J	2.8 U	43.6
Iron	100	37700	125000 J	104000 J	241 UJ	70400 J
Lead	3	4.6 U	37.6 J	20 J	1.6 UJ	7.8 J
Magnesium	5000	22900	9970	7140	1300	3400

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-01	MW-07-02	MW-08-01
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-06-02-NX-G-608-4	NMW-07-01-FD-G-669-4	NMW-07-01-NX-G-609-4	NMW-07-02-NX-G-610-4	NMW-08-01-NX-G-611-4
DATE SAMPLED:		04/08/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:			Field Duplicate			
Manganese	15	1500	2010	1510	6.1 U	510
Mercury	0.2	0.2 U	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Nickel	40	15.8	30.2 J	16.5 UJ	3 U	4.2 U
Potassium	5000	43800	18800	15200	67700	4610
Selenium	5	0 R	20 UJ	20 UJ	4 UJ	20 UJ
Silver	10	0 R	2 U	2 U	2 U	2 U
Sodium	5000	101000	18000	17100	52500	9260
Thallium	10	5 UJ	2 UJ	2 UJ	10 UJ	2 UJ
Vanadium	50	6.1 U	40.4	23.4	8.7 U	9.1 U
Zinc	20	18.8 J	188 J	0 R	13.3 J	42.3 J
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	21 U	38.6 U	22 U	24 U	58.8 U
Antimony	60	11 U	16 U	16 U	16 U	16 U
Arsenic	10	2.5 U	2 U	2.7 U	2 U	2 U
Barium	200	215	33.5	39.9	28.7	21.6 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	2 U	2 U	2 U	2 U
Calcium	5000	65000	27300	27900	36300	8740
Chromium	10	5 UJ	3 U	3 U	3 U	3 U
Cobalt	50	9.4 U	3 U	3 U	3 U	3.8 U
Copper	25	4 U	2 U	2 U	3.6 U	2 U
Iron	100	34000	81800	88900	51.1 U	5320
Lead	3	2.2 U	2.9 U	3.2 U	1.6 U	1.9 U
Magnesium	5000	22200	3320	3370	505	2320
Manganese	15	1340	1060	1200	2.6 U	416
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	5.8	3 U	3 U	3 U	3 U
Potassium	5000	44000	10800	11100	69400	2700
Selenium	5	4 UJ	20 U	4 U	4 U	4 U
Silver	10	3 U	2 U	2 U	2 U	2 U
Sodium	5000	104000	15900	16000	55000	9020
Thallium	10	2 UJ	2 UJ	2 UJ	10 UJ	2 UJ
Vanadium	50	2 U	2.9 U	3.6 U	10.5 U	2 U
Zinc	20	8 UJ	11 UJ	11 UJ	11 UJ	11 UJ
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 UJ	10 UJ	10 UJ	10 UJ

LOCATION NAME:		MW-06-02	MW-07-01	MW-07-01	MW-07-02	MW-08-01
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN	DEEP OVERBURDEN	BEDROCK	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-06-02-NX-G-608-4	NMW-07-01-FD-G-669-4	NMW-07-01-NX-G-609-4	NMW-07-02-NX-G-610-4	NMW-08-01-NX-G-611-4
DATE SAMPLED:		04/08/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:			Field Duplicate			
AMMONIA	QL(mg/L)					
Ammonia	0.03	51.7	5.14	6.02	0.300	0.0340
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	84.9	60.3 J	85.6 J	150	15.4
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	27.3	NA	NA	3.7	1.0
OTHER						
Hardness	(mg/L)	257	114	102	106	37
pH	--	6.63	NA	6.45	11.73	6.74
Specific Conductance	(umhos/cm)	730	NA	585	1050	120

LOCATION NAME:		MW-08-02	MW-12-01	MW-12-02	MW-II	OW-27
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-08-02-NX-G-612-4	NMW-12-01-NX-G-613-4	NMW-12-02-NX-G-614-4	EOW-02-00-NX-G-604-4	EOW-27-00-FD-G-667-4
DATE SAMPLED:		04/10/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:						Field Duplicate
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	3 J	10 U	10 U	2 J
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	1 J	10 U	6 J
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 UJ	10 U	300	400
Benzene	10	10 U	1 J	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	2 J	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	11	10 U	1 J	4 J
Chloroethane	10	10 U	9 J	10 U	10 U	6 J
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	3 J	10 U	10 U	22
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	12	10 U	110	10 U
Total Xylenes	10	10 U	9 J	10 U	10 U	51
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	9 J
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		MW-08-02	MW-12-01	MW-12-02	MW-II	OW-27
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-08-02-NX-G-612-4	NMW-12-01-NX-G-613-4	NMW-12-02-NX-G-614-4	EOW-02-00-NX-G-604-4	EOW-27-00-FD-G-667-4
DATE SAMPLED:		04/10/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:						Field Duplicate
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	1 J	10 U	10 U	2 J
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	3 J
2-Methylphenol	10	10 U	0.9 J	10 U	3 J	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	6 J
4-Chloroaniline	10	10 U	10 U	10 U	1 J	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	60	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		MW-08-02	MW-12-01	MW-12-02	MW-II	OW-27
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-08-02-NX-G-612-4	NMW-12-01-NX-G-613-4	NMW-12-02-NX-G-614-4	EOW-02-00-NX-G-604-4	EOW-27-00-FD-G-667-4
DATE SAMPLED:		04/10/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:						Field Duplicate
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	0.9 J
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	13 J
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	0.8 J	10 U	10 U	4 J
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		MW-08-02	MW-12-01	MW-12-02	MW-II	OW-27
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-08-02-NX-G-612-4	NMW-12-01-NX-G-613-4	NMW-12-02-NX-G-614-4	EOW-02-00-NX-G-604-4	EOW-27-00-FD-G-667-4
DATE SAMPLED:		04/10/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:						Field Duplicate
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.0087 J	0.050 U	0.010 J	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	445 J	13900 J	55.9 UJ	24200 J	13000 J
Antimony	60	16 U	16 U	16 U	16 U	16 U
Arsenic	10	1 U	1.1 U	1 U	2.2 U	2.9 U
Barium	200	118	146	8.4 U	125	136
Beryllium	5	1 U	2.6	1 U	3.4	1.6
Cadmium	5	2 UJ	2 UJ	2 UJ	2 UJ	20.6 J
Calcium	5000	25500	14300	5520	13300	78800
Chromium	10	3 UJ	15.7 UJ	5 UJ	54.3 J	28 J
Cobalt	50	3 U	8.3	3 U	26.2	24.4
Copper	25	2 U	21.6 U	64.8	43 J	23 J
Iron	100	9430 J	92000 J	8830 J	114000 J	113000 J
Lead	3	3.3 UJ	24.7 J	2.2 UJ	39.9 J	67.2 J
Magnesium	5000	4140	4310	1140	7100	4840

LOCATION NAME:		MW-08-02	MW-12-01	MW-12-02	MW-II	OW-27
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-08-02-NX-G-612-4	NMW-12-01-NX-G-613-4	NMW-12-02-NX-G-614-4	EOW-02-00-NX-G-604-4	EOW-27-00-FD-G-667-4
DATE SAMPLED:		04/10/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:						Field Duplicate
Manganese	15	3380	6960	1410	4290	783
Mercury	0.2	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Nickel	40	3.2 U	15.4 U	19.3 U	49.4 J	43.1 J
Potassium	5000	4420	5960	1640	8070	7420
Selenium	5	4 UJ	20 UJ	4 UJ	20 UJ	20 UJ
Silver	10	2 U	2 U	2 U	2 U	2 U
Sodium	5000	10600	7930	7220	7130 J	8300 J
Thallium	10	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	50	2 U	19.7	3.1 U	35.2	18.9
Zinc	20	11 U	52.6 J	54.8 J	192 J	2770 J
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	32.7 U	31.2 U	22 U	22 U	36.8 U
Antimony	60	16 U	16 U	16 U	16 U	16 U
Arsenic	10	2 U	2 U	2 U	2 U	2 U
Barium	200	95.3	76.2	6 U	29.2	65.6
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	2 U	2.1 U	2 U	2.6 U	2 U
Calcium	5000	20900	14000	5360	11300	66400
Chromium	10	3 U	3 U	3 U	3 U	3 U
Cobalt	50	3 U	3 U	3 U	13.4 U	3 U
Copper	25	2 U	2.9 U	2.6 U	2 U	2 U
Iron	100	5770	73900	4740	80300	90300
Lead	3	2.1 U	1.5 U	4.2 U	5 U	2.9
Magnesium	5000	3590	2940	1150	2790	2780
Manganese	15	2800	6770	1250	3680	630
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	3 U	3 U	18.3	3 U	3 U
Potassium	5000	4340	4120	1680	2720	4900
Selenium	5	4 UJ	4 UJ	4 UJ	4 UJ	4 UJ
Silver	10	2 U	2 U	2 U	2 U	2 U
Sodium	5000	10800	7590	7190	5430	8370
Thallium	10	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	50	2 U	2.3 U	2 U	2 U	2 U
Zinc	20	11 UJ	23 J	35.8 J	11 UJ	11 UJ
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ

LOCATION NAME:		MW-08-02	MW-12-01	MW-12-02	MW-II	OW-27
FLOW ZONE:		BEDROCK	SHALLOW OVERBURDEN	DEEP OVERBURDEN	SHALLOW OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		NMW-08-02-NX-G-612-4	NMW-12-01-NX-G-613-4	NMW-12-02-NX-G-614-4	EOW-02-00-NX-G-604-4	EOW-27-00-FD-G-667-4
DATE SAMPLED:		04/10/92	04/09/92	04/09/92	04/09/92	04/10/92
REMARKS:						Field Duplicate
AMMONIA	QL(mg/L)					
Ammonia	0.03	0.880	6.03	0.500	17.1	6.28
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	24.0	31.4	17.3	55.0 J	99.5
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.6	NA	NA	13.4 J	23.1
OTHER						
Hardness	(mg/L)	81	53	18	62	217
pH	--	7.13	6.38	6.65	6.63	NA
Specific Conductance	(umhos/cm)	200	400	105	460	NA

LOCATION NAME:	OW-27	OW-30
FLOW ZONE:	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:	EOW-27-00-NX-G-600-4	EOW-30-00-NX-G-601-4
DATE SAMPLED:	04/10/92	04/09/92
REMARKS:		

VOLATILE ORGANICS-CLP	CRQL(ug/L)		
1,1,1-Trichloroethane	10	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U
1,1-Dichloroethane	10	2 J	100
1,1-Dichloroethene	10	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U
1,2-Dichloroethene(total)	10	6 J	96
1,2-Dichloropropane	10	10 U	10 U
2-Butanone	10	10 U	10 U
2-Hexanone	10	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U
Acetone	10	540	10 U
Benzene	10	6 J	3 J
Bromodichloromethane	10	10 U	10 U
Bromoform	10	10 U	10 U
Bromomethane	10	10 U	10 U
Carbon Disulfide	10	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U
Chlorobenzene	10	5 J	10 U
Chloroethane	10	5 J	42
Chloroform	10	10 U	10 U
Chloromethane	10	10 U	10 U
Dibromochloromethane	10	10 U	10 U
Ethylbenzene	10	22	3 J
Methylene Chloride	10	10 U	10 U
Styrene	10	10	10 U
Tetrachloroethene	10	10 U	10 U
Toluene	10	10 U	26
Total Xylenes	10	50	7 J
Trichloroethene	10	10 U	10 U
Vinyl Chloride	10	8 J	340
cis-1,3-Dichloropropene	10	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U
WATER SOLUBLE ORGANICS	**QL(ug/L)**		
Acrylonitrile	50	50 U	50 U

LOCATION NAME:	OW-27	OW-30
FLOW ZONE:	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:	EOW-27-00-NX-G-600-4	EOW-30-00-NX-G-601-4
DATE SAMPLED:	04/10/92	04/09/92
REMARKS:		

Ethyl Urethane	100	50 U	50 U
N,N-DMF	50	50 U	142
Urethane	1000	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)		
1,2,4-Trichlorobenzene	10	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U
1,4-Dichlorobenzene	10	1 J	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U
2,4-Dimethylphenol	10	1 J	10 U
2,4-Dinitrophenol	25	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U
2-Chlorophenol	10	10 U	10 U
2-Methylnaphthalene	10	2 J	10 U
2-Methylphenol	10	10 U	10 U
2-Nitroaniline	25	25 U	25 U
2-Nitrophenol	10	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U
3-Nitroaniline	25	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U
4-Chloro-3-methylphenol	10	3 J	10 U
4-Chloroaniline	10	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U
4-Methylphenol	10	10 U	25
4-Nitroaniline	25	25 U	25 U
4-Nitrophenol	25	25 U	25 U
Acenaphthene	10	10 U	10 U
Acenaphthylene	10	10 U	10 U
Anthracene	10	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U

LOCATION NAME:	OW-27	OW-30
FLOW ZONE:	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:	EOW-27-00-NX-G-600-4	EOW-30-00-NX-G-601-4
DATE SAMPLED:	04/10/92	04/09/92
REMARKS:		

Benzo(b)fluoranthene	10	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U
Carbazole	10	10 U	10 U
Chrysene	10	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U
Dibenzofuran	10	10 U	10 U
Diethylphthalate	10	10 U	10 U
Dimethylphthalate	10	10 U	10 U
Fluoranthene	10	10 U	10 U
Fluorene	10	10 U	10 U
Hexachlorobenzene	10	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U
Hexachloroethane	10	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U
Isophorone	10	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U
Naphthalene	10	3 J	10 U
Nitrobenzene	10	10 U	10 U
Pentachlorophenol	25	25 U	25 U
Phenanthrene	10	10 U	10 U
Phenol	10	10 U	10 U
Pyrene	10	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U
PESTICIDES/PCBs	**CRQL(ug/L)**		
4,4'-DDD	0.10	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U

LOCATION NAME:	OW-27	OW-30
FLOW ZONE:	DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:	EOW-27-00-NX-G-600-4	EOW-30-00-NX-G-601-4
DATE SAMPLED:	04/10/92	04/09/92
REMARKS:		

Aroclor-1221	2.0	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)		
Aluminum	200	11000 J	3460 J
Antimony	60	16 U	16 U
Arsenic	10	2.8 U	1 U
Barium	200	128	27.6
Beryllium	5	1.6	1 U
Cadmium	5	18.5 J	2 UJ
Calcium	5000	69500	22600
Chromium	10	24.3 J	8.1 UJ
Cobalt	50	19.8	3 U
Copper	25	19.4 UJ	8.2 U
Iron	100	108000 J	38200 J
Lead	3	72.5 J	11.6 UJ
Magnesium	5000	4330	2760

LOCATION NAME:		OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EOW-27-00-NX-G-600-4	EOW-30-00-NX-G-601-4
DATE SAMPLED:		04/10/92	04/09/92
REMARKS:			
Manganese	15	762	926
Mercury	0.2	0.5 J	0.2 UJ
Nickel	40	37.5 J	7.7 U
Potassium	5000	6670	6690
Selenium	5	20 UJ	4 UJ
Silver	10	2 U	2 U
Sodium	5000	8270 J	6730
Thallium	10	2 UJ	2 UJ
Vanadium	50	15.4	6 U
Zinc	20	2730 J	23.6 J
METALS - FILTERED	CRDL(ug/L)		
Aluminum	200	22 U	22 U
Antimony	60	16 U	16 U
Arsenic	10	2 U	2 U
Barium	200	66.1	17.2 U
Beryllium	5	1 U	1 U
Cadmium	5	2 U	2 U
Calcium	5000	65800	23300
Chromium	10	3 U	3 U
Cobalt	50	3 U	3 U
Copper	25	2 U	2 U
Iron	100	89400	34400
Lead	3	1.7	1.9 U
Magnesium	5000	2740	2230
Manganese	15	624	732
Mercury	0.2	0.2 U	0.2 U
Nickel	40	3 U	3 U
Potassium	5000	4870	6330
Selenium	5	4 UJ	4 UJ
Silver	10	2 U	2 U
Sodium	5000	8290	6860
Thallium	10	2 UJ	2 UJ
Vanadium	50	2 U	2 U
Zinc	20	11 UJ	11 UJ
WATER QUALITY PARAMETERS			
CYANIDE	CRDL(mg/L)		
Cyanide	10	10 UJ	10 UJ

LOCATION NAME:		OW-27	OW-30
FLOW ZONE:		DEEP OVERBURDEN	DEEP OVERBURDEN
M&E SAMPLE ID:		EOW-27-00-NX-G-600-4	EOW-30-00-NX-G-601-4
DATE SAMPLED:		04/10/92	04/09/92
REMARKS:			
AMMONIA	QL(mg/L)		
Ammonia	0.03	5.57	5.14
TOTAL ORGANIC CARBON	QL(mg/L)		
Total Organic Carbon	0.5	99.5	34.3
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)		
Biochemical Oxygen Demand	1.0	27.9	31.5 J
OTHER			
Hardness	(mg/L)	191	68
pH	--	6.36	6.64
Specific Conductance	(umhos/cm)	640	295

#9083

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3.6
#9083

D-10 COMPLETE ANALYTICAL DATA, GROUNDWATER (RESIDENTIAL WELLS)

- JUNE 1991
- SEPTEMBER/OCTOBER 1991
- JANUARY/FEBRUARY 1992
- SEPTEMBER 1993

SDMS DocID 9083

GROUNDWATER (RESIDENTIAL WELLS) - JUNE 1991

LOCATION NAME:		RES#1	RES#1	RES#2	RES#3	RES#4
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
VOLATILE ORGANICS-METHOD 524.2	QL(ug/L)					
1,1,1,2-Tetrachloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1.0	1.0 U	1.0 U	1.0 U	3.1	1.0 U
1,1-Dichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloropropene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Chlorotoluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Chlorotoluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-pentanone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromochloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Disulfide	1.0	1.0 U	1.0 U	1.0 U	12.0	1.0 U
Carbon Tetrachloride	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0	1.0 U

LOCATION NAME:		RES#1	RES#1	RES#2	RES#3	RES#4
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
Chloroform	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.4	1.0 U
Hexachlorobutadiene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	1.0	1.0 U	1.1 U	1.0 U	1.0 U	1.3 U
Naphthalene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Chloride	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	1.0	1.0 U	1.0 U	1.0 U	0.8 J	1.0 U
p-Isopropyltoluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Xylene\m-Xylene	1.0	1.0 U	1.0 U	1.0 U	1.3 U	1.0 U
sec-Butylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
tert-Butylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	5	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	5	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	5	NA	NA	NA	NA	NA
1,1-Dichloroethane	5	NA	NA	NA	NA	NA
1,1-Dichloroethene	5	NA	NA	NA	NA	NA
1,2-Dichloroethane	5	NA	NA	NA	NA	NA
1,2-Dichloroethene(total)	5	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	NA	NA	NA	NA	NA
2-Butanone	10	NA	NA	NA	NA	NA

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M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
2-Hexanone	10	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	10	NA	NA	NA	NA	NA
Acetone	10	NA	NA	NA	NA	NA
Benzene	5	NA	NA	NA	NA	NA
Bromodichloromethane	5	NA	NA	NA	NA	NA
Bromoform	5	NA	NA	NA	NA	NA
Bromomethane	10	NA	NA	NA	NA	NA
Carbon Disulfide	5	NA	NA	NA	NA	NA
Carbon Tetrachloride	5	NA	NA	NA	NA	NA
Chlorobenzene	5	NA	NA	NA	NA	NA
Chloroethane	10	NA	NA	NA	NA	NA
Chloroform	5	NA	NA	NA	NA	NA
Chloromethane	10	NA	NA	NA	NA	NA
Dibromochloromethane	5	NA	NA	NA	NA	NA
Ethylbenzene	5	NA	NA	NA	NA	NA
Methylene Chloride	5	NA	NA	NA	NA	NA
Styrene	5	NA	NA	NA	NA	NA
Tetrachloroethene	5	NA	NA	NA	NA	NA
Toluene	5	NA	NA	NA	NA	NA
Total Xylenes	5	NA	NA	NA	NA	NA
Trichloroethene	5	NA	NA	NA	NA	NA
Vinyl Acetate	10	NA	NA	NA	NA	NA
Vinyl Chloride	10	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	5	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	5	NA	NA	NA	NA	NA
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	R	R	50 U	50 U	50 U
2,4,6-Trichlorophenol	10	R	R	10 U	10 U	10 U
2,4-Dichlorophenol	10	R	R	10 U	10 U	10 U
2,4-Dimethylphenol	10	R	R	10 U	10 U	10 U
2,4-Dinitrophenol	50	R	R	50 U	50 U	50 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#1	RES#1	RES#2	RES#3	RES#4
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	R	R	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	R	R	10 U	10 U	10 U
2-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
2-Nitrophenol	10	R	R	10 U	10 U	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U	20 U	20 U
3-Nitroaniline	50	50 U	50 U	50 UJ	50 U	50 UJ
4,6-Dinitro-2-methylphenol	50	R	R	50 U	50 U	50 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	R	R	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	R	R	10 U	10 U	10 U
4-Nitroaniline	50	50 U	50 U	50 UJ	50 U	50 UJ
4-Nitrophenol	50	R	R	50 U	50 U	50 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzoic Acid	50	R	R	50 U	50 U	50 U
Benzyl Alcohol	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#1	RES#1	RES#2	RES#3	RES#4
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	50	R	R	50 U	50 U	50 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	R	R	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		RES#1	RES#1	RES#2	RES#3	RES#4
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	27 U	37.7 U	27 U	470 J	294 J
Antimony	60	17 U	17 U	17 U	17 U	17 U
Arsenic	10	4 U	4 U	4 U	R	R
Barium	200	8.4	8.0	5.8	22.8	44.3
Beryllium	5	1 U	1 U	1 U	1.1 U	1.6 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	4720	4620	5130	17800	10800
Chromium	10	7 U	7 U	7 U	7 U	7 U
Cobalt	50	4 U	4 U	4 U	4 U	4 U
Copper	25	11 U	17.0	11 U	11 U	52.0 U
Iron	100	1870 J	2070 J	40.7 U	81000 J	180 J
Lead	3	5.8 U	9.7 U	2.3 U	8.6 U	8.7 U
Magnesium	5000	1620	1630	1600	4580	1440
Manganese	15	3080 J	3040 J	9 U	3100 J	1180 J
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	6 U	6 U	6 U	6 U	15.5 U
Potassium	5000	793	889	821	3180	7470
Selenium	5	4 U	4 U	4 U	R	R
Silver	10	4 U	4 U	4 U	4.0 UJ	4.0 UJ
Sodium	5000	7780	7630	6310	11700	5890
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1 U	1 U
Vanadium	50	3 U	3 U	3 U	7.8 U	3 U
Zinc	20	8 U	8 U	8 U	22.8 U	14.1 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	10 U	14.7 U	155 U	10 U	175
Antimony	60	11.6	11 U	11 U	11 U	11 U
Arsenic	10	4 U	4 U	4 U	4 U	4 U
Barium	200	8.4 U	8.9 U	5.7 U	18.6	41.2

LOCATION NAME:		RES#1	RES#1	RES#2	RES#3	RES#4
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	2.1 U	2.1 U	1.5 U	1 U	1 U
Calcium	5000	4960	4820	5750	18500	10700
Chromium	10	2 U	2 U	2 U	2 U	2 U
Cobalt	50	3.0 U	2 U	2 U	2 U	2 U
Copper	25	3 U	3 U	7.7	3 U	29.6
Iron	100	767	781	34.3 U	30000	37.0 U
Lead	3	2.5 U	3.9 U	3.2 U	1 U	4.0 U
Magnesium	5000	1690	1650	1680	4890	1410
Manganese	15	3160	3040	4.7 U	2640	1130
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	4 U	4 U	6.9
Potassium	5000	852	800	891	3180	7420
Selenium	5	4 U	4 U	4 U	4 U	4 U
Silver	10	2 U	2 U	2 U	2 U	2 U
Sodium	5000	8020	7640	6750	12400	6090
Thallium	10	1 U	1 U	1 U	3.0 UJ	3.0 UJ
Vanadium	50	2 U	2 U	2 U	2 U	2 U
Zinc	20	41.5 U	12.3 U	57.3	3.7 U	14.2 U
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	1.80	2.10	3.20	3.70	0.45
CYANIDE	CRDL(mg/L)					
Cyanide	10	2 U	2 U	2 U	10.0 U	10.0 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	1.0	1.0 UJ	1.1 UJ	1.0 UJ	5.6 J	1.1 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	2.4	2.4 U	2.4 U	2.4 U	10 U	2.4 UJ
OTHER						
Hardness	(mg/L)	18	18	19	63	33

LOCATION NAME:		RES#1	RES#1	RES#2	RES#3	RES#4
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RFJ-04-0-FD-06-26-G-019	RFJ-04-0-NX-06-26-G-012	RNG-07-0-NX-06-26-G-015	RJF-06-0-NX-06-27-G-014	RFS-03-0-NX-06-26-G-011
DATE SAMPLED:		06/26/91	06/26/91	06/26/91	06/27/91	06/26/91
REMARKS:		Field Duplicate				
pH	--	NA	5.93	6.45	6.93	5.88
Specific Conductance	(umhos)	NA	300	240	240	520

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
VOLATILE ORGANICS-METHOD 524.2	QL(ug/L)					
1,1,1,2-Tetrachloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloropropene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Chlorotoluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Chlorotoluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-pentanone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromochloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Disulfide	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
Chloroform	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Naphthalene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Chloride	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Xylene\m-Xylene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
sec-Butylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
tert-Butylbenzene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	5	NA	NA	NA	NA	5 U
1,1,2,2-Tetrachloroethane	5	NA	NA	NA	NA	5 U
1,1,2-Trichloroethane	5	NA	NA	NA	NA	5 U
1,1-Dichloroethane	5	NA	NA	NA	NA	5 U
1,1-Dichloroethene	5	NA	NA	NA	NA	5 U
1,2-Dichloroethane	5	NA	NA	NA	NA	5 U
1,2-Dichloroethene(total)	5	NA	NA	NA	NA	5 U
1,2-Dichloropropane	5	NA	NA	NA	NA	5 U
2-Butanone	10	NA	NA	NA	NA	10 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
2-Hexanone	10	NA	NA	NA	NA	10 U
4-Methyl-2-pentanone	10	NA	NA	NA	NA	10 U
Acetone	10	NA	NA	NA	NA	10 U
Benzene	5	NA	NA	NA	NA	5 U
Bromodichloromethane	5	NA	NA	NA	NA	5 U
Bromoform	5	NA	NA	NA	NA	5 U
Bromomethane	10	NA	NA	NA	NA	10 U
Carbon Disulfide	5	NA	NA	NA	NA	5 U
Carbon Tetrachloride	5	NA	NA	NA	NA	5 U
Chlorobenzene	5	NA	NA	NA	NA	5 U
Chloroethane	10	NA	NA	NA	NA	10 U
Chloroform	5	NA	NA	NA	NA	5 U
Chloromethane	10	NA	NA	NA	NA	10 U
Dibromochloromethane	5	NA	NA	NA	NA	5 U
Ethylbenzene	5	NA	NA	NA	NA	5 U
Methylene Chloride	5	NA	NA	NA	NA	5 U
Styrene	5	NA	NA	NA	NA	5 U
Tetrachloroethene	5	NA	NA	NA	NA	5 U
Toluene	5	NA	NA	NA	NA	5 U
Total Xylenes	5	NA	NA	NA	NA	5 U
Trichloroethene	5	NA	NA	NA	NA	2 J
Vinyl Acetate	10	NA	NA	NA	NA	10 U
Vinyl Chloride	10	NA	NA	NA	NA	10 U
cis-1,3-Dichloropropene	5	NA	NA	NA	NA	5 U
trans-1,3-Dichloropropene	5	NA	NA	NA	NA	5 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	50 U	R	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	R	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	R	10 U
2,4-Dinitrophenol	50	50 U	50 U	50 U	R	50 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	R	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	R	10 U
2-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
2-Nitrophenol	10	10 U	10 U	10 U	R	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U	20 U	20 U
3-Nitroaniline	50	50 U	50 U	50 UJ	50 UJ	50 U
4,6-Dinitro-2-methylphenol	50	50 U	50 U	50 U	R	50 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	R	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 UJ
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	R	10 U
4-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
4-Nitrophenol	50	50 U	50 U	50 U	R	50 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	R	R	10 U	10 UJ	10 U
Benzo(b)fluoranthene	10	R	R	10 U	10 UJ	10 U
Benzo(g,h,i)perylene	10	R	R	10 U	10 UJ	10 U
Benzo(k)fluoranthene	10	R	R	10 U	10 UJ	10 U
Benzoic Acid	50	50 U	50 U	50 U	R	50 U
Benzyl Alcohol	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	R	R	10 U	10 UJ	10 U
Dibenz(a,h)anthracene	10	R	R	10 U	10 UJ	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 UJ	10 UJ	10 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	R	R	10 U	10 UJ	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	50	50 U	50 U	50 U	R	50 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	R	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	96.9 U	58.1 U	14.9 U	16.0 U	27 U
Antimony	60	17 U	17 U	11 U	11 U	17 U
Arsenic	10	4 U	4 U	2 U	2 U	4 U
Barium	200	20.8	5.8	1.5 U	2.7 U	2 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	1 U	1.4 U	3 U
Calcium	5000	4990	6750	12200	7900	6020
Chromium	10	7 U	7 U	2 U	2 U	7 U
Cobalt	50	4 U	4 U	2 U	2 U	4 U
Copper	25	11 U	11 U	3 U	11.6 U	58.6
Iron	100	18 U	258	27.5 U	365 J	137 U
Lead	3	4.2 U	6.2 U	4.4 U	4.4 U	6.8 U
Magnesium	5000	1190	2070	1960	2180	1460
Manganese	15	21.4 J	2090 J	6.1 U	1150	9 U
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	6 U	6 U	4 U	4 U	6 U
Potassium	5000	1810	1070	619	1320	969
Selenium	5	4 U	4 U	4.0 UJ	4.0 UJ	4 U
Silver	10	4 U	4 U	2 U	2 U	4 U
Sodium	5000	6260	12200	31400	12600	18100
Thallium	10	1.0 UJ	1.0 UJ	3.0 UJ	3.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	2 U	2 U	3 U
Zinc	20	8 U	8 U	12.4 U	10.0 U	37.1 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	99.7 U	31.3 U	27 U	27 U	36.2 U
Antimony	60	11.7	14.1	17 U	17 U	11 U
Arsenic	10	4 U	4 U	4 U	4 U	4 U
Barium	200	26.5	5.7 U	2 U	4.1 U	2.7 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3.1 U	1.8 U	3 U	3 U	2.5 U
Calcium	5000	5660	6630	11500	7940	6390
Chromium	10	2 U	2 U	7 U	7 U	2 U
Cobalt	50	2.4 U	2 U	4 U	4 U	2.0 U
Copper	25	3 U	3 U	11 U	11 U	22.1
Iron	100	14.5 U	162 U	18 U	18 U	46.5 U
Lead	3	1.5 U	5.0 U	2.7 U	2.9 U	1.8 U
Magnesium	5000	1030	1980	1910	2250	1530
Manganese	15	31.1	2020	9 U	1130 J	11.6
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	6 U	6 U	8.0
Potassium	5000	1720	1110	491	1380	1030
Selenium	5	4 U	4 U	4 U	4 U	4 U
Silver	10	2 U	2 U	4 U	4 U	2 U
Sodium	5000	5320	11400	32500	13600	19100
Thallium	10	1 U	1 U	5.0 UJ	1.0 UJ	1 U
Vanadium	50	2 U	2 U	3 U	3 U	2 U
Zinc	20	10.6 U	52.6 U	8 U	8 U	8.7 U

WATER QUALITY PARAMETERS

SULFIDE	CRQL(mg/L)					
Sulfide	0.05	1.40	0.80	0.90	0.58	1.60
CYANIDE	CRDL(mg/L)					
Cyanide	10	2 U	2 U	10.0 U	10.0 U	2 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	1.0	1.0 UJ	1.4 UJ	1.0 UJ	1.0 UJ	1.1 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	2.4	2.4 U	2.4 U	2.4 UJ	2.4 UJ	2.4 U
OTHER						
Hardness	(mg/L)	17	25	39	29	21

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-0-NX-06-26-G-013	RTK-09-0-NX-06-26-G-017	RCG-02-0-NX-06-21-G-010	RDC-01-0-NX-06-21-G-009	RJM-08-0-NX-06-25-G-016
DATE SAMPLED:		06/26/91	06/26/91	06/21/91	06/21/91	06/25/91
REMARKS:						
pH	--	6.22	5.99	7.83	6.24	6.18
Specific Conductance	(umhos)	360	130	170	100	95

GROUNDWATER (RESIDENTIAL WELLS) - SEPTEMBER/OCTOBER 1991

LOCATION NAME:		RES#1	RES#2	RES#3	RES#4	RES#5
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN	BEDROCK
M&E SAMPLE ID:		RFJ-04-00-NX-G-168-2	RNG-07-00-NX-G-171-2	RJF-06-00-NX-G-170-2	RFS-03-00-NX-G-167-2	RET-05-00-NX-G-169-2
DATE SAMPLED:		09/25/91	09/27/91	10/01/91	09/26/91	09/25/91
REMARKS:						
VOLATILE ORGANICS-METHOD 524.2 QL(ug/L)						
1,1,1,2-Tetrachloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	1	1 U	1 U	1.9	1 U	1 U
1,1-Dichloroethene	1	1 U	1 U	1 U	1 U	1 U
1,1-Dichloropropene	1	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	1	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	1	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	1	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	1	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	1	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	1	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,3-Dichloropropane	1	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
2,2-Dichloropropane	1	1 U	1 U	1 U	1 U	1 U
2-Butanone	5	5 U	5 U	5 U	5 U	5 U
2-Chlorotoluene	1	1 U	1 U	1 U	1 U	1 U
2-Hexanone	5	5 U	5 U	5 U	5 U	5 U
4-Chlorotoluene	1	1 U	1 U	1 U	1 U	1 U
4-Methyl-2-pentanone	5	5 U	5 U	5 U	5 U	5 U
Acetone	5	5 U	5 U	5 U	5 U	5 U
Benzene	1	1 U	1 U	0.8 J	1 U	1 U
Bromobenzene	1	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	1	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	1	1 U	1 U	1 U	1 U	1 U
Bromoform	1	1 U	1 U	1 U	1 U	1 U
Bromomethane	1	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	1	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	1	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1	1 U	1 U	1 U	1 U	1 U
Chloroethane	1	1 U	1 U	1 U	1 U	1 U

LOCATION NAME:		RES#1	RES#2	RES#3	RES#4	RES#5
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN	BEDROCK
M&E SAMPLE ID:		RFJ-04-00-NX-G-168-2	RNG-07-00-NX-G-171-2	RJF-06-00-NX-G-170-2	RFS-03-00-NX-G-167-2	RET-05-00-NX-G-169-2
DATE SAMPLED:		09/25/91	09/27/91	10/01/91	09/26/91	09/25/91
REMARKS:						
Chloroform	1	1 U	1 U	1 U	1 U	1 U
Chloromethane	1	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	1	1 U	1 U	1 U	1 U	1 U
Dibromomethane	1	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	1	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1	1 U	1 U	1 U	1 U	1 U
Hexachlorobutadiene	1	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene	1	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	1	1.5 U	17 U	14 U	1 U	1.1 U
Naphthalene	1	1 U	1 U	1 U	1 U	1 U
Styrene	1	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	1	1 U	1 U	1 U	1 U	1 U
Toluene	1	1 U	1 U	0.6 J	1 U	1 U
Trichloroethene	1	1 U	1.5	1 U	0.6 J	1 U
Trichlorofluoromethane	1	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	1	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	1	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	1	XX NC	XX NC	XX NC	XX NC	XX NC
n-Butylbenzene	1	1 U	1 U	1 U	1 U	1 U
n-Propylbenzene	1	1 U	1 U	1 U	1 U	1 U
o-Xylene	1	1 U	1 U	1 U	1 U	1 U
p-Isopropyltoluene	1	1 U	1 U	1 U	1 U	1 U
p-Xylene\m-Xylene	1	1 U	1 U	1 U	1 U	1 U
sec-Butylbenzene	1	1 U	1 U	1 U	1 U	1 U
tert-Butylbenzene	1	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	1	1 U	1 U	1 U	0.3 J	1 U
trans-1,3-Dichloropropene	1	XX NC	XX NC	XX NC	XX NC	XX NC
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 UJ	50 U	50 U	50 U	50 U
Acrylamide	200	200 UJ	200 U	200 UJ	200 U	200 U
Acrylonitrile	50	50 UJ	50 U	50 UJ	50 U	50 U
Ethyl Urethane	100	100 UJ	100 U	100 U	100 U	100 U
N,N-DMF	50	50 UJ	50 UJ	14 J	50 UJ	50 UJ
Urethane	1000	1000 UJ	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#1	RES#2	RES#3	RES#4	RES#5
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN	BEDROCK
M&E SAMPLE ID:		RFJ-04-00-NX-G-168-2	RNG-07-00-NX-G-171-2	RJF-06-00-NX-G-170-2	RFS-03-00-NX-G-167-2	RET-05-00-NX-G-169-2
DATE SAMPLED:		09/25/91	09/27/91	10/01/91	09/26/91	09/25/91
REMARKS:						
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	63	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#1	RES#2	RES#3	RES#4	RES#5
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN	BEDROCK
M&E SAMPLE ID:		RFJ-04-00-NX-G-168-2	RNG-07-00-NX-G-171-2	RJF-06-00-NX-G-170-2	RFS-03-00-NX-G-167-2	RET-05-00-NX-G-169-2
DATE SAMPLED:		09/25/91	09/27/91	10/01/91	09/26/91	09/25/91
REMARKS:						
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		RES#1	RES#2	RES#3	RES#4	RES#5
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN	BEDROCK
M&E SAMPLE ID:		RFJ-04-00-NX-G-168-2	RNG-07-00-NX-G-171-2	RJF-06-00-NX-G-170-2	RFS-03-00-NX-G-167-2	RET-05-00-NX-G-169-2
DATE SAMPLED:		09/25/91	09/27/91	10/01/91	09/26/91	09/25/91
REMARKS:						
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	13 U	263 U	552 J	14.1 U	93.6 U
Antimony	60	25 U	25 U	25 U	28.1 UJ	25 U
Arsenic	10	1.0 UJ	1 U	1 U	1.0 UJ	1.0 UJ
Barium	200	8.0 U	15.2	9.1 U	1.0 U	20.7
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	5070	3220	17100	23400	9440
Chromium	10	8.0 UJ	8 U	8 U	8 U	8.0 UJ
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	7.4 U	58.4	22.5 U	9.4 U	4 U
Iron	100	1760	41700	18200	166 UJ	51.1 U
Lead	3	5.7 U	12.8 U	1.9 U	2.1 U	1.2 U
Magnesium	5000	1670	708	4520	2190	1250
Manganese	15	3100	408	398	8.1 U	18.7 UJ
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	683 U	875 U	4010	720 U	1930 U
Selenium	5	1 U	1.0 UJ	1 U	1 U	1 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	7970	7110	12400	9270	7730

LOCATION NAME:		RES#1	RES#2	RES#3	RES#4	RES#5
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN	BEDROCK
M&E SAMPLE ID:		RFJ-04-00-NX-G-168-2	RNG-07-00-NX-G-171-2	RJF-06-00-NX-G-170-2	RFS-03-00-NX-G-167-2	RET-05-00-NX-G-169-2
DATE SAMPLED:		09/25/91	09/27/91	10/01/91	09/26/91	09/25/91
REMARKS:						
Thallium	10	1.0 UJ	1 U	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	11.6 U	51.7 U	36.3 U	6.7 UJ	13.0 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	126 U	137 U	118 U	123 U	60.4 U
Antimony	60	25 U	25 U	25 U	43.9 UJ	28.4
Arsenic	10	1.0 UJ	1 U	1.0	1.0 UJ	1.0 UJ
Barium	200	9.6 U	1.8 U	6.8 U	2.5 U	19.7
Beryllium	5	1 U	1 U	1 U	2.3 UJ	1 U
Cadmium	5	3 U	3 U	3 U	3.0 U	3 U
Calcium	5000	5240	3210	16900	23000	9110
Chromium	10	8.0 UJ	8 U	8 U	8 U	8.0 UJ
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	14.9 U	9.7 U	13.1 U	11.7 U	8.4 U
Iron	100	1050	117	583	34.9 UJ	12.0 U
Lead	3	1.8 U	1 U	2.2 U	4.1 U	3.0 U
Magnesium	5000	1710	757	4550	2190	1300
Manganese	15	3160	178	266	9.3 U	17.7 UJ
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	620 U	742 U	3880	1720 U	2020 U
Selenium	5	1 U	1 U	1 U	1 U	1 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	8280	6870	12400	9710	7970
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3.9 U	3 U
Zinc	20	23.6 U	19.3 U	8.3 U	17.5 UJ	15.3 U
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	4.8 UJ	2.4 UJ	2.4 U	2.4 UJ	5.2 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#1	RES#2	RES#3	RES#4	RES#5
FLOW ZONE:		SHALLOW OVERBURDEN	BEDROCK	BEDROCK	SHALLOW OVERBURDEN	BEDROCK
M&E SAMPLE ID:		RFJ-04-00-NX-G-168-2	RNG-07-00-NX-G-171-2	RJF-06-00-NX-G-170-2	RFS-03-00-NX-G-167-2	RET-05-00-NX-G-169-2
DATE SAMPLED:		09/25/91	09/27/91	10/01/91	09/26/91	09/25/91
REMARKS:						
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	1.8	5.2	17.7 J	0.9	4.0 U
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	3.1 U	22.0	1.0 U	1.0 U
OTHER						
Hardness	(mg/L)	20	11	61	67	29
pH	--	5.77	6.91	7.17	7.25	6.49
Specific Conductance	(umhos/cm)	85	55	180	110	105

LOCATION NAME:		RES#6	RES#7	RES#8	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RTK-09-00-NX-G-173-2	RCG-02-00-NX-G-166-2	RDC-01-00-FD-G-313-2	RDC-01-00-NX-G-165-2	RJM-08-00-NX-G-172-2
DATE SAMPLED:		09/25/91	09/24/91	09/24/91	09/24/91	09/24/91
REMARKS:				Field Duplicate		
VOLATILE ORGANICS-METHOD 524.2 QL(ug/L)						
1,1,1,2-Tetrachloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	1	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	1	1 U	1 U	1 U	1 U	1 U
1,1-Dichloropropene	1	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	1	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	1	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	1	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	1	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	1	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	1	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
1,3-Dichloropropane	1	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U
2,2-Dichloropropane	1	1 U	1 U	1 U	1 U	1 U
2-Butanone	5	5 U	5 UJ	5 UJ	5 UJ	5 UJ
2-Chlorotoluene	1	1 U	1 U	1 U	1 U	1 U
2-Hexanone	5	5 U	5 U	5 U	5 U	5 U
4-Chlorotoluene	1	1 U	1 U	1 U	1 U	1 U
4-Methyl-2-pentanone	5	5 U	5 U	5 U	5 U	5 U
Acetone	5	5 U	5 U	5 U	5 U	5 U
Benzene	1	1 U	1 U	1 U	1 U	1 U
Bromobenzene	1	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	1	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	1	1 U	1 U	1 U	1 U	1 U
Bromoform	1	1 U	1 U	1 U	1 U	1 U
Bromomethane	1	1 U	1 U	1 U	1 U	1 U
Carbon Disulfide	1	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	1	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1	1 U	1 U	1 U	1 U	1 U
Chloroethane	1	1 U	1 U	1 U	1 U	1 U

LOCATION NAME:		RES#6	RES#7	RES#8	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RTK-09-00-NX-G-173-2	RCG-02-00-NX-G-166-2	RDC-01-00-FD-G-313-2	RDC-01-00-NX-G-165-2	RJM-08-00-NX-G-172-2
DATE SAMPLED:		09/25/91	09/24/91	09/24/91	09/24/91	09/24/91
REMARKS:				Field Duplicate		
Chloroform	1	1 U	1 U	1 U	1 U	1 U
Chloromethane	1	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	1	1 U	1 U	1 U	1 U	1 U
Dibromomethane	1	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	1	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1	1 U	0.1 J	1 U	1 U	1 U
Hexachlorobutadiene	1	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene	1	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	1	1.8 U	1 U	1 U	1 U	1 U
Naphthalene	1	1 U	1 U	1 U	1 U	1 U
Styrene	1	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	1	1 U	1 U	1 U	1 U	1 U
Toluene	1	1 U	4.1 J	1 U	1 U	1 U
Trichloroethene	1	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	1	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	1	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	1	1 U	1 U	1 U	1 U	1 U
cis-1,3-Dichloropropene	1	XX NC	XX NC	XX NC	XX NC	XX NC
n-Butylbenzene	1	1 U	1 U	1 U	1 U	1 U
n-Propylbenzene	1	1 U	1 U	1 U	1 U	1 U
o-Xylene	1	1 U	1 U	1 U	1 U	1 U
p-Isopropyltoluene	1	1 U	1 U	1 U	1 U	1 U
p-Xylene\m-Xylene	1	1 U	1 U	1 U	1 U	1 U
sec-Butylbenzene	1	1 U	1 U	1 U	1 U	1 U
tert-Butylbenzene	1	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	1	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	1	XX NC	XX NC	XX NC	XX NC	XX NC
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 U	50 UJ	50 UJ	50 UJ	50 UJ
Acrylamide	200	200 U	200 UJ	200 UJ	200 UJ	200 UJ
Acrylonitrile	50	50 U	50 UJ	50 UJ	50 UJ	50 UJ
Ethyl Urethane	100	100 U	100 UJ	100 UJ	100 UJ	100 UJ
N,N-DMF	50	50 UJ	50 UJ	1.9 J	50 UJ	50 UJ
Urethane	1000	1000 U	1000 UJ	1000 UJ	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#6	RES#7	RES#8	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RTK-09-00-NX-G-173-2	RCG-02-00-NX-G-166-2	RDC-01-00-FD-G-313-2	RDC-01-00-NX-G-165-2	RJM-08-00-NX-G-172-2
DATE SAMPLED:		09/25/91	09/24/91	09/24/91	09/24/91	09/24/91
REMARKS:				Field Duplicate		
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#6	RES#7	RES#8	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RTK-09-00-NX-G-173-2	RCG-02-00-NX-G-166-2	RDC-01-00-FD-G-313-2	RDC-01-00-NX-G-165-2	RJM-08-00-NX-G-172-2
DATE SAMPLED:		09/25/91	09/24/91	09/24/91	09/24/91	09/24/91
REMARKS:				Field Duplicate		
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		RES#6	RES#7	RES#8	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RTK-09-00-NX-G-173-2	RCG-02-00-NX-G-166-2	RDC-01-00-FD-G-313-2	RDC-01-00-NX-G-165-2	RJM-08-00-NX-G-172-2
DATE SAMPLED:		09/25/91	09/24/91	09/24/91	09/24/91	09/24/91
REMARKS:				Field Duplicate		
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	25.1 U	64.3 U	146 U	86.0 U	35.0 U
Antimony	60	25 U	25 U	25 U	25 U	25 U
Arsenic	10	1.0 UJ	1 U	1 U	1 U	1 U
Barium	200	4.8 U	1.5 U	1.0 U	1.5 U	1 U
Beryllium	5	1 U	1 U	1.0 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	7890	16300	7530	7370	5630
Chromium	10	8.0 UJ	8 U	8 U	8 U	8 U
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	4 U	5.3 U	22.8 U	20.2 U	51.8
Iron	100	160	61.6 U	732	720	256
Lead	3	1.2 U	1.4 U	1.6 U	2.1 U	3.8 U
Magnesium	5000	2120	2420	2070	2020	1370
Manganese	15	2180	2.6	1160	1130	7.3
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	658 U	656 U	1130 U	1240 U	728 U
Selenium	5	1 U	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	10400	13800	13000	12500	17700

LOCATION NAME:		RES#6	RES#7	RES#8	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RTK-09-00-NX-G-173-2	RCG-02-00-NX-G-166-2	RDC-01-00-FD-G-313-2	RDC-01-00-NX-G-165-2	RJM-08-00-NX-G-172-2
DATE SAMPLED:		09/25/91	09/24/91	09/24/91	09/24/91	09/24/91
REMARKS:				Field Duplicate		
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	10.1 U	30.6 U	25.7 U	22.5 U	17.1 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	35.3 U	51.6 U	33.3 U	132 U	98.0 U
Antimony	60	25 U	25 U	25 U	25 U	32.4
Arsenic	10	1.0 UJ	1 U	1 U	1 U	1 U
Barium	200	4.8 U	2.0 U	1 U	2.0 U	2.3 U
Beryllium	5	1 U	1 U	1 U	1.0 U	1.9 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	7790	16400	7130	7560	5720
Chromium	10	8.0 UJ	8 U	8 U	8 U	8 U
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	4 U	5.3 U	9.7 U	33.4 U	54.0 U
Iron	100	126 U	74.0 U	72.7 U	72.4 U	187
Lead	3	1.9 U	1.5 U	3.1 U	1.0 U	1.9 U
Magnesium	5000	2200	2470	1890	2080	1360
Manganese	15	2310	2 U	1080	1130	8.4
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	835 U	799 U	1040 U	1260 U	986 U
Selenium	5	1 U	1 U	1.0 UJ	1.0 UJ	1 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	10700	13600	11900	12900	16800
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	8.4 U	25.2 U	25.1 U	47.2 U	26.1 U
WATER QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	7.6 UJ	2.8 UJ	2.8 UJ	2.8 UJ	2.8 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		RES#6	RES#7	RES#8	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RTK-09-00-NX-G-173-2	RCG-02-00-NX-G-166-2	RDC-01-00-FD-G-313-2	RDC-01-00-NX-G-165-2	RJM-08-00-NX-G-172-2
DATE SAMPLED:		09/25/91	09/24/91	09/24/91	09/24/91	09/24/91
REMARKS:				Field Duplicate		
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	2.5 U	0.9	1.1	1.1	0.8
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
OTHER						
Hardness	(mg/L)	28	51	27	27	20
pH	--	6.27	7.53	NA	6.64	6.05
Specific Conductance	(umhos/cm)	130	180	NA	97	120

GROUNDWATER (RESIDENTIAL WELLS) - JANUARY/FEBRUARY 1992

LOCATION NAME:		RES#7	RES#8	RES#10
FLOW ZONE:		BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RCG-02-00-NX-G-501-3	RDC-01-00-NX-G-500-3	RDW-10-00-NX-G-502-3
DATE SAMPLED:		02/03/92	02/03/92	02/03/92
REMARKS:				
VOLATILE ORGANICS-METHOD 524.2 QL(ug/L)				
1,1,1,2-Tetrachloroethane	1	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	1	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	1	1.0 U	1.0 U	1.0 U
1,1-Dichloropropene	1	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	1	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	1	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	1	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	1	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	1	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane	1	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	1	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	1	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	1	1.0 U	1.0 U	1.0 U
1,3-Dichloropropane	1	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	1	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	1	1.0 U	1.0 U	1.0 U
2-Butanone	5	5.0 U	5.0 U	5.0 U
2-Chlorotoluene	1	1.0 U	1.0 U	1.0 U
2-Hexanone	5	5.0 U	5.0 U	5.0 U
4-Chlorotoluene	1	1.0 U	1.0 U	1.0 U
4-Methyl-2-pentanone	5	5.0 U	5.0 U	5.0 U
Acetone	5	5.0 U	0.6 J	5.0 U
Benzene	1	1.0 U	1.0 U	1.0 U
Bromobenzene	1	1.0 U	1.0 U	1.0 U
Bromochloromethane	1	1.0 U	1.0 U	1.0 U
Bromodichloromethane	1	1.0 U	1.0 U	1.0 U
Bromoform	1	1.0 U	1.0 U	1.0 U
Bromomethane	1	1.0 U	1.0 U	1.0 U
Carbon Disulfide	1	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	1	1.0 U	1.0 U	1.0 U
Chlorobenzene	1	1.0 U	1.0 U	1.0 U
Chloroethane	1	1.0 U	1.0 U	1.0 U

LOCATION NAME:		RES#7	RES#8	RES#10
FLOW ZONE:		BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RCG-02-00-NX-G-501-3	RDC-01-00-NX-G-500-3	RDW-10-00-NX-G-502-3
DATE SAMPLED:		02/03/92	02/03/92	02/03/92
REMARKS:				
Chloroform	1	1.0 U	1.0 U	1.0 U
Chloromethane	1	1.0 U	1.0 U	1.0 U
Dibromochloromethane	1	1.0 U	1.0 U	1.0 U
Dibromomethane	1	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	1	1.0 U	1.0 U	1.0 U
Ethylbenzene	1	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	1	1.0 U	1.0 U	1.0 U
Isopropylbenzene	1	1.0 U	1.0 U	1.0 U
Methylene Chloride	1	1.0 U	1.0 U	1.0 U
Naphthalene	1	1.0 U	1.0 U	1.0 U
Styrene	1	1.0 U	1.0 U	1.0 U
Tetrachloroethene	1	1.0 U	1.0 U	1.0 U
Toluene	1	1.0 U	1.0 U	1.0 U
Total Xylenes	1	1.0 U	1.0 U	1.0 U
Trichloroethene	1	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane	1	1.0 U	1.0 U	1.0 U
Vinyl Chloride	1	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1	1.0 U	1.0 U	1.0 U
n-Butylbenzene	1	1.0 U	1.0 U	1.0 U
n-Propylbenzene	1	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	1	1.0 U	1.0 U	1.0 U
sec-Butylbenzene	1	1.0 U	1.0 U	1.0 U
tert-Butylbenzene	1	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	1	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1	1.0 U	1.0 U	1.0 U
WATER SOLUBLE ORGANICS	QL(ug/L)			
Acrylonitrile	50	50 U	50 U	50 U
Ethyl Urethane	100	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)			
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U

LOCATION NAME:		RES#7	RES#8	RES#10
FLOW ZONE:		BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RCG-02-00-NX-G-501-3	RDC-01-00-NX-G-500-3	RDW-10-00-NX-G-502-3
DATE SAMPLED:		02/03/92	02/03/92	02/03/92
REMARKS:				
1,4-Dichlorobenzene	10	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 UJ	10 UJ	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 UJ	25 UJ	25 UJ
2,4-Dinitrotoluene	10	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 UJ
4-Bromophenyl-phenylether	10	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 UJ
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U

LOCATION NAME:		RES#7	RES#8	RES#10
FLOW ZONE:		BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RCG-02-00-NX-G-501-3	RDC-01-00-NX-G-500-3	RDW-10-00-NX-G-502-3
DATE SAMPLED:		02/03/92	02/03/92	02/03/92
REMARKS:				
Dibenzofuran	10	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)			
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.0024 J	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U

LOCATION NAME:		RES#7	RES#8	RES#10
FLOW ZONE:		BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RCG-02-00-NX-G-501-3	RDC-01-00-NX-G-500-3	RDW-10-00-NX-G-502-3
DATE SAMPLED:		02/03/92	02/03/92	02/03/92
REMARKS:				
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 J	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 J	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)			
Aluminum	200	20 U	20.0	36.6
Antimony	60	8 U	8 U	8 U
Arsenic	10	2 U	2 U	2.0 UJ
Barium	200	4 U	4 U	4 U
Beryllium	5	1.0 UJ	1.0 UJ	1.0 UJ
Cadmium	5	1 U	1 U	1 U
Calcium	5000	13000	7390	14400
Chromium	10	4.0 UJ	4.0 UJ	4.0 UJ
Cobalt	50	3 U	3 U	3 U
Copper	25	3 U	3 U	3 U
Iron	100	57.9 U	742	24.4 U
Lead	3	1.5 U	3.3 U	2.1 U
Magnesium	5000	2110	2140	2220
Manganese	15	4.1	978	1 U
Mercury	0.2	R	R	0.46 J
Nickel	40	4 U	4 U	4 U
Potassium	5000	572	1220	945
Selenium	5	4.0 UJ	20.0 UJ	20.0 UJ
Silver	10	2 U	2 U	2 U
Sodium	5000	24700	12300	891000
Thallium	10	2.0 UJ	2.0 UJ	10.0 UJ
Vanadium	50	2 U	2 U	2 U

LOCATION NAME:		RES#7	RES#8	RES#10
FLOW ZONE:		BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RCG-02-00-NX-G-501-3	RDC-01-00-NX-G-500-3	RDW-10-00-NX-G-502-3
DATE SAMPLED:		02/03/92	02/03/92	02/03/92
REMARKS:				
Zinc	20	4 U	4 U	165
METALS - FILTERED	CRDL(ug/L)			
Aluminum	200	66 U	66 U	66 U
Antimony	60	31 U	31 U	31 U
Arsenic	10	2.0 UJ	2.0 UJ	2.0 UJ
Barium	200	1.7 U	3.0 U	1 U
Beryllium	5	1 U	1 U	1 U
Cadmium	5	1 U	1 U	1 U
Calcium	5000	13300	7310	15300
Chromium	10	2.2 UJ	2 U	2 U
Cobalt	50	3 U	3 U	3 U
Copper	25	3 U	5.6 U	3 U
Iron	100	94.2 J	149 J	35 U
Lead	3	1.2 U	3.9 U	1.4 U
Magnesium	5000	2120	1970	2240
Manganese	15	3.0 U	932	1.4 U
Mercury	0.2	0.2 U	0.2 U	0.2 U
Nickel	40	4.3 U	4 U	4 U
Potassium	5000	724	1220	767
Selenium	5	20.0 UJ	20.0 UJ	20.0 UJ
Silver	10	5 U	5 U	5 U
Sodium	5000	24900	12300	22600
Thallium	10	10.0 UJ	2.0 UJ	2.0 UJ
Vanadium	50	3 U	3 U	3 U
Zinc	20	11 U	15.1	11 U
WATER QUALITY PARAMETERS				
SULFIDE	CRQL(mg/L)			
Sulfide	0.05	1.0 U	1.0 U	1.0 U
CYANIDE	CRDL(mg/L)			
Cyanide	10	10.0 UJ	10.0 UJ	10.0 UJ
TOTAL ORGANIC CARBON	QL(mg/L)			
Total Organic Carbon	0.5	12	9.0	8.3

LOCATION NAME:		RES#7	RES#8	RES#10
FLOW ZONE:		BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RCG-02-00-NX-G-501-3	RDC-01-00-NX-G-500-3	RDW-10-00-NX-G-502-3
DATE SAMPLED:		02/03/92	02/03/92	02/03/92
REMARKS:				
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)			
Biochemical Oxygen Demand	1.0	1.0 U	1.0 U	1.0 U
OTHER				
Hardness	(mg/L)	41	27	45
pH	--	NA	6.1	8.3
Specific Conductance	(umhos/cm)	175	165	220

GROUNDWATER (RESIDENTIAL WELLS) - SEPTEMBER 1993

GROUNDWATER (RESIDENTIAL WELLS) - SEPTEMBER 1993 (09/21/93-09/23/93)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-00-NX-G-801-6	RTK-06-00-NX-G-802-6	RCG-07-00-NX-G-803-6	RDC-08-00-NX-G-804-6	RJM-09-00-NX-G-805-6
DATE SAMPLED:		09/21/93	09/21/93	09/23/93	09/22/93	09/23/93
REMARKS:						
VOLATILE ORGANICS-METHOD 524.2	QL(ug/L)					
1,1,1,2-Tetrachloroethane	1	NA	NA	1.0 U	NA	1.0 U
1,1,1-Trichloroethane	1	NA	NA	1.0 U	NA	1.0 U
1,1,2,2-Tetrachloroethane	1	NA	NA	1.0 U	NA	1.0 U
1,1,2-Trichloroethane	1	NA	NA	1.0 U	NA	1.0 U
1,1-Dichloroethane	1	NA	NA	1.0 U	NA	1.0 U
1,1-Dichloroethene	1	NA	NA	1.0 U	NA	1.0 U
1,1-Dichloropropene	1	NA	NA	1.0 U	NA	1.0 U
1,2,3-Trichlorobenzene	1	NA	NA	1.0 U	NA	1.0 U
1,2,3-Trichloropropane	1	NA	NA	1.0 U	NA	1.0 U
1,2,4-Trichlorobenzene	1	NA	NA	1.0 U	NA	1.0 U
1,2,4-Trimethylbenzene	1	NA	NA	1.0 U	NA	1.0 U
1,2-Dibromo-3-chloropropane	1	NA	NA	1.0 U	NA	1.0 U
1,2-Dibromoethane	1	NA	NA	1.0 U	NA	1.0 U
1,2-Dichlorobenzene	1	NA	NA	1.0 U	NA	1.0 U
1,2-Dichloroethane	1	NA	NA	1.0 U	NA	1.0 U
1,2-Dichloropropane	1	NA	NA	1.0 U	NA	1.0 U
1,3,5-Trimethylbenzene	1	NA	NA	1.0 U	NA	1.0 U
1,3-Dichlorobenzene	1	NA	NA	1.0 U	NA	1.0 U
1,3-Dichloropropane	1	NA	NA	1.0 U	NA	1.0 U
1,4-Dichlorobenzene	1	NA	NA	1.0 U	NA	1.0 U
2,2-Dichloropropane	1	NA	NA	1.0 U	NA	1.0 U
2-Butanone	5	NA	NA	5.0 U	NA	5.0 U
2-Chlorotoluene	1	NA	NA	1.0 U	NA	1.0 U
2-Hexanone	5	NA	NA	5.0 U	NA	5.0 U
4-Chlorotoluene	1	NA	NA	1.0 U	NA	1.0 U
4-Methyl-2-pentanone	5	NA	NA	5.0 U	NA	5.0 U
Acetone	5	NA	NA	5.0 U	NA	5.0 U
Benzene	1	NA	NA	1.0 U	NA	1.0 U
Bromobenzene	1	NA	NA	1.0 U	NA	1.0 U
Bromochloromethane	1	NA	NA	1.0 U	NA	1.0 U
Bromodichloromethane	1	NA	NA	1.0 J	NA	1.0 J
Bromoform	1	NA	NA	1.0 U	NA	1.0 U
Bromomethane	1	NA	NA	1.0 U	NA	1.0 U
Carbon Disulfide	1	NA	NA	5.0 U	NA	5.0 U
Carbon Tetrachloride	1	NA	NA	1.0 U	NA	1.0 U
Chlorobenzene	1	NA	NA	1.0 U	NA	1.0 U
Chloroethane	1	NA	NA	1.0 U	NA	1.0 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-00-NX-G-801-6	RTK-06-00-NX-G-802-6	RCG-07-00-NX-G-803-6	RDC-08-00-NX-G-804-6	RJM-09-00-NX-G-805-6
DATE SAMPLED:		09/21/93	09/21/93	09/23/93	09/22/93	09/23/93
REMARKS:						
Chloroform	1	NA	NA	1.0 U	NA	1.0 U
Chloromethane	1	NA	NA	1.0 U	NA	1.0 U
Dibromochloromethane	1	NA	NA	1.0 U	NA	1.0 U
Dibromomethane	1	NA	NA	1.0 U	NA	1.0 U
Dichlorodifluoromethane	1	NA	NA	1.0 U	NA	1.0 U
Ethylbenzene	1	NA	NA	1.0 U	NA	1.0 U
Hexachlorobutadiene	1	NA	NA	1.0 U	NA	1.0 U
Isopropylbenzene	1	NA	NA	1.0 U	NA	1.0 U
Methylene Chloride	1	NA	NA	1.0 U	NA	1.0 U
N-Butylbenzene	1	NA	NA	1.0 U	NA	1.0 U
N-Propylbenzene	1	NA	NA	1.0 U	NA	1.0 U
Naphthalene	1	NA	NA	1.0 U	NA	1.0 U
Styrene	1	NA	NA	R	NA	R
Tert-Butylbenzene	1	NA	NA	1.0 U	NA	1.0 U
Tetrachloroethene	1	NA	NA	1.0 U	NA	1.0 U
Toluene	1	NA	NA	1.0 U	NA	1.0 U
Trichloroethene	1	NA	NA	1.0 U	NA	1.0 U
Trichlorofluoromethane	1	NA	NA	1.0 U	NA	1.0 U
Vinyl Chloride	1	NA	NA	1.0 U	NA	1.0 U
cis-1,2-Dichloroethene	1	NA	NA	1.0 U	NA	1.0 U
cis-1,3-Dichloropropene	1	NA	NA	1.0 U	NA	1.0 U
o-Xylene	1	NA	NA	1.0 U	NA	1.0 U
p-Isopropyltoluene	1	NA	NA	1.0 U	NA	1.0 U
p-Xylene\m-Xylene	1	NA	NA	1.0 U	NA	1.0 U
sec-Butylbenzene	1	NA	NA	1.0 U	NA	1.0 U
trans-1,2-Dichloroethene	1	NA	NA	1.0 U	NA	1.0 U
trans-1,3-Dichloropropene	1	NA	NA	1.0 U	NA	1.0 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	NA	NA	NA	50 U	NA
Ethyl Urethane	50	NA	NA	NA	50 U	NA
N,N-DMF	50	NA	NA	NA	50 U	NA
Urethane	10000	NA	NA	NA	10000 U	NA
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	10	NA	NA	NA	NA	NA

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-00-NX-G-801-6	RTK-06-00-NX-G-802-6	RCG-07-00-NX-G-803-6	RDC-08-00-NX-G-804-6	RJM-09-00-NX-G-805-6
DATE SAMPLED:		09/21/93	09/21/93	09/23/93	09/22/93	09/23/93
REMARKS:						
1,3-Dichlorobenzene	10	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	10	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	10	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	25	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	10	NA	NA	NA	NA	NA
2,4-Dichlorophenol	10	NA	NA	NA	NA	NA
2,4-Dimethylphenol	10	NA	NA	NA	NA	NA
2,4-Dinitrophenol	25	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	10	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	10	NA	NA	NA	NA	NA
2-Chloronaphthalene	10	NA	NA	NA	NA	NA
2-Chlorophenol	10	NA	NA	NA	NA	NA
2-Methylnaphthalene	10	NA	NA	NA	NA	NA
2-Methylphenol	10	NA	NA	NA	NA	NA
2-Nitroaniline	25	NA	NA	NA	NA	NA
2-Nitrophenol	10	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	10	NA	NA	NA	NA	NA
3-Nitroaniline	25	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	25	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	10	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	10	NA	NA	NA	NA	NA
4-Chloroaniline	10	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	10	NA	NA	NA	NA	NA
4-Methylphenol	10	NA	NA	NA	NA	NA
4-Nitroaniline	25	NA	NA	NA	NA	NA
4-Nitrophenol	25	NA	NA	NA	NA	NA
Acenaphthene	10	NA	NA	NA	NA	NA
Acenaphthylene	10	NA	NA	NA	NA	NA
Anthracene	10	NA	NA	NA	NA	NA
Benzo(a)anthracene	10	NA	NA	NA	NA	NA
Benzo(a)pyrene	10	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	10	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	10	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	10	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	10	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	10	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	10	NA	NA	NA	NA	NA
Butylbenzylphthalate	10	NA	NA	NA	NA	NA
Carbazole	10	NA	NA	NA	NA	NA

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-00-NX-G-801-6	RTK-06-00-NX-G-802-6	RCG-07-00-NX-G-803-6	RDC-08-00-NX-G-804-6	RJM-09-00-NX-G-805-6
DATE SAMPLED:		09/21/93	09/21/93	09/23/93	09/22/93	09/23/93
REMARKS:						
Chrysene	10	NA	NA	NA	NA	NA
Di-n-butylphthalate	10	NA	NA	NA	NA	NA
Di-n-octylphthalate	10	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	10	NA	NA	NA	NA	NA
Dibenzofuran	10	NA	NA	NA	NA	NA
Diethylphthalate	10	NA	NA	NA	NA	NA
Dimethylphthalate	10	NA	NA	NA	NA	NA
Fluoranthene	10	NA	NA	NA	NA	NA
Fluorene	10	NA	NA	NA	NA	NA
Hexachlorobenzene	10	NA	NA	NA	NA	NA
Hexachlorobutadiene	10	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	10	NA	NA	NA	NA	NA
Hexachloroethane	10	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	10	NA	NA	NA	NA	NA
Isophorone	10	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	10	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	10	NA	NA	NA	NA	NA
Naphthalene	10	NA	NA	NA	NA	NA
Nitrobenzene	10	NA	NA	NA	NA	NA
Pentachlorophenol	25	NA	NA	NA	NA	NA
Phenanthrene	10	NA	NA	NA	NA	NA
Phenol	10	NA	NA	NA	NA	NA
Pyrene	10	NA	NA	NA	NA	NA
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	NA	NA	NA	NA	NA
4,4'-DDE	0.10	NA	NA	NA	NA	NA
4,4'-DDT	0.10	NA	NA	NA	NA	NA
Aldrin	0.05	NA	NA	NA	NA	NA
Aroclor-1016	1.0	NA	NA	NA	NA	NA
Aroclor-1221	2.0	NA	NA	NA	NA	NA
Aroclor-1232	1.0	NA	NA	NA	NA	NA
Aroclor-1242	1.0	NA	NA	NA	NA	NA
Aroclor-1248	1.0	NA	NA	NA	NA	NA
Aroclor-1254	1.0	NA	NA	NA	NA	NA
Aroclor-1260	1.0	NA	NA	NA	NA	NA
Dieldrin	0.10	NA	NA	NA	NA	NA
Endosulfan I	0.05	NA	NA	NA	NA	NA

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-00-NX-G-801-6	RTK-06-00-NX-G-802-6	RCG-07-00-NX-G-803-6	RDC-08-00-NX-G-804-6	RJM-09-00-NX-G-805-6
DATE SAMPLED:		09/21/93	09/21/93	09/23/93	09/22/93	09/23/93
REMARKS:						
Endosulfan II	0.10	NA	NA	NA	NA	NA
Endosulfan Sulfate	0.10	NA	NA	NA	NA	NA
Endrin	0.10	NA	NA	NA	NA	NA
Endrin Aldehyde	0.10	NA	NA	NA	NA	NA
Endrin Ketone	0.10	NA	NA	NA	NA	NA
Heptachlor	0.05	NA	NA	NA	NA	NA
Heptachlor Epoxide	0.05	NA	NA	NA	NA	NA
Methoxychlor	0.50	NA	NA	NA	NA	NA
Toxaphene	5.0	NA	NA	NA	NA	NA
alpha-BHC	0.05	NA	NA	NA	NA	NA
alpha-Chlordane	0.05	NA	NA	NA	NA	NA
beta-BHC	0.05	NA	NA	NA	NA	NA
delta-BHC	0.05	NA	NA	NA	NA	NA
gamma-BHC(Lindane)	0.05	NA	NA	NA	NA	NA
gamma-Chlordane	0.05	NA	NA	NA	NA	NA
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	85.8	69.9	107	80.2	55.4
Antimony	60	19.0 U	19.0 U	19.0 U	19.0 U	19.0 U
Arsenic	10	3.0 U	3.0 U	3.0 U	3.9	3.0 U
Barium	200	13.5	6.0 U	6.0 U	6.0 U	6.0 U
Beryllium	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Calcium	5000	7880	6900	15400	6310	6340 U
Chromium	10	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Cobalt	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Copper	25	13.0 U	7.3 U	3.0 U	3.0 U	156 U
Iron	100	12.8	59.1	31.3	840	314
Lead	3	3.0 U	3.0 U	3.0 U	3.0 U	7.0
Magnesium	5000	2170	2180	2560	1810	1670
Manganese	15	3.9	2120	2.9	1070	6.6
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	21.0 U	21.0 U	21.0 U	21.0 U	21.0 U
Potassium	5000	1870	1490	796.0 U	1390	982
Selenium	5	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Silver	10	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Sodium	5000	9820	13000	19500	12600	17900
Thallium	10	7.0 U	7.0 U	7.0 U	7.0 U	7.0 U

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-00-NX-G-801-6	RTK-06-00-NX-G-802-6	RCG-07-00-NX-G-803-6	RDC-08-00-NX-G-804-6	RJM-09-00-NX-G-805-6
DATE SAMPLED:		09/21/93	09/21/93	09/23/93	09/22/93	09/23/93
REMARKS:						
Vanadium	50	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Zinc	20	7.0 U	7.0 U	7.0 U	7.0 U	10.1
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	71.8 U	59.6 U	39.0 U	74.9 U	74.9 U
Antimony	60	19.0 U	19.0 U	19.0 U	19.0 U	19.0 U
Arsenic	10	3.6	3.0 U	3.0 U	3.0 U	3.0 U
Barium	200	16.4	6.0 U	6.0 U	6.0 U	6.0 U
Beryllium	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cadmium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Calcium	5000	8100	7040	6410	6520	15400
Chromium	10	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Cobalt	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Copper	25	14.6 UJ	3.0 UJ	97.8 J	3.0 UJ	3.0 UJ
Iron	100	22.5 U	31.2 U	73.8	29.9 U	35.8 U
Lead	3	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Magnesium	5000	2160	2130	1690	1810	2540
Manganese	15	5.5	2070	7.4	1070	2.7
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	21.0 U	21.0 U	21.0 U	21.0 U	21.0 U
Potassium	5000	2030	1100	1080	1280	935
Selenium	5	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Silver	10	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Sodium	5000	12300 U	15400	18700	13800 U	21500
Thallium	10	7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ	7.0 UJ
Vanadium	50	6.0 U	6.0 U	6.0 U	6.0 U	6.0 U
Zinc	20	21.0 U	7.0 U	7.0 U	15.9 U	7.0 U
TOT. ANTIMONY, LOW DET. LIMIT	CRDL(ug/L)					
Antimony	2.0	2.0 UJ	2.0 UJ	2.0 U	2.0 U	2.0 UJ
DIS. ANTIMONY, LOW DET. LIMIT	CRDL(ug/L)					
Antimony	2.0	2.0 U	2.0 U	2.0 U	2.0 UJ	2.0 UJ
CYANIDE	CRDL(mg/L)					
Cyanide	10	NA	NA	10.0 U	NA	NA

LOCATION NAME:		RES#5	RES#6	RES#7	RES#8	RES#9
FLOW ZONE:		BEDROCK	BEDROCK	BEDROCK	BEDROCK	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RET-05-00-NX-G-801-6	RTK-06-00-NX-G-802-6	RCG-07-00-NX-G-803-6	RDC-08-00-NX-G-804-6	RJM-09-00-NX-G-805-6
DATE SAMPLED:		09/21/93	09/21/93	09/23/93	09/22/93	09/23/93
REMARKS:						
OTHER						
pH	--	5.73	5.70	8.24	6.65	6.01
Specific Conductance	(umhos/cm)	90	100	150	100	100

LOCATION NAME:	RES#10	RES#11	RES#11
FLOW ZONE:	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:	RDW-10-00-NX-G-806-6	RKJ-11-00-FD-G-808-6	RKJ-11-00-NX-G-807-6
DATE SAMPLED:	09/21/93	09/22/93	09/22/93
REMARKS:		Field Duplicate	

VOLATILE ORGANICS-METHOD 524.2 QL(ug/L)

1,1,1,2-Tetrachloroethane	1	NA	1.0 U	1.0 U
1,1,1-Trichloroethane	1	NA	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1	NA	1.0 U	1.0 U
1,1,2-Trichloroethane	1	NA	1.0 U	1.0 U
1,1-Dichloroethane	1	NA	1.0 U	1.0 U
1,1-Dichloroethene	1	NA	1.0 U	1.0 U
1,1-Dichloropropene	1	NA	1.0 U	1.0 U
1,2,3-Trichlorobenzene	1	NA	1.0 U	1.0 U
1,2,3-Trichloropropane	1	NA	1.0 U	1.0 U
1,2,4-Trichlorobenzene	1	NA	1.0 U	1.0 U
1,2,4-Trimethylbenzene	1	NA	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	1	NA	1.0 U	1.0 U
1,2-Dibromoethane	1	NA	1.0 U	1.0 U
1,2-Dichlorobenzene	1	NA	1.0 U	1.0 U
1,2-Dichloroethane	1	NA	1.0 U	1.0 U
1,2-Dichloropropane	1	NA	1.0 U	1.0 U
1,3,5-Trimethylbenzene	1	NA	1.0 U	1.0 U
1,3-Dichlorobenzene	1	NA	1.0 U	1.0 U
1,3-Dichloropropane	1	NA	1.0 U	1.0 U
1,4-Dichlorobenzene	1	NA	1.0 U	1.0 U
2,2-Dichloropropane	1	NA	1.0 U	1.0 U
2-Butanone	5	NA	5.0 U	5.0 U
2-Chlorotoluene	1	NA	1.0 U	1.0 U
2-Hexanone	5	NA	5.0 U	5.0 U
4-Chlorotoluene	1	NA	1.0 U	1.0 U
4-Methyl-2-pentanone	5	NA	5.0 U	5.0 U
Acetone	5	NA	5.0 U	5.0 U
Benzene	1	NA	1.0 U	1.0 U
Bromobenzene	1	NA	1.0 U	1.0 U
Bromochloromethane	1	NA	1.0 U	1.0 U
Bromodichloromethane	1	NA	1.0 U	1.0 J
Bromoform	1	NA	1.0 U	1.0 U
Bromomethane	1	NA	1.0 U	1.0 U
Carbon Disulfide	1	NA	5.0 U	5.0 U
Carbon Tetrachloride	1	NA	1.0 U	1.0 U
Chlorobenzene	1	NA	1.0 U	1.0 U
Chloroethane	1	NA	1.0 U	1.0 U

LOCATION NAME:		RES#10	RES#11	RES#11
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RDW-10-00-NX-G-806-6	RKJ-11-00-FD-G-808-6	RKJ-11-00-NX-G-807-6
DATE SAMPLED:		09/21/93	09/22/93	09/22/93
REMARKS:			Field Duplicate	
Chloroform	1	NA	1.0 U	1.0 U
Chloromethane	1	NA	1.0 U	1.0 U
Dibromochloromethane	1	NA	1.0 U	1.0 U
Dibromomethane	1	NA	1.0 U	1.0 U
Dichlorodifluoromethane	1	NA	1.0 U	1.0 U
Ethylbenzene	1	NA	1.0 U	1.0 U
Hexachlorobutadiene	1	NA	1.0 U	1.0 U
Isopropylbenzene	1	NA	1.0 U	1.0 U
Methylene Chloride	1	NA	1.0 U	1.0 U
N-Butylbenzene	1	NA	1.0 U	1.0 U
N-Propylbenzene	1	NA	1.0 U	1.0 U
Naphthalene	1	NA	1.0 U	1.0 U
Styrene	1	NA	R	R
Tert-Butylbenzene	1	NA	1.0 U	1.0 U
Tetrachloroethene	1	NA	1.0 U	1.0 U
Toluene	1	NA	1.0 U	1.0 U
Trichloroethene	1	NA	1.0 U	1.0 U
Trichlorofluoromethane	1	NA	1.0 U	1.0 U
Vinyl Chloride	1	NA	1.0 U	1.0 U
cis-1,2-Dichloroethene	1	NA	1.0 U	1.0 U
cis-1,3-Dichloropropene	1	NA	1.0 U	1.0 U
o-Xylene	1	NA	1.0 U	1.0 U
p-Isopropyltoluene	1	NA	1.0 U	1.0 U
p-Xylene\m-Xylene	1	NA	1.0 U	1.0 U
sec-Butylbenzene	1	NA	1.0 U	1.0 U
trans-1,2-Dichloroethene	1	NA	1.0 U	1.0 U
trans-1,3-Dichloropropene	1	NA	1.0 U	1.0 U
WATER SOLUBLE ORGANICS	QL(ug/L)			
Acrylonitrile	50	NA	50 U	50 U
Ethyl Urethane	50	NA	50 U	50 U
N,N-DMF	50	NA	50 U	50 U
Urethane	10000	NA	10000 U	10000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)			
1,2,4-Trichlorobenzene	10	NA	10 U	10 U
1,2-Dichlorobenzene	10	NA	10 U	10 U

LOCATION NAME:		RES#10	RES#11	RES#11
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RDW-10-00-NX-G-806-6	RKJ-11-00-FD-G-808-6	RKJ-11-00-NX-G-807-6
DATE SAMPLED:		09/21/93	09/22/93	09/22/93
REMARKS:			Field Duplicate	
1,3-Dichlorobenzene	10	NA	10 U	10 U
1,4-Dichlorobenzene	10	NA	10 U	10 U
2,2'-Oxybis(1-chloropropane)	10	NA	10 U	10 U
2,4,5-Trichlorophenol	25	NA	25 U	25 U
2,4,6-Trichlorophenol	10	NA	10 U	10 U
2,4-Dichlorophenol	10	NA	10 U	10 U
2,4-Dimethylphenol	10	NA	10 U	10 U
2,4-Dinitrophenol	25	NA	25 U	25 U
2,4-Dinitrotoluene	10	NA	10 U	10 U
2,6-Dinitrotoluene	10	NA	10 U	10 U
2-Chloronaphthalene	10	NA	10 U	10 U
2-Chlorophenol	10	NA	10 U	10 U
2-Methylnaphthalene	10	NA	10 U	10 U
2-Methylphenol	10	NA	10 U	10 U
2-Nitroaniline	25	NA	25 U	25 U
2-Nitrophenol	10	NA	10 U	10 U
3,3'-Dichlorobenzidine	10	NA	10 U	10 U
3-Nitroaniline	25	NA	25 U	25 U
4,6-Dinitro-2-methylphenol	25	NA	25 U	25 U
4-Bromophenyl-phenylether	10	NA	10 U	10 U
4-Chloro-3-methylphenol	10	NA	10 U	10 U
4-Chloroaniline	10	NA	10 U	10 U
4-Chlorophenyl-phenylether	10	NA	10 U	10 U
4-Methylphenol	10	NA	10 U	10 U
4-Nitroaniline	25	NA	25 U	25 U
4-Nitrophenol	25	NA	25 U	25 U
Acenaphthene	10	NA	10 U	10 U
Acenaphthylene	10	NA	10 U	10 U
Anthracene	10	NA	10 U	10 U
Benzo(a)anthracene	10	NA	10 U	10 U
Benzo(a)pyrene	10	NA	10 U	10 U
Benzo(b)fluoranthene	10	NA	10 U	10 U
Benzo(g,h,i)perylene	10	NA	10 U	10 U
Benzo(k)fluoranthene	10	NA	10 U	10 U
Bis(2-chloroethoxy)methane	10	NA	10 U	10 U
Bis(2-chloroethyl)ether	10	NA	10 U	10 U
Bis(2-ethylhexyl)phthalate	10	NA	10 U	10 U
Butylbenzylphthalate	10	NA	10 U	10 U
Carbazole	10	NA	10 U	10 U

LOCATION NAME:	RES#10	RES#11	RES#11
FLOW ZONE:	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:	RDW-10-00-NX-G-806-6	RKJ-11-00-FD-G-808-6	RKJ-11-00-NX-G-807-6
DATE SAMPLED:	09/21/93	09/22/93	09/22/93
REMARKS:		Field Duplicate	

Chrysene	10	NA	10 U	10 U
Di-n-butylphthalate	10	NA	10 U	10 U
Di-n-octylphthalate	10	NA	10 U	10 U
Dibenz(a,h)anthracene	10	NA	10 U	10 U
Dibenzofuran	10	NA	10 U	10 U
Diethylphthalate	10	NA	10 U	10 U
Dimethylphthalate	10	NA	10 U	10 U
Fluoranthene	10	NA	10 U	10 U
Fluorene	10	NA	10 U	10 U
Hexachlorobenzene	10	NA	10 U	10 U
Hexachlorobutadiene	10	NA	10 U	10 U
Hexachlorocyclopentadiene	10	NA	10 U	10 U
Hexachloroethane	10	NA	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	NA	10 U	10 U
Isophorone	10	NA	10 U	10 U
N-Nitroso-di-n-propylamine	10	NA	10 U	10 U
N-Nitrosodiphenylamine	10	NA	10 U	10 U
Naphthalene	10	NA	10 U	10 U
Nitrobenzene	10	NA	10 U	10 U
Pentachlorophenol	25	NA	25 U	25 U
Phenanthrene	10	NA	10 U	10 U
Phenol	10	NA	10 U	10 U
Pyrene	10	NA	10 U	10 U
PESTICIDES/PCBs	**CRQL(ug/L)**			
4,4'-DDD	0.10	NA	0.11 U	0.13 UJ
4,4'-DDE	0.10	NA	0.11 U	0.13 UJ
4,4'-DDT	0.10	NA	0.11 U	0.13 UJ
Aldrin	0.05	NA	0.054 U	0.067 UJ
Aroclor-1016	1.0	NA	R	R
Aroclor-1221	2.0	NA	2.2 U	2.7 UJ
Aroclor-1232	1.0	NA	1.1 U	1.3 UJ
Aroclor-1242	1.0	NA	1.1 U	1.3 UJ
Aroclor-1248	1.0	NA	1.1 U	1.3 UJ
Aroclor-1254	1.0	NA	1.1 U	1.3 UJ
Aroclor-1260	1.0	NA	1.1 U	1.3 UJ
Dieldrin	0.10	NA	0.11 UJ	0.13 UJ
Endosulfan I	0.05	NA	0.054 U	0.067 UJ

LOCATION NAME:		RES#10	RES#11	RES#11
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RDW-10-00-NX-G-806-6	RKJ-11-00-FD-G-808-6	RKJ-11-00-NX-G-807-6
DATE SAMPLED:		09/21/93	09/22/93	09/22/93
REMARKS:			Field Duplicate	
Endosulfan II	0.10	NA	0.11 U	0.13 UJ
Endosulfan Sulfate	0.10	NA	0.11 U	0.13 UJ
Endrin	0.10	NA	0.11 U	0.13 UJ
Endrin Aldehyde	0.10	NA	0.11 U	0.13 UJ
Endrin Ketone	0.10	NA	0.11 U	0.13 UJ
Heptachlor	0.05	NA	0.054 U	0.067 UJ
Heptachlor Epoxide	0.05	NA	0.054 U	0.067 UJ
Methoxychlor	0.50	NA	0.54 U	0.67 UJ
Toxaphene	5.0	NA	5.4 U	6.7 UJ
alpha-BHC	0.05	NA	0.054 U	0.067 UJ
alpha-Chlordane	0.05	NA	0.054 U	0.067 UJ
beta-BHC	0.05	NA	0.054 U	0.067 UJ
delta-BHC	0.05	NA	0.054 U	0.067 UJ
gamma-BHC(Lindane)	0.05	NA	0.054 U	0.067 UJ
gamma-Chlordane	0.05	NA	0.054 U	0.067 UJ
METALS - UNFILTERED	CRDL(mg/L)			
Aluminum	200	106	NA	90.6
Antimony	60	19.0 U	NA	19.0 U
Arsenic	10	3.0 U	NA	3.0 U
Barium	200	6.0 U	NA	8.5
Beryllium	5	1.0 U	NA	1.0 U
Cadmium	5	2.0 U	NA	2.0 U
Calcium	5000	16100	NA	3520
Chromium	10	4.0 U	NA	4.0 U
Cobalt	50	5.0 U	NA	5.0 U
Copper	25	3.0 U	NA	142
Iron	100	19.5	NA	203
Lead	3	3.0 U	NA	3.0 U
Magnesium	5000	2440	NA	1450
Manganese	15	2.9	NA	30.1
Mercury	0.2	0.2 U	NA	0.2 U
Nickel	40	21.0 U	NA	21.0 U
Potassium	5000	1100	NA	1440
Selenium	5	4.0 U	NA	4.0 U
Silver	10	3.0 U	NA	3.0 U
Sodium	5000	24800	NA	7030
Thallium	10	7.0 U	NA	7.0 U

LOCATION NAME:		RES#10	RES#11	RES#11
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RDW-10-00-NX-G-806-6	RKJ-11-00-FD-G-808-6	RKJ-11-00-NX-G-807-6
DATE SAMPLED:		09/21/93	09/22/93	09/22/93
REMARKS:			Field Duplicate	
Vanadium	50	6.0 U	NA	6.0 U
Zinc	20	7.0 U	NA	7.0 U
METALS - FILTERED	CRDL(ug/L)			
Aluminum	200	54.0 U	55.5 U	51.5 U
Antimony	60	19.0 U	19.0 U	19.0 U
Arsenic	10	3.0 U	3.0 U	3.0 U
Barium	200	6.0 U	7.6	7.6
Beryllium	5	1.0 U	1.0 U	1.0 U
Cadmium	5	2.0 U	2.0 U	2.0 U
Calcium	5000	16400	3490	3420
Chromium	10	4.0 U	4.0 U	4.0 U
Cobalt	50	5.0 U	5.0 U	5.0 U
Copper	25	3.0 UJ	120 J	113 J
Iron	100	14.5 U	20.3 U	18.8 U
Lead	3	3.0 U	3.0 U	3.0 U
Magnesium	5000	2440	1430	1400
Manganese	15	3.6	31.0	29.8
Mercury	0.2	0.2 U	0.2 U	0.2 U
Nickel	40	21.0 U	21.0 U	21.0 U
Potassium	5000	796.0 U	1140	1120
Selenium	5	4.0 U	4.0 U	4.0 U
Silver	10	3.0 U	3.0 U	3.0 U
Sodium	5000	27000	7250 U	7120 U
Thallium	10	7.0 UJ	7.0 UJ	7.0 UJ
Vanadium	50	6.0 U	6.0 U	6.0 U
Zinc	20	7.0 U	7.0 U	7.0 U
TOT. ANTIMONY, LOW DET. LIMIT	CRDL(ug/L)			
Antimony	2.0	2.0 UJ	2.0 U	2.0 UJ
DIS. ANTIMONY, LOW DET. LIMIT	CRDL(ug/L)			
Antimony	2.0	2.0 UJ	2.0 UJ	2.0 U
CYANIDE	CRDL(mg/L)			
Cyanide	10	NA	NA	10.0 U

LOCATION NAME:		RES#10	RES#11	RES#11
FLOW ZONE:		SHALLOW OVERBURDEN	SHALLOW OVERBURDEN	SHALLOW OVERBURDEN
M&E SAMPLE ID:		RDW-10-00-NX-G-806-6	RKJ-11-00-FD-G-808-6	RKJ-11-00-NX-G-807-6
DATE SAMPLED:		09/21/93	09/22/93	09/22/93
REMARKS:			Field Duplicate	
OTHER				
pH	--	8.14	NA	6.0
Specific Conductance	(umhos/cm)	150	NA	66

D-11 COMPLETE ANALYTICAL DATA, SURFACE WATER

- JUNE 1991
- SEPTEMBER/OCTOBER 1991
- JANUARY/FEBRUARY 1992
- APRIL 1992
- MAY 1992

SURFACE WATER - JUNE 1991

SURFACE WATER - JUNE 1991 (06/20/91-06/27/91)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0-0.5-NX-06-20-W-024	SW-02-0-0.3-NX-06-25-W-025	SW-03-0-0.3-NX-06-24-W-026	SW-04-0-0.3-NX-06-24-W-027	SW-05-0-0.3-NX-06-24-W-028
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene(total)	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	10 U	10 U
Benzene	5	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	5	5 U	5 U	5 U	5 U	5 U
Bromoform	5	5 U	5 U	5 U	5 U	5 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	5	5 U	4 J	4 J	4 J	5 U
Carbon Tetrachloride	5	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5	5 U	5 U	5 U	5 U	5 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	5	5 U	5 U	5 U	5 U	5 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	5	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	5	5 U	5 U	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5	5 U	5 U	5 U	5 U	5 U
Toluene	5	5 U	5 U	5 U	5 U	5 U
Total Xylenes	5	5 U	5 U	5 U	5 U	9
Trichloroethene	5	5 U	5 U	5 U	5 U	5 U
Vinyl Acetate	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0-0.5-NX-06-20-W-024	SW-02-0-0.3-NX-06-25-W-025	SW-03-0-0.3-NX-06-24-W-026	SW-04-0-0.3-NX-06-24-W-027	SW-05-0-0.3-NX-06-24-W-028
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	50 U	50 U	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	50	50 U	50 U	50 U	50 U	50 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U	20 U	20 U
3-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
4,6-Dinitro-2-methylphenol	50	50 U	50 U	50 U	50 U	50 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
4-Nitrophenol	50	50 U	50 U	50 U	50 U	50 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzoic Acid	50	50 U	50 U	50 U	50 U	50 U
Benzyl Alcohol	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0-0.5-NX-06-20-W-024	SW-02-0-0.3-NX-06-25-W-025	SW-03-0-0.3-NX-06-24-W-026	SW-04-0-0.3-NX-06-24-W-027	SW-05-0-0.3-NX-06-24-W-028
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	50	50 U	50 U	50 U	50 U	50 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0-0.5-NX-06-20-W-024	SW-02-0-0.3-NX-06-25-W-025	SW-03-0-0.3-NX-06-24-W-026	SW-04-0-0.3-NX-06-24-W-027	SW-05-0-0.3-NX-06-24-W-028
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	272 J	88.5 J	68.8 U	53.4 U	10 U
Antimony	60	11 U	17 U	17 U	17 U	11 U
Arsenic	10	2 U	4 U	4 U	4 U	4.1
Barium	200	7.4 U	5.3	5.3	5.8	279
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	3 U	3 U	3 U	2.9 U
Calcium	5000	2980	3950	4030	4130	27100
Chromium	10	2.1 U	7 U	7 U	7 U	2 U
Cobalt	50	2.2 U	4 U	4 U	4 U	2.4 U
Copper	25	3 U	11 U	11 U	11 U	3 U
Iron	100	3250 J	250	234	467 J	34600
Lead	3	5.2 U	4.7 U	3.4 U	3.6 U	5.3 U
Magnesium	5000	1070	1270	1360	1410	12900
Manganese	15	161	22.2 J	43.1 J	201 J	2030
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	5.0	6 U	6 U	6 U	4 U
Potassium	5000	1050	777	797	861	45000
Selenium	5	4.0 UJ	4 U	4 U	4 U	4 U
Silver	10	2 U	4 U	4 U	4 U	2 U
Sodium	5000	6840	7900	7990	8020	59900

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0-0.5-NX-06-20-W-024	SW-02-0-0.3-NX-06-25-W-025	SW-03-0-0.3-NX-06-24-W-026	SW-04-0-0.3-NX-06-24-W-027	SW-05-0-0.3-NX-06-24-W-028
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
Thallium	10	3.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1 U
Vanadium	50	4.1 U	3 U	3 U	3 U	2 U
Zinc	20	13.6 U	8 U	8 U	18.1 U	27.5 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	27 U	69.8 U	56.1 U	64.8 U	116 J
Antimony	60	17 U	11 U	11 U	17 U	17 U
Arsenic	10	4 U	4 U	4 U	4 U	4 U
Barium	200	5.5 U	4.8 U	5.1 U	5.9 U	6.6
Beryllium	5	1.1 U	1 U	1 U	1.1 U	1 U
Cadmium	5	3 U	3.4 U	1.8 U	3 U	3 U
Calcium	5000	2970	4130	4260	4390	4530
Chromium	10	7 U	2 U	2 U	7 U	7 U
Cobalt	50	4 U	2.4 U	2 U	4 U	4 U
Copper	25	11 U	3 U	3 U	11 U	11 U
Iron	100	787 J	132 U	146 U	361 J	1520 J
Lead	3	4.2 U	4.3 U	2.8 U	3.2 U	4.3 U
Magnesium	5000	1020	1370	1400	1410	1460
Manganese	15	134 J	17.6	30.6	193 J	299 J
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	6 U	4 U	4 U	6 U	6 U
Potassium	5000	1120	882	859	918	969
Selenium	5	4.0 UJ	4 U	4 U	4 U	4 U
Silver	10	4 U	2 U	2 U	4 U	4 U
Sodium	5000	9010	9960	8540	9800	8310
Thallium	10	1.0 UJ	1 U	1 U	1.0 UJ	1.0 UJ
Vanadium	50	3 U	2 U	2 U	3 U	3 U
Zinc	20	29.7 U	8.8 U	50.9 U	23.6 U	8 U
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 U	2 U	2 U	2 U	2 U
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.80	2.20	1.90	1.30	1.60

SURFACE WATER - JUNE 1991 (06/20/91-06/27/91)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0-0.5-NX-06-20-W-024	SW-02-0-0.3-NX-06-25-W-025	SW-03-0-0.3-NX-06-24-W-026	SW-04-0-0.3-NX-06-24-W-027	SW-05-0-0.3-NX-06-24-W-028
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	1.0	3.7 UJ	2.1 UJ	3.2 UJ	2.3 UJ	2.8 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	2.4	2.8 J	2.4 U	2.4 U	2.4 U	2.4 U
OTHER						
Hardness	(mg/L)	12	15	16	16	121
pH	--	5.52	5.77	5.83	5.90	5.93
Specific Conductance	(umhos)	73	77	77	80	83
Dissolved Oxygen	(mg/L)	1.9	9.49	9.66	9.39	9.60

LOCATION NAME:		SW-06	SW-06	SW-07	SW-08	SW-08
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-06-0-0.3-FD-06-21-W-047	SW-06-0-0.3-NX-06-21-W-029	SW-07-0-0.3-NX-06-25-W-030	SW-08-0-0.3-FD-06-25-W-100	SW-08-0-0.3-NX-06-25-W-031
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/25/91
REMARKS:		Field Duplicate			Field Duplicate	
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	5	5 U	5 U	5 U	NA	5 UJ
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	NA	5 UJ
1,1,2-Trichloroethane	5	5 U	5 U	5 U	NA	5 UJ
1,1-Dichloroethane	5	5 U	5 U	5 U	NA	5 UJ
1,1-Dichloroethene	5	5 U	5 U	5 U	NA	5 UJ
1,2-Dichloroethane	5	5 U	5 U	5 U	NA	5 UJ
1,2-Dichloroethene(total)	5	5 U	5 U	5 U	NA	5 UJ
1,2-Dichloropropane	5	5 U	5 U	5 U	NA	5 UJ
2-Butanone	10	10 U	10 U	10 U	NA	10 UJ
2-Hexanone	10	10 U	10 U	10 U	NA	10 UJ
4-Methyl-2-pentanone	10	10 U	10 U	10 U	NA	10 UJ
Acetone	10	10 U	10 U	10 U	NA	10 UJ
Benzene	5	5 U	5 U	5 U	NA	5 UJ
Bromodichloromethane	5	5 U	5 U	5 U	NA	5 UJ
Bromoform	5	5 U	5 U	5 U	NA	5 UJ
Bromomethane	10	10 U	10 U	10 U	NA	10 UJ
Carbon Disulfide	5	5 U	5 U	5 U	NA	10 J
Carbon Tetrachloride	5	5 U	5 U	5 U	NA	5 UJ
Chlorobenzene	5	5 U	5 U	5 U	NA	5 UJ
Chloroethane	10	10 U	10 U	10 U	NA	10 UJ
Chloroform	5	5 U	5 U	5 U	NA	5 UJ
Chloromethane	10	10 U	10 U	10 U	NA	10 UJ
Dibromochloromethane	5	5 U	5 U	5 U	NA	5 UJ
Ethylbenzene	5	5 U	5 U	5 U	NA	5 UJ
Methylene Chloride	5	5 U	5 U	5 U	NA	5 UJ
Styrene	5	5 U	5 U	5 U	NA	5 UJ
Tetrachloroethene	5	5 U	5 U	5 U	NA	5 UJ
Toluene	5	5 U	5 U	5 U	NA	5 UJ
Total Xylenes	5	5 U	5 U	8	NA	5 UJ
Trichloroethene	5	5 U	5 U	5 U	NA	5 UJ
Vinyl Acetate	10	10 U	10 U	10 U	NA	10 UJ
Vinyl Chloride	10	10 U	10 U	10 U	NA	10 UJ
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	NA	5 UJ
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	NA	5 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	NA	10 U

LOCATION NAME:	SW-06	SW-06	SW-07	SW-08	SW-08
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	SW-06-0-0.3-FD-06-21-W-047	SW-06-0-0.3-NX-06-21-W-029	SW-07-0-0.3-NX-06-25-W-030	SW-08-0-0.3-FD-06-25-W-100	SW-08-0-0.3-NX-06-25-W-031
DATE SAMPLED:	06/21/91	06/21/91	06/25/91	06/25/91	06/25/91
REMARKS:	Field Duplicate			Field Duplicate	
1,2-Dichlorobenzene	10	10 U	10 U	10 U	NA	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	NA	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	NA	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	50 U	NA	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	NA	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	NA	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	NA	10 U
2,4-Dinitrophenol	50	50 U	50 U	50 U	NA	50 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	NA	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	NA	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	NA	10 U
2-Chlorophenol	10	10 U	10 U	10 U	NA	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	NA	10 U
2-Methylphenol	10	10 U	10 U	10 U	NA	10 U
2-Nitroaniline	50	50 U	50 U	50 U	NA	50 U
2-Nitrophenol	10	10 U	10 U	10 U	NA	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U	NA	20 U
3-Nitroaniline	50	50 UJ	50 U	50 U	NA	50 U
4,6-Dinitro-2-methylphenol	50	50 U	50 U	50 U	NA	50 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	NA	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	NA	10 U
4-Chloroaniline	10	10 U	10 U	10 U	NA	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	NA	10 U
4-Methylphenol	10	10 U	10 U	10 U	NA	10 U
4-Nitroaniline	50	50 U	50 U	50 U	NA	50 U
4-Nitrophenol	50	50 U	50 U	50 U	NA	50 U
Acenaphthene	10	10 U	10 U	10 U	NA	10 U
Acenaphthylene	10	10 U	10 U	10 U	NA	10 U
Anthracene	10	10 U	10 U	10 U	NA	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	NA	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	NA	R
Benzo(b)fluoranthene	10	10 U	10 U	10 U	NA	R
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	NA	R
Benzo(k)fluoranthene	10	10 U	10 U	10 U	NA	R
Benzoic Acid	50	50 U	50 U	50 U	NA	50 U
Benzyl Alcohol	10	10 U	10 U	10 U	NA	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	NA	10 U
Chrysene	10	10 U	10 U	10 U	NA	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	NA	10 U

LOCATION NAME:		SW-06	SW-06	SW-07	SW-08	SW-08
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-06-0-0.3-FD-06-21-W-047	SW-06-0-0.3-NX-06-21-W-029	SW-07-0-0.3-NX-06-25-W-030	SW-08-0-0.3-FD-06-25-W-100	SW-08-0-0.3-NX-06-25-W-031
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/25/91
REMARKS:		Field Duplicate			Field Duplicate	
Di-n-octylphthalate	10	10 U	10 U	10 U	NA	R
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	NA	R
Dibenzofuran	10	10 U	10 U	10 U	NA	10 U
Diethylphthalate	10	10 U	10 U	10 U	NA	10 U
Dimethylphthalate	10	10 U	10 U	10 U	NA	10 U
Fluoranthene	10	10 U	10 U	10 U	NA	10 U
Fluorene	10	10 U	10 U	10 U	NA	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	NA	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	NA	10 U
Hexachlorocyclopentadiene	10	10 UJ	10 UJ	10 UJ	NA	10 U
Hexachloroethane	10	10 U	10 U	10 U	NA	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	NA	R
Isophorone	10	10 U	10 U	10 U	NA	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	NA	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	NA	10 U
Naphthalene	10	10 U	10 U	10 U	NA	10 U
Nitrobenzene	10	10 U	10 U	10 U	NA	10 U
Pentachlorophenol	50	50 U	50 U	50 U	NA	50 U
Phenanthrene	10	10 U	10 U	10 U	NA	10 U
Phenol	10	10 U	10 U	10 U	NA	10 U
Pyrene	10	10 U	10 U	10 U	NA	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	NA	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	NA	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	NA	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	NA	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	NA	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	NA	1.0 U

LOCATION NAME:		SW-06	SW-06	SW-07	SW-08	SW-08
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-06-0-0.3-FD-06-21-W-047	SW-06-0-0.3-NX-06-21-W-029	SW-07-0-0.3-NX-06-25-W-030	SW-08-0-0.3-FD-06-25-W-100	SW-08-0-0.3-NX-06-25-W-031
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/25/91
REMARKS:		Field Duplicate			Field Duplicate	
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	NA	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U	NA	1.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	NA	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U	NA	0.50 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	70.7 U	NA	177 J	NA	84.6 U
Antimony	60	11.1 U	NA	17 U	NA	17 U
Arsenic	10	2 U	NA	4 U	NA	4 U
Barium	200	8.7 U	NA	24.8	NA	10.6
Beryllium	5	1 U	NA	1 U	NA	1 U
Cadmium	5	1.5 U	NA	3 U	NA	3 U
Calcium	5000	5500	NA	8620	NA	6550
Chromium	10	2 U	NA	7 U	NA	7 U
Cobalt	50	2 U	NA	4 U	NA	4 U
Copper	25	3 U	NA	11 U	NA	11 U
Iron	100	1720 J	NA	14800 J	NA	1810 J
Lead	3	3.0 U	NA	2 U	NA	2 U
Magnesium	5000	1770	NA	2590	NA	2070
Manganese	15	379	NA	1330 J	NA	524 J
Mercury	0.2	0.2 U	NA	0.2 U	NA	0.2 U
Nickel	40	4 U	NA	6 U	NA	6 U
Potassium	5000	1470	NA	3420	NA	1910
Selenium	5	4.0 UJ	NA	4 U	NA	4 U
Silver	10	2 U	NA	4 U	NA	4 U
Sodium	5000	9510	NA	12000	NA	11000

LOCATION NAME:		SW-06	SW-06	SW-07	SW-08	SW-08
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-06-0-0.3-FD-06-21-W-047	SW-06-0-0.3-NX-06-21-W-029	SW-07-0-0.3-NX-06-25-W-030	SW-08-0-0.3-FD-06-25-W-100	SW-08-0-0.3-NX-06-25-W-031
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/25/91
REMARKS:		Field Duplicate			Field Duplicate	
Thallium	10	3.0 UJ	NA	1.0 UJ	NA	1.0 UJ
Vanadium	50	2.5 U	NA	3 U	NA	3 U
Zinc	20	8.3 U	NA	8 U	NA	8 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	NA	34.5 U	39.8 U	38.0 U	32.2 U
Antimony	60	NA	17 U	11 U	15.9	11 U
Arsenic	10	NA	4 U	4 U	4 U	4 U
Barium	200	NA	7.8 U	24.1	11.1 U	10.5 U
Beryllium	5	NA	2.1 U	1 U	1 U	1 U
Cadmium	5	NA	3 U	2.4 U	3.0 U	3.0 U
Calcium	5000	NA	5400	8240	7090	7190
Chromium	10	NA	7 U	2 U	2 U	2 U
Cobalt	50	NA	4 U	2 U	2 U	2 U
Copper	25	NA	11 U	3 U	3 U	3 U
Iron	100	NA	720 J	2880	624	791
Lead	3	NA	5.4 U	1.8 U	1 U	1.1 U
Magnesium	5000	NA	1720	2510	2190	2170
Manganese	15	NA	338 J	1150	556	543
Mercury	0.2	NA	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	NA	6 U	4 U	4 U	4 U
Potassium	5000	NA	1430	3490	2030	2020
Selenium	5	NA	4 U	4 U	4 U	4 U
Silver	10	NA	4 U	2 U	2.5	2 U
Sodium	5000	NA	11600	12400	11600	13100
Thallium	10	NA	1.0 UJ	1 U	1 U	1 U
Vanadium	50	NA	3 U	2 U	2 U	2 U
Zinc	20	NA	21.8 U	17.5 U	16.4 U	16.4 U
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 U	NA	2 U	NA	2 U
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.90	0.58	1.90	NA	0.64

LOCATION NAME:		SW-06	SW-06	SW-07	SW-08	SW-08
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-06-0-0.3-FD-06-21-W-047	SW-06-0-0.3-NX-06-21-W-029	SW-07-0-0.3-NX-06-25-W-030	SW-08-0-0.3-FD-06-25-W-100	SW-08-0-0.3-NX-06-25-W-031
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/25/91
REMARKS:		Field Duplicate			Field Duplicate	
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	1.0	2.8 UJ	3.0 UJ	4.1 UJ	NA	4.2 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	2.4	2.4 UJ	2.4 UJ	3.0 U	NA	6.0 U
OTHER						
Hardness	(mg/L)	21	NA	32	NA	25
pH	--	NA	6.02	6.18	NA	6.01
Specific Conductance	(umhos)	NA	106	160	NA	133
Dissolved Oxygen	(mg/L)	NA	7.48	8.40	NA	6.62

LOCATION NAME:		SW-09	SW-09	SW-10	SW-12	SW-13
STREAM:		MITCHELL BROOK	MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0-0.3-FD-06-20-W-048	SW-09-0-0.3-NX-06-20-W-032	SW-10-0-0.3-NX-06-20-W-033	SW-12-0-0.3-NX-06-25-W-035	SW-13-0-0.3-NX-06-20-W-036
DATE SAMPLED:		06/20/91	06/20/91	06/20/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene(total)	5	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	10 U	10 U
Benzene	5	5 U	5 U	5 U	3 J	5 U
Bromodichloromethane	5	5 U	5 U	5 U	5 U	5 U
Bromoform	5	5 U	5 U	5 U	5 U	5 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	5	5 U	1 J	5 U	5 U	5 U
Carbon Tetrachloride	5	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5	5 U	5 U	5 U	2 J	5 U
Chloroethane	10	10 U	10 U	10 U	6 J	10 U
Chloroform	5	5 U	5 U	5 U	5 U	5 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	5	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	5	5 U	5 U	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5	5 U	5 U	5 U	5 U	5 U
Toluene	5	5 U	5 U	5 U	5 U	5 U
Total Xylenes	5	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	5 U	5 U	5 U
Vinyl Acetate	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-09	SW-09	SW-10	SW-12	SW-13
STREAM:		MITCHELL BROOK	MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0-0.3-FD-06-20-W-048	SW-09-0-0.3-NX-06-20-W-032	SW-10-0-0.3-NX-06-20-W-033	SW-12-0-0.3-NX-06-25-W-035	SW-13-0-0.3-NX-06-20-W-036
DATE SAMPLED:		06/20/91	06/20/91	06/20/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U	50 U	50 U	50 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	50	50 U	50 U	50 U	50 U	50 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U	20 U	20 U	20 U
3-Nitroaniline	50	50 U	50 U	50 UJ	50 U	50 U
4,6-Dinitro-2-methylphenol	50	50 U	50 U	50 U	50 U	50 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	50	50 U	50 U	50 U	50 U	50 U
4-Nitrophenol	50	50 U	50 U	50 U	50 U	50 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 UJ	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzoic Acid	50	50 U	50 U	50 U	50 UJ	50 U
Benzyl Alcohol	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-09	SW-09	SW-10	SW-12	SW-13
STREAM:		MITCHELL BROOK	MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0-0.3-FD-06-20-W-048	SW-09-0-0.3-NX-06-20-W-032	SW-10-0-0.3-NX-06-20-W-033	SW-12-0-0.3-NX-06-25-W-035	SW-13-0-0.3-NX-06-20-W-036
DATE SAMPLED:		06/20/91	06/20/91	06/20/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 UJ	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 UJ	10 UJ	10 UJ	10 U	10 UJ
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 UJ	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	50	50 U	50 U	50 U	50 U	50 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 UJ	11 J	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		SW-09	SW-09	SW-10	SW-12	SW-13
STREAM:		MITCHELL BROOK	MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0-0.3-FD-06-20-W-048	SW-09-0-0.3-NX-06-20-W-032	SW-10-0-0.3-NX-06-20-W-033	SW-12-0-0.3-NX-06-25-W-035	SW-13-0-0.3-NX-06-20-W-036
DATE SAMPLED:		06/20/91	06/20/91	06/20/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	121 U	126 U	121 U	968 J	363 J
Antimony	60	16.1 U	11 U	16.1 U	17 U	11 U
Arsenic	10	2 U	2 U	2 U	4 U	2 U
Barium	200	7.5 U	8.6 U	31.6	173	8.3 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	1.3 U	3 U	1.4 U
Calcium	5000	2750	2940	11100	23200	2430
Chromium	10	2 U	2 U	2 U	7 U	3.1 U
Cobalt	50	2 U	2 U	2 U	4 U	2 U
Copper	25	3 U	3 U	3 U	11 U	3 U
Iron	100	743 J	847 J	5140 J	65000 J	547 J
Lead	3	3.8 U	2.6 U	3.8 U	8.9 U	4.7 U
Magnesium	5000	969	1000	2680	7380	971
Manganese	15	88.5	117	1690	1610 J	29.6
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	4 U	6 U	4 U
Potassium	5000	805	794	2970	11600	650
Selenium	5	4.0 UJ	4.0 UJ	4.0 UJ	4 U	4.0 UJ
Silver	10	2 U	2 U	2 U	4 U	2 U
Sodium	5000	6920	6980	9930	35300	7310

LOCATION NAME:		SW-09	SW-09	SW-10	SW-12	SW-13
STREAM:		MITCHELL BROOK	MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0-0.3-FD-06-20-W-048	SW-09-0-0.3-NX-06-20-W-032	SW-10-0-0.3-NX-06-20-W-033	SW-12-0-0.3-NX-06-25-W-035	SW-13-0-0.3-NX-06-20-W-036
DATE SAMPLED:		06/20/91	06/20/91	06/20/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				
Thallium	10	3.0 UJ	3.0 UJ	3.0 UJ	1.0 UJ	3.0 UJ
Vanadium	50	2 U	2 U	2 U	5.1 U	3.2 U
Zinc	20	3.5 U	6.5 U	7.7 U	22.8	13.0 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	42.1 U	66.1 U	27 U	38.2 U	108 U
Antimony	60	17 U	17 U	17 U	11 U	17 U
Arsenic	10	4 U	4 U	4 U	4 U	4 U
Barium	200	6.9 U	6.4 U	30.2	92.9	5.9 U
Beryllium	5	1 U	1.1 U	1 U	1 U	1.1 U
Cadmium	5	3 U	3 U	3 U	2.7 U	3.5 U
Calcium	5000	2650	2790	11300	20100	2430
Chromium	10	7 U	7 U	7 U	2 U	7 U
Cobalt	50	4 U	4 U	4 U	2.4 U	4 U
Copper	25	11 U	11 U	11 U	3 U	11 U
Iron	100	201 J	319 J	3620 J	4890	194 J
Lead	3	3.3	3.4 U	2.1 U	3.7 U	5.0 U
Magnesium	5000	893	932	2800	6320	873
Manganese	15	75.1 J	69.4 J	1740 J	1450	16.4 J
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	7.0	6 U	6 U	4 U	6 U
Potassium	5000	805	902	3170	9840	684
Selenium	5	4.0 UJ	4.0 UJ	4 U	4 U	4 U
Silver	10	4 U	4 U	4 U	2 U	4 U
Sodium	5000	7130	9050	12100	31700	8760
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1 U	1.0 UJ
Vanadium	50	3.7 U	3 U	3 U	2 U	3 U
Zinc	20	8 U	8 U	8 U	35.7 U	45.5 U
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 U	10.0 U	10.0 U	2 U	10.0 U
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.32	0.32	1.90	1.30	1.40

LOCATION NAME:		SW-09	SW-09	SW-10	SW-12	SW-13
STREAM:		MITCHELL BROOK	MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0-0.3-FD-06-20-W-048	SW-09-0-0.3-NX-06-20-W-032	SW-10-0-0.3-NX-06-20-W-033	SW-12-0-0.3-NX-06-25-W-035	SW-13-0-0.3-NX-06-20-W-036
DATE SAMPLED:		06/20/91	06/20/91	06/20/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	1.0	3.5 UJ	2.7 UJ	2.8 UJ	3.2 UJ	5.0 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	2.4	2.4 U	2.4 U	2.4 U	3.0 U	2.4 U
OTHER						
Hardness	(mg/L)	11	11	39	88	10
pH	--	NA	5.71	7.2	6.01	5.79
Specific Conductance	(umhos)	NA	72	26	1200	55
Dissolved Oxygen	(mg/L)	NA	7.30	6.48	1.85	8.12

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0-0.3-NX-06-19-W-037	SW-15-0-0.3-NX-06-25-W-038
DATE SAMPLED:	06/19/91	06/25/91
REMARKS:		

VOLATILE ORGANICS-CLP	CRQL(ug/L)		
1,1,1-Trichloroethane	5	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U
1,1-Dichloroethene	5	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U
1,2-Dichloroethene(total)	5	4 J	5 U
1,2-Dichloropropane	5	5 U	5 U
2-Butanone	10	10 U	10 U
2-Hexanone	10	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U
Acetone	10	10 U	10 U
Benzene	5	5 U	5 U
Bromodichloromethane	5	5 U	5 U
Bromoform	5	5 U	5 U
Bromomethane	10	10 U	10 U
Carbon Disulfide	5	5 U	5 U
Carbon Tetrachloride	5	5 U	5 U
Chlorobenzene	5	5 U	5 U
Chloroethane	10	10 U	10 U
Chloroform	5	5 U	5 U
Chloromethane	10	10 U	10 U
Dibromochloromethane	5	5 U	5 U
Ethylbenzene	5	5 U	5 U
Methylene Chloride	5	5 U	6 U
Styrene	5	5 U	5 U
Tetrachloroethene	5	5 U	5 U
Toluene	5	5 U	5 U
Total Xylenes	5	5 U	5 U
Trichloroethene	5	5 U	5 U
Vinyl Acetate	10	10 U	10 U
Vinyl Chloride	10	10 U	10 U
cis-1,3-Dichloropropene	5	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)		
1,2,4-Trichlorobenzene	10	10 U	10 U

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0-0.3-NX-06-19-W-037	SW-15-0-0.3-NX-06-25-W-038
DATE SAMPLED:	06/19/91	06/25/91
REMARKS:		

1,2-Dichlorobenzene	10	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U
2,4,5-Trichlorophenol	50	50 U	50 U
2,4,6-Trichlorophenol	10	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U
2,4-Dinitrophenol	50	50 U	50 U
2,4-Dinitrotoluene	10	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U
2-Chlorophenol	10	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U
2-Methylphenol	10	10 U	10 U
2-Nitroaniline	50	50 U	50 U
2-Nitrophenol	10	10 U	10 U
3,3'-Dichlorobenzidine	20	20 U	20 U
3-Nitroaniline	50	50 U	50 U
4,6-Dinitro-2-methylphenol	50	50 U	50 U
4-Bromophenyl-phenylether	10	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U
4-Chloroaniline	10	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U
4-Methylphenol	10	10 U	10 U
4-Nitroaniline	50	50 U	50 U
4-Nitrophenol	50	50 U	50 U
Acenaphthene	10	10 U	10 U
Acenaphthylene	10	10 U	10 U
Anthracene	10	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 UJ
Benzo(k)fluoranthene	10	10 U	10 U
Benzoic Acid	50	50 U	50 UJ
Benzyl Alcohol	10	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U
Chrysene	10	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0-0.3-NX-06-19-W-037	SW-15-0-0.3-NX-06-25-W-038
DATE SAMPLED:	06/19/91	06/25/91
REMARKS:		

Di-n-octylphthalate	10	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 UJ
Dibenzofuran	10	10 U	10 U
Diethylphthalate	10	10 U	10 U
Dimethylphthalate	10	10 U	10 U
Fluoranthene	10	10 U	10 U
Fluorene	10	10 U	10 U
Hexachlorobenzene	10	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U
Hexachlorocyclopentadiene	10	10 UJ	10 U
Hexachloroethane	10	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 UJ
Isophorone	10	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U
Naphthalene	10	10 U	10 U
Nitrobenzene	10	10 U	10 U
Pentachlorophenol	50	50 U	50 U
Phenanthrene	10	10 U	10 U
Phenol	10	10 U	10 U
Pyrene	10	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U
PESTICIDES/PCBs	**CRQL(ug/L)**		
4,4'-DDD	0.10	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U
Aroclor-1016	0.50	0.50 U	0.50 U
Aroclor-1221	0.50	0.50 U	0.50 U
Aroclor-1232	0.50	0.50 U	0.50 U
Aroclor-1242	0.50	0.50 U	0.50 U
Aroclor-1248	0.50	0.50 U	0.50 U
Aroclor-1254	1.0	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0-0.3-WX-06-19-W-037	SW-15-0-0.3-WX-06-25-W-038
DATE SAMPLED:	06/19/91	06/25/91
REMARKS:		

Dieldrin	0.10	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U
Toxaphene	1.0	1.0 U	1.0 U
alpha-BHC	0.05	0.05 U	0.05 U
alpha-Chlordane	0.50	0.50 U	0.50 U
beta-BHC	0.05	0.05 U	0.05 U
delta-BHC	0.05	0.05 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U
gamma-Chlordane	0.50	0.50 U	0.50 U
METALS - UNFILTERED	CRDL(mg/L)		
Aluminum	200	369 J	951 J
Antimony	60	20.9 U	17 U
Arsenic	10	2 U	4 U
Barium	200	9.0 U	10.6
Beryllium	5	1 U	1 U
Cadmium	5	1.6 U	3 U
Calcium	5000	2440	2710
Chromium	10	3.0 U	7 U
Cobalt	50	2 U	4 U
Copper	25	3 U	11 U
Iron	100	920 J	3360 J
Lead	3	4.1 U	7.3 U
Magnesium	5000	960	994
Manganese	15	87.8	276 J
Mercury	0.2	0.2 U	0.2 U
Nickel	40	4 U	6 U
Potassium	5000	722	857
Selenium	5	4.0 UJ	4 U
Silver	10	2 U	4 U
Sodium	5000	6550	6780

LOCATION NAME:		SW-14	SW-15
STREAM:		MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-14-0-0.3-NX-06-19-W-037	SW-15-0-0.3-NX-06-25-W-038
DATE SAMPLED:		06/19/91	06/25/91
REMARKS:			
Thallium	10	3.0 UJ	1.0 UJ
Vanadium	50	2 U	3 U
Zinc	20	21.8 U	20.5
METALS - FILTERED	CRDL(ug/L)		
Aluminum	200	92.9 U	134 U
Antimony	60	17 U	11 U
Arsenic	10	4 U	4 U
Barium	200	5.9 U	10.3 U
Beryllium	5	1 U	1 U
Cadmium	5	3 U	1.2 U
Calcium	5000	2570	3070
Chromium	10	7 U	2 U
Cobalt	50	4 U	2 U
Copper	25	11 U	3 U
Iron	100	262 J	419
Lead	3	2 U	2.4 U
Magnesium	5000	952	948
Manganese	15	67.5 J	364
Mercury	0.2	0.2 U	0.2 U
Nickel	40	6 U	4 U
Potassium	5000	780	926
Selenium	5	4.0 UJ	4 U
Silver	10	4 U	2 U
Sodium	5000	8230	8620
Thallium	10	1.0 UJ	1 U
Vanadium	50	3 U	2 U
Zinc	20	36.4 U	28.7 U
WATER QUALITY PARAMETERS			
CYANIDE	CRDL(mg/L)		
Cyanide	10	10.0 U	2 U
SULFIDE	CRQL(mg/L)		
Sulfide	0.05	1.90	1.60

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0-0.3-NX-06-19-W-037	SW-15-0-0.3-NX-06-25-W-038
DATE SAMPLED:	06/19/91	06/25/91
REMARKS:		

TOTAL ORGANIC CARBON	QL(mg/L)		
Total Organic Carbon	1.0	R	3.3 UJ
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)		
Biochemical Oxygen Demand	2.4	2.4 UJ	3.0 U
OTHER			
Hardness	(mg/L)	10	11
pH	--	5.52	5.76
Specific Conductance	(umhos)	58	59
Dissolved Oxygen	(mg/L)	7.60	6.25

SURFACE WATER - SEPTEMBER/OCTOBER 1991

SURFACE WATER - SEPTEMBER/OCTOBER 1991 (09/24/91-10/09/91)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0.0-0.3-NX-W-209-2	SW-02-0.0-0.3-NX-W-210-2	SW-03-0.0-0.3-NX-W-211-2	SW-04-0.1-0.3-NX-W-212-2	SW-05-0.0-0.3-NX-W-213-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	10 U	10 U
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	14	10 U	5 J
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	2 J
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 UJ	50 U	50 U	50 U	50 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0.0-0.3-NX-W-209-2	SW-02-0.0-0.3-NX-W-210-2	SW-03-0.0-0.3-NX-W-211-2	SW-04-0.1-0.3-NX-W-212-2	SW-05-0.0-0.3-NX-W-213-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
Acrylamide	200	200 UJ	200 UJ	200 UJ	200 U	200 U
Acrylonitrile	50	50 UJ	50 UJ	50 UJ	50 U	50 U
Ethyl Urethane	100	100 UJ	100 U	100 U	100 U	100 U
N,N-DMF	50	50 UJ	50 U	50 U	50 U	50 U
Urethane	1000	1000 UJ	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0.0-0.3-NX-W-209-2	SW-02-0.0-0.3-NX-W-210-2	SW-03-0.0-0.3-NX-W-211-2	SW-04-0.1-0.3-NX-W-212-2	SW-05-0.0-0.3-NX-W-213-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0.0-0.3-NX-W-209-2	SW-02-0.0-0.3-NX-W-210-2	SW-03-0.0-0.3-NX-W-211-2	SW-04-0.1-0.3-NX-W-212-2	SW-05-0.0-0.3-NX-W-213-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	573 J	274 U	238 U	331 J	138 J
Antimony	60	25 U	25 U	25 U	25.0	25 U
Arsenic	10	1 U	1 U	1 U	1 U	1 U
Barium	200	10.3 U	7.4 U	5.7 U	8.0 U	8.0 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	2500	4070	4010	4220	4800
Chromium	10	8 U	8 U	8 U	8 U	8 U
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	32.2 U	16.9 U	16.9 U	11.6	4 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0.0-0.3-NX-W-209-2	SW-02-0.0-0.3-NX-W-210-2	SW-03-0.0-0.3-NX-W-211-2	SW-04-0.1-0.3-NX-W-212-2	SW-05-0.0-0.3-NX-W-213-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
Iron	100	1360 J	233 U	192 U	882 J	978 J
Lead	3	8.8 U	3.0 U	2.0 U	3.0 U	1.8 U
Magnesium	5000	975	1460	1460	1490	1610
Manganese	15	155	68.2	42.3	225	248
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	1520 U	695 U	708 U	892 U	1200 U
Selenium	5	1 U	1 U	1 U	1.0 UJ	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	4620	9720	9710	9640	10000
Thallium	10	1 U	1.0 UJ	1 U	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	45.8 U	48.3 U	22.1 U	16.6 U	7.0 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	124 U	230 U	620	153 J	259 J
Antimony	60	25 U	25 U	25 U	25 U	25 U
Arsenic	10	1 U	1 U	1 U	1 U	1 U
Barium	200	6.8 U	8.0 U	19.9 U	7.0 U	13.2
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3.0 U
Calcium	5000	2530	4390	5590	4550	4630
Chromium	10	8 U	8 U	13.0 U	8 U	13.5
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	8.3 U	13.1 U	16.0 U	9.8	29.8
Iron	100	440	162 U	997	241 J	404 J
Lead	3	3.5 U	5.0 U	4.7 U	2.9 U	3.6 U
Magnesium	5000	904	1480	1600	1550	1590
Manganese	15	102	23.9 U	547	136	169
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	1460 U	825 U	1070 U	1020 U	1080 U
Selenium	5	1 U	1 U	1 U	1.0 UJ	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	6140 U	11400	11500	11500	11500
Thallium	10	1 U	1 U	1 U	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	18.0 U	23.4 U	36.3 U	14.8 U	65.3 U

LOCATION NAME:		SW-01	SW-02	SW-03	SW-04	SW-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-01-0.0-0.3-NX-W-209-2	SW-02-0.0-0.3-NX-W-210-2	SW-03-0.0-0.3-NX-W-211-2	SW-04-0.1-0.3-NX-W-212-2	SW-05-0.0-0.3-NX-W-213-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						

WATER QUALITY PARAMETERS

CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10 U	10.2 J	10.0 UJ
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	2.4 U	0.4 UJ	0.4 UJ	0.4 U	1.6 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	9.9 J	7.2 J	7.2 J	6.1 J	4.9 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.0 U	1.0 U	R	R
OTHER						
Hardness	(mg/L)	10	16	16	17	19
pH	--	4.4	5.7	6.2	6.3	6.5
Specific Conductance	(umhos/cm)	50	91	92	100	170
Dissolved Oxygen	(mg/L)	.8	10.2	9.4	9.5	9

LOCATION NAME:		SW-06	SW-07	SW-08	SW-08	SW-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-06-0.0-0.3-NX-W-214-2	SW-07-0.0-0.3-NX-W-215-2	SW-08-0.0-0.3-FD-W-322-2	SW-08-0.0-0.3-NX-W-216-2	SW-09-0.0-0.3-NX-W-222-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	10 U	10 U
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	3 J	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	50 U	50 U	50 UJ	50 UJ	50 UJ

LOCATION NAME:		SW-06	SW-07	SW-08	SW-08	SW-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-06-0.0-0.3-NX-W-214-2	SW-07-0.0-0.3-NX-W-215-2	SW-08-0.0-0.3-FD-W-322-2	SW-08-0.0-0.3-NX-W-216-2	SW-09-0.0-0.3-NX-W-222-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
Acrylamide	200	200 U	200 U	200 U	200 U	200 UJ
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 UJ
Ethyl Urethane	100	100 U	100 U	100 U	100 U	100 UJ
N,N-DMF	50	50 U	50 U	50 U	50 U	50 UJ
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	NA
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-06	SW-07	SW-08	SW-08	SW-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-06-0.0-0.3-NX-W-214-2	SW-07-0.0-0.3-NX-W-215-2	SW-08-0.0-0.3-FD-W-322-2	SW-08-0.0-0.3-NX-W-216-2	SW-09-0.0-0.3-NX-W-222-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	NA	NA	NA	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		SW-06	SW-07	SW-08	SW-08	SW-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-06-0.0-0.3-NX-W-214-2	SW-07-0.0-0.3-NX-W-215-2	SW-08-0.0-0.3-FD-W-322-2	SW-08-0.0-0.3-NX-W-216-2	SW-09-0.0-0.3-NX-W-222-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	121 J	178 U	67.1 U	102 U	156 UJ
Antimony	60	25 U	28.8	25 U	25 U	25 U
Arsenic	10	1 U	1 U	1 U	1.0	1 U
Barium	200	13.2	21.5	12.1 U	12.1 U	9.8 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3.0 UJ	3 U	3 U	3 U
Calcium	5000	5930	6760	6640	6840	3720
Chromium	10	8 U	8 U	8 U	8 U	8 U
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	4 U	4.2 U	9.2 U	5.1 U	4 U

LOCATION NAME:		SW-06	SW-07	SW-08	SW-08	SW-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-06-0.0-0.3-NX-W-214-2	SW-07-0.0-0.3-NX-W-215-2	SW-08-0.0-0.3-FD-W-322-2	SW-08-0.0-0.3-NX-W-216-2	SW-09-0.0-0.3-NX-W-222-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
Iron	100	1690 J	5000 J	1470 J	2180 J	292 J
Lead	3	1.1 U	2.4 U	2.2 U	1.7 U	6.4 UJ
Magnesium	5000	1970	2090	2030	2120	1270
Manganese	15	377	577	451	488	18.2 U
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	1940 U	1900 U	1700 U	1550 U	568 U
Selenium	5	1.0 UJ	1 U	1 U	1 U	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	11900	13100	12300	12700	11000
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3.3 U
Zinc	20	6 U	8.2 U	10.3 U	10.3 U	17.9 J
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	132 J	116 U	13 U	95.4 U	110 UJ
Antimony	60	25 U	25 U	25 U	25 U	25 U
Arsenic	10	1 U	1 U	1 U	1 U	1 U
Barium	200	8.5	14.1	11.1 U	11.1 U	8.8 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	6000	6150	6590	6870	3960
Chromium	10	8 U	8 U	8 U	8 U	8 U
Cobalt	50	6 U	6 U	6 U	6 U	6 U
Copper	25	20.2	26.8 U	4 U	25.5 U	8.1 U
Iron	100	722 J	1950	437	586	148 UJ
Lead	3	2.2 UJ	2.3 U	1.8 U	1 U	1 U
Magnesium	5000	1990	1920	2010	2050	1290
Manganese	15	346	479	444	430	14.3 U
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	16 U	16 U	16 U	16 U	16 U
Potassium	5000	1840 U	1780 U	1620 U	1780 U	533 U
Selenium	5	1.0 UJ	1 U	1 U	1 U	1.0 UJ
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	13300	13700	12600	13600	12400
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	3 U	4.2 U	3 U	3 U	3.3 U
Zinc	20	21.4 U	34.0 U	14.7 U	29.1 U	36.6 J

LOCATION NAME:	SW-06	SW-07	SW-08	SW-08	SW-09
STREAM:	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:	SW-06-0.0-0.3-NX-W-214-2	SW-07-0.0-0.3-NX-W-215-2	SW-08-0.0-0.3-FD-W-322-2	SW-08-0.0-0.3-NX-W-216-2	SW-09-0.0-0.3-NX-W-222-2
DATE SAMPLED:	10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:			Field Duplicate		

WATER QUALITY PARAMETERS

CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10 U	10 U	10 U	10 U
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	4.9 J	3.9 J	5.2	4.7	3.8 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	R	R	R	1.2 J	R
OTHER						
Hardness	(mg/L)	23	25	25	26	15
pH	--	6.5	6.0	NA	6.0	5.9
Specific Conductance	(umhos/cm)	130	136	NA	138	73
Dissolved Oxygen	(mg/L)	8.5	8.6	NA	8.8	9.5

LOCATION NAME:		SW-10	SW-10	SW-11	SW-12	SW-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-FD-W-321-2	SW-10-0.0-0.3-NX-W-221-2	SW-11-0.0-0.3-NX-W-219-2	SW-12-0.0-0.3-NX-W-220-2	SW-13-0.0-0.3-NX-W-218-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 UJ
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 UJ
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 UJ
Acetone	10	10 U	10 U	10 U	10 U	10 U
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	4 J	2 J	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 UJ
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 UJ
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 UJ
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 UJ
Toluene	10	10 U	10 U	10 U	10 U	10 UJ
Total Xylenes	10	10 U	10 U	10 U	10 U	10 UJ
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acetonitrile	50	93 UJ	50 U	50 UJ	50 UJ	50 UJ

LOCATION NAME:		SW-10	SW-10	SW-11	SW-12	SW-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-FD-W-321-2	SW-10-0.0-0.3-NX-W-221-2	SW-11-0.0-0.3-NX-W-219-2	SW-12-0.0-0.3-NX-W-220-2	SW-13-0.0-0.3-NX-W-218-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
Acrylamide	200	200 UJ	200 U	200 UJ	272 J	200 UJ
Acrylonitrile	50	50 UJ	50 U	50 UJ	50 UJ	50 UJ
Ethyl Urethane	100	100 UJ	100 U	100 UJ	100 UJ	100 UJ
N,N-DMF	50	5 J	100 U	50 UJ	50 UJ	50 UJ
Urethane	1000	1000 UJ	1000 U	1000 UJ	1000 UJ	1000 UJ
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 UJ	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 UJ	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 UJ	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 UJ	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	NA	NA	10 UJ	10 UJ	10 UJ
2,4,5-Trichlorophenol	25	25 U	25 UJ	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 UJ	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 UJ	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 UJ	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 UJ	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 UJ	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 UJ	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 UJ	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 UJ	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 UJ	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 UJ	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 UJ	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 UJ	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 UJ	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 UJ	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 UJ	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 UJ	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 UJ	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 UJ	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 UJ	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 UJ	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 UJ	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 UJ	25 U	25 U	25 U
Acenaphthene	10	10 U	10 UJ	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 UJ	10 U	10 U	10 U
Anthracene	10	10 U	10 UJ	10 U	10 U	10 U

LOCATION NAME:		SW-10	SW-10	SW-11	SW-12	SW-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-FD-W-321-2	SW-10-0.0-0.3-NX-W-221-2	SW-11-0.0-0.3-NX-W-219-2	SW-12-0.0-0.3-NX-W-220-2	SW-13-0.0-0.3-NX-W-218-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
Benzo(a)anthracene	10	10 U	10 UJ	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 UJ	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 UJ	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 UJ	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 UJ	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 UJ	10 U	10 U	10 U
Carbazole	10	10 U	10 UJ	10 U	10 U	10 U
Chrysene	10	10 U	10 UJ	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 UJ	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 UJ	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 UJ	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 UJ	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 UJ	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 UJ	10 U	10 U	10 U
Fluoranthene	10	10 U	10 UJ	10 U	10 U	10 U
Fluorene	10	10 U	10 UJ	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 UJ	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 UJ	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 UJ	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 UJ	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 UJ	10 U	10 U	10 U
Isophorone	10	10 U	10 UJ	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 UJ	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 UJ	10 U	10 U	10 U
Naphthalene	10	10 U	10 UJ	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 UJ	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 UJ	25 U	25 U	25 U
Phenanthrene	10	10 U	10 UJ	10 U	10 U	10 U
Phenol	10	10 U	10 UJ	10 U	10 U	10 U
Pyrene	10	10 U	10 UJ	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 UJ	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 UJ	10 U	10 U	10 U
bis(2-Chloroisopropyl) ether	10	10 U	10 UJ	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10	11 U	10 UJ	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U

LOCATION NAME:		SW-10	SW-10	SW-11	SW-12	SW-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-FD-W-321-2	SW-10-0.0-0.3-NX-W-221-2	SW-11-0.0-0.3-NX-W-219-2	SW-12-0.0-0.3-NX-W-220-2	SW-13-0.0-0.3-NX-W-218-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
4,4'-DDT	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 UJ	2.0 UJ	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 UJ	0.10 UJ	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 UJ	0.50 UJ	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 UJ	5.0 UJ	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 UJ	0.0016 J	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 UJ	0.050 UJ	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	43.1 U	123 U	63.5 U	96.9 U	99.5 U
Antimony	60	47 U	47 U	25 U	25 U	25 U
Arsenic	10	2.0 UJ	2.0 UJ	1 U	1 U	1 U
Barium	200	24.9	24.9	9.1	28.4	9.1
Beryllium	5	1 U	1.6 U	1 U	1 U	1 U
Cadmium	5	3.0 UJ	3.0 UJ	3 U	3.0 UJ	3 U
Calcium	5000	9140	9080	6570 J	10000	3650 J
Chromium	10	6.0 UJ	6.0 UJ	8 U	8 U	8 U
Cobalt	50	8 U	8 U	6 U	6 U	6 U
Copper	25	5 U	5 U	8.8 UJ	5.1 U	14.9 UJ

LOCATION NAME:		SW-10	SW-10	SW-11	SW-12	SW-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-FD-W-321-2	SW-10-0.0-0.3-NX-W-221-2	SW-11-0.0-0.3-NX-W-219-2	SW-12-0.0-0.3-NX-W-220-2	SW-13-0.0-0.3-NX-W-218-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
Iron	100	4330 J	7990 J	1400 J	4200 J	145 UJ
Lead	3	2 U	2.2 U	1.3 U	2.8 U	2.4 U
Magnesium	5000	2060	2060	2070 J	3260	1240 J
Manganese	15	1350	1470	458	708	10.2
Mercury	0.2	0.20 UJ	0.20 UJ	0.2 U	0.20 UJ	0.2 U
Nickel	40	9 U	9 U	16 U	16 U	16 U
Potassium	5000	2910 U	3120 U	1920 U	4220	513 U
Selenium	5	R	R	1 U	1 U	1 U
Silver	10	7.7 UJ	4.5 UJ	3 U	3 U	3 U
Sodium	5000	9580	9510	12200	18800	11100
Thallium	10	4.0 UJ	4 U	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	5 U	5 U	3 U	3 U	3 U
Zinc	20	12.7 UJ	9.0 UJ	7.7 UJ	8.8 U	22.0 UJ
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	21.4 U	42.5 U	88.1 U	102.0 U	79.8 U
Antimony	60	14 U	14 U	25 U	25 U	25 U
Arsenic	10	2 U	2.0 UJ	1 U	1 U	1 U
Barium	200	23.6	21.7	9.0	25.2	4.0
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	3 U	3 U	3 U
Calcium	5000	9620	9440	7170 J	9830	4080 J
Chromium	10	2 U	2 U	13.1	8 U	8 U
Cobalt	50	2 U	2.1 U	6 U	6 U	6 U
Copper	25	2 U	2 U	14.0 UJ	21.4 U	6.1 UJ
Iron	100	3390	3260	762 J	3160	71.9 UJ
Lead	3	1 U	1.2 U	1.4 U	1.1 U	1.6 U
Magnesium	5000	2480	2380	2160 J	3120	1260 J
Manganese	15	1320	1270	464	690	9.4
Mercury	0.2	0.20 UJ	0.20 UJ	0.2 U	0.20 UJ	0.2 U
Nickel	40	5 U	5 U	16 U	16 U	16 U
Potassium	5000	3040 U	2930 U	2030 U	3810	993 U
Selenium	5	R	R	1 U	1 U	1 U
Silver	10	5 U	5 U	3 U	3 U	3 U
Sodium	5000	10700	11100	14800	20200	13000
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	2 U	2 U	3 U	3 U	3 U
Zinc	20	12.3 UJ	6.6 UJ	21.3 UJ	44.3 U	6 U

LOCATION NAME:	SW-10	SW-10	SW-11	SW-12	SW-13
STREAM:	UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-10-0.0-0.3-FD-W-321-2	SW-10-0.0-0.3-NX-W-221-2	SW-11-0.0-0.3-NX-W-219-2	SW-12-0.0-0.3-NX-W-220-2	SW-13-0.0-0.3-NX-W-218-2
DATE SAMPLED:	10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:	Field Duplicate				

WATER QUALITY PARAMETERS

CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10.0 UJ	10 U	10 U	10 U
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	4.0 J	2.8 J	5.7 J	5.4 J	5.2 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.2	1.1	1.1	1.0 U
OTHER						
Hardness	(mg/L)	31	31	25 J	38	14 J
pH	--	NA	5.9	6.2	7.0	5.6
Specific Conductance	(umhos/cm)	NA	146	126	222	83
Dissolved Oxygen	(mg/L)	NA	8.4	7.7	8.8	9.5

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0.0-0.3-NX-W-317-2	SW-15-0.0-0.3-NX-W-223-2
DATE SAMPLED:	10/03/91	10/04/91
REMARKS:		

VOLATILE ORGANICS-CLP	CRQL(ug/L)		
1,1,1-Trichloroethane	10	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U
2-Butanone	10	10 U	10 U
2-Hexanone	10	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U
Acetone	10	10 U	10 U
Benzene	10	10 U	10 U
Bromodichloromethane	10	10 U	10 U
Bromoform	10	10 U	10 U
Bromomethane	10	10 U	10 U
Carbon Disulfide	10	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U
Chlorobenzene	10	10 U	10 U
Chloroethane	10	10 U	10 U
Chloroform	10	10 U	10 U
Chloromethane	10	10 U	10 U
Dibromochloromethane	10	10 U	10 U
Ethylbenzene	10	10 U	10 U
Methylene Chloride	10	10 U	10 U
Styrene	10	10 U	10 U
Tetrachloroethene	10	10 U	10 U
Toluene	10	10 U	10 U
Total Xylenes	10	10 U	10 U
Trichloroethene	10	10 U	10 U
Vinyl Chloride	10	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U
WATER SOLUBLE ORGANICS	**QL(ug/L)**		
Acetonitrile	50	50 UJ	50 U

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0.0-0.3-NX-W-317-2	SW-15-0.0-0.3-NX-W-223-2
DATE SAMPLED:	10/03/91	10/04/91
REMARKS:		

Acrylamide	200	200 UJ	200 U
Acrylonitrile	50	50 UJ	50 U
Ethyl Urethane	100	100 UJ	100 U
N,N-DMF	50	50 UJ	50 U
Urethane	1000	1000 UJ	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)		
1,2,4-Trichlorobenzene	10	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 UJ	NA
2,4,5-Trichlorophenol	25	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U
2-Chlorophenol	10	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U
2-Methylphenol	10	10 U	10 U
2-Nitroaniline	25	25 U	25 U
2-Nitrophenol	10	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U
3-Nitroaniline	25	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U
4-Chloroaniline	10	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U
4-Methylphenol	10	10 U	10 U
4-Nitroaniline	25	25 U	25 U
4-Nitrophenol	25	25 U	25 U
Acenaphthene	10	10 U	10 U
Acenaphthylene	10	10 U	10 U
Anthracene	10	10 U	10 U

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0.0-0.3-NX-W-317-2	SW-15-0.0-0.3-NX-W-223-2
DATE SAMPLED:	10/03/91	10/04/91
REMARKS:		

Benzo(a)anthracene	10	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U
Carbazole	10	10 U	10 U
Chrysene	10	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U
Dibenzofuran	10	10 U	10 U
Diethylphthalate	10	10 U	10 U
Dimethylphthalate	10	10 U	10 U
Fluoranthene	10	10 U	10 U
Fluorene	10	10 U	10 U
Hexachlorobenzene	10	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U
Hexachloroethane	10	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U
Isophorone	10	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U
Naphthalene	10	10 U	10 U
Nitrobenzene	10	10 U	10 U
Pentachlorophenol	25	25 U	25 U
Phenanthrene	10	10 U	10 U
Phenol	10	10 U	10 U
Pyrene	10	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U
bis(2-Chloroisopropyl) ether	10	NA	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U
PESTICIDES/PCBs	**CRQL(ug/L)**		
4,4'-DDD	0.10	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0.0-0.3-NX-W-317-2	SW-15-0.0-0.3-NX-W-223-2
DATE SAMPLED:	10/03/91	10/04/91
REMARKS:		

4,4'-DDT	0.10	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)		
Aluminum	200	95.6 U	172 U
Antimony	60	25 U	25 U
Arsenic	10	1 U	1 U
Barium	200	9.1	9.8 U
Beryllium	5	1 U	1 U
Cadmium	5	3 U	3.0 UJ
Calcium	5000	3650 J	3690
Chromium	10	8 U	8 U
Cobalt	50	6 U	6 U
Copper	25	7.9 UJ	20.7 U

LOCATION NAME:		SW-14	SW-15
STREAM:		MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-14-0.0-0.3-NX-W-317-2	SW-15-0.0-0.3-NX-W-223-2
DATE SAMPLED:		10/03/91	10/04/91
REMARKS:			
Iron	100	204 UJ	183 U
Lead	3	2.9 U	1.9 U
Magnesium	5000	1210 J	1270
Manganese	15	24.3	12.3 U
Mercury	0.2	0.2 U	0.2 U
Nickel	40	16 U	16 U
Potassium	5000	618 U	596 U
Selenium	5	1 U	1 U
Silver	10	3 U	3 U
Sodium	5000	10900	10800
Thallium	10	1.0 UJ	1.0 UJ
Vanadium	50	3 U	3 U
Zinc	20	14.2 UJ	20.0 U
METALS - FILTERED	CRDL(ug/L)		
Aluminum	200	83.0 U	144 U
Antimony	60	25 U	25 U
Arsenic	10	1 U	1 U
Barium	200	7.0	8.6 U
Beryllium	5	1 U	1 U
Cadmium	5	3 U	3 U
Calcium	5000	3790 J	3850
Chromium	10	8 U	8 U
Cobalt	50	6 U	6 U
Copper	25	13.1 UJ	24.1 U
Iron	100	132 UJ	127 U
Lead	3	1.1 U	1.7 U
Magnesium	5000	1220 J	1280
Manganese	15	21.4	9.0 U
Mercury	0.2	0.2 U	0.2 U
Nickel	40	16 U	16 U
Potassium	5000	713 U	681 U
Selenium	5	1 U	1 U
Silver	10	3 U	3 U
Sodium	5000	10600	11900
Thallium	10	1.0 UJ	1.0 UJ
Vanadium	50	3 U	4.5 U
Zinc	20	7.9 UJ	11.5 U

LOCATION NAME:	SW-14	SW-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:	SW-14-0.0-0.3-NX-W-317-2	SW-15-0.0-0.3-NX-W-223-2
DATE SAMPLED:	10/03/91	10/04/91
REMARKS:		

WATER QUALITY PARAMETERS

CYANIDE	CRDL(mg/L)		
Cyanide	10	10 U	10.0 U
SULFIDE	CRQL(mg/L)		
Sulfide	0.05	0.4 UJ	0.4 UJ
TOTAL ORGANIC CARBON	QL(mg/L)		
Total Organic Carbon	0.5	5.3 J	3.2 J
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)		
Biochemical Oxygen Demand	1.0	1.0 U	R
OTHER			
Hardness	(mg/L)	14 J	14
pH	--	5.8	5.3
Specific Conductance	(umhos/cm)	29	83
Dissolved Oxygen	(mg/L)	9.1	8.7

SURFACE WATER - JANUARY/FEBRUARY 1992

SURFACE WATER - JANUARY/FEBRUARY 1992 (01/29/92-02/05/92)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SW-04	SW-05	SW-06	SW-07	SW-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-04-0.0-0.3-NX-W-522-3	SW-05-0.0-0.3-NX-W-523-3	SW-06-0.0-0.3-NX-W-524-3	SW-07-0.0-0.3-NX-W-525-3	SW-09-0.0-0.3-NX-W-526-3
DATE SAMPLED:		01/28/92	01/30/92	01/30/92	01/29/92	01/28/92
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	10 U	10 U
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	2 J	10 UJ	1 J	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	50 U	12 U	18 U	10 U	12 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	R	50 U

LOCATION NAME:		SW-04	SW-05	SW-06	SW-07	SW-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-04-0.0-0.3-NX-W-522-3	SW-05-0.0-0.3-NX-W-523-3	SW-06-0.0-0.3-NX-W-524-3	SW-07-0.0-0.3-NX-W-525-3	SW-09-0.0-0.3-NX-W-526-3
DATE SAMPLED:		01/28/92	01/30/92	01/30/92	01/29/92	01/28/92
REMARKS:						
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	250 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	250 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	250 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	250 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	250 U	10 UJ	10 UJ	10 U
2,4,5-Trichlorophenol	25	25 U	620 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	250 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	250 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	250 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	620 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	250 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	250 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	250 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	250 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	250 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	250 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	620 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	250 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 UJ	250 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	620 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	620 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	250 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	250 U	10 U	10 U	10 U
4-Chloroaniline	10	10 UJ	250 UJ	10 UJ	10 UJ	10 U
4-Chlorophenyl-phenylether	10	10 U	250 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	250 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	620 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	620 U	25 U	25 U	25 U
Acenaphthene	10	10 U	250 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	250 U	10 U	10 U	10 U
Anthracene	10	10 U	250 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	250 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	250 U	10 U	10 U	10 U

LOCATION NAME:		SW-04	SW-05	SW-06	SW-07	SW-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-04-0.0-0.3-NX-W-522-3	SW-05-0.0-0.3-NX-W-523-3	SW-06-0.0-0.3-NX-W-524-3	SW-07-0.0-0.3-NX-W-525-3	SW-09-0.0-0.3-NX-W-526-3
DATE SAMPLED:		01/28/92	01/30/92	01/30/92	01/29/92	01/28/92
REMARKS:						
Benzo(b)fluoranthene	10	10 U	250 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	250 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	250 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	250 U	10 U	10 U	10 U
Carbazole	10	10 U	250 U	10 U	10 U	10 U
Chrysene	10	10 U	250 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	250 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	250 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	250 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	250 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	250 U	10 U	10 U	10 U
Dimethylphthalate	10	1 J	250 U	10 U	10 U	10 U
Fluoranthene	10	10 U	250 U	10 U	10 U	10 U
Fluorene	10	10 U	250 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	250 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	250 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	250 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	250 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	250 U	10 U	10 U	10 U
Isophorone	10	10 U	250 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	250 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	250 U	10 U	10 U	10 U
Naphthalene	10	10 U	250 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	250 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	620 U	25 U	25 U	25 U
Phenanthrene	10	10 U	250 U	10 U	10 U	10 U
Phenol	10	10 U	250 U	10 U	10 U	10 U
Pyrene	10	10 U	250 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	250 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	250 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	1000 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		SW-04	SW-05	SW-06	SW-07	SW-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-04-0.0-0.3-NX-W-522-3	SW-05-0.0-0.3-NX-W-523-3	SW-06-0.0-0.3-NX-W-524-3	SW-07-0.0-0.3-NX-W-525-3	SW-09-0.0-0.3-NX-W-526-3
DATE SAMPLED:		01/28/92	01/30/92	01/30/92	01/29/92	01/28/92
REMARKS:						
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	140	107	105	109	147
Antimony	60	31 U	31.0 UJ	31.0 UJ	31.0 UJ	31 U
Arsenic	10	2.0 UJ	2 U	2 U	2 U	2.0 UJ
Barium	200	7.5 U	9.2 U	6.4 U	9.2 U	10.6 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1.0 UJ	1 U	1 U	1 U	1.0 UJ
Calcium	5000	3030	3700	3420	3210	2810
Chromium	10	2 U	2 U	2.3 U	6.3 U	2 U
Cobalt	50	3 U	3 U	3 U	3 U	3 U
Copper	25	3 U	3 U	3 U	3 U	3 U
Iron	100	108	1360	578	820	280
Lead	3	2.6 U	2.1 U	3.1 U	1.4 U	2.0 U
Magnesium	5000	1250	1370	1360	1180	1070

LOCATION NAME:		SW-04	SW-05	SW-06	SW-07	SW-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-04-0.0-0.3-NX-W-522-3	SW-05-0.0-0.3-NX-W-523-3	SW-06-0.0-0.3-NX-W-524-3	SW-07-0.0-0.3-NX-W-525-3	SW-09-0.0-0.3-NX-W-526-3
DATE SAMPLED:		01/28/92	01/30/92	01/30/92	01/29/92	01/28/92
REMARKS:						
Manganese	15	62.5 J	195	150	132	53.4 J
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	4 U	4 U	4 U
Potassium	5000	612	982	788	675	472
Selenium	5	4 U	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
Silver	10	5 U	5 U	5 U	5 U	5 U
Sodium	5000	9290	9430	9370	8600	8080
Thallium	10	2.0 UJ	2.0 UJ	2.0 UJ	10 U	2.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	11 U	11 U	11 U	11 U	11 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	89.8	97.8	102	114	126
Antimony	60	31.0 UJ	31.0 UJ	31.0 UJ	31.0 UJ	31.0 UJ
Arsenic	10	2 U	2 U	2 U	2 U	2 U
Barium	200	6.3 U	8.9 U	8.9 U	11.7 U	10.8 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	1 U	1 U	1 U
Calcium	5000	3270	3700	3690	3680	3160
Chromium	10	2 U	2 U	2 U	2 U	2 U
Cobalt	50	3 U	3 U	3 U	3 U	3 U
Copper	25	3 U	3 U	3 U	3 U	3 U
Iron	100	82.1 J	702 J	454 J	688 J	232 J
Lead	3	1.4 UJ	7.2 U	2.4 U	2.6 U	2.9 UJ
Magnesium	5000	1240	1310	1340	1190	1100
Manganese	15	56.0	143	142	124	52.7
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	4 U	4 U	4 U
Potassium	5000	701	911	882	898	603
Selenium	5	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
Silver	10	5 U	5 U	5 U	5 U	5 U
Sodium	5000	11000	10900	10700	11500	10100
Thallium	10	2.8 UJ	2 U	2 U	2 U	2.6 UJ
Vanadium	50	3 U	3 U	3 U	3 U	3 U
Zinc	20	11 U	11 U	11 U	17.9	11 U
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10 U	10 U	11 U

SURFACE WATER - JANUARY/FEBRUARY 1992 (01/29/92-02/05/92)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SW-04	SW-05	SW-06	SW-07	SW-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-04-0.0-0.3-NX-W-522-3	SW-05-0.0-0.3-NX-W-523-3	SW-06-0.0-0.3-NX-W-524-3	SW-07-0.0-0.3-NX-W-525-3	SW-09-0.0-0.3-NX-W-526-3
DATE SAMPLED:		01/28/92	01/30/92	01/30/92	01/29/92	01/28/92
REMARKS:						
SULFIDE	CRQL(mg/L)					
Sulfide	0.05	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	5.0	6.1	6.0	4.4	3.3
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.0 U	1.3 U	1.8 U	1.3 U	1.3 U
OTHER						
Hardness	(mg/L)	13	15	14	13	11
pH	--	6.1	6.0	6.5	6.3	5.4
Specific Conductance	(umhos/cm)	900	100	90	80	80
Dissolved Oxygen	(mg/L)	NA	13.2	12.5	NA	NA

LOCATION NAME:		SW-10	SW-11	SW-12	SW-12
STREAM:		UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-NX-W-527-3	SW-11-0.0-0.3-NX-W-528-3	SW-12-0.0-0.3-FD-W-569-3	SW-12-0.0-0.3-NX-W-529-3
DATE SAMPLED:		01/29/92	01/28/92	01/29/92	01/29/92
REMARKS:				Field Duplicate	
VOLATILE ORGANICS-CLP	CRQL(ug/L)				
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 U	10 U	11 U
Benzene	10	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U
Carbon Disulfide	10	6 J	10 U	10 U	9 J
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U
Methylene Chloride	10	37 U	93 U	10 U	20 U
Styrene	10	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)				
Acrylonitrile	50	50 U	50 U	50 U	50 U

LOCATION NAME:		SW-10	SW-11	SW-12	SW-12
STREAM:		UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-NX-W-527-3	SW-11-0.0-0.3-NX-W-528-3	SW-12-0.0-0.3-FD-W-569-3	SW-12-0.0-0.3-NX-W-529-3
DATE SAMPLED:		01/29/92	01/28/92	01/29/92	01/29/92
REMARKS:				Field Duplicate	
Ethyl Urethane	100	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)				
1,2,4-Trichlorobenzene	10	10 U	10 U	12 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	12 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	12 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	12 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	12 UJ	10 UJ
2,4,5-Trichlorophenol	25	25 U	25 U	31 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	12 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	12 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	12 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	31 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	12 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	12 U	10 U
2-Chloronaphthalene	10	10 U	10 U	12 U	10 U
2-Chlorophenol	10	10 U	10 U	12 U	10 U
2-Methylnaphthalene	10	10 U	10 U	12 U	10 U
2-Methylphenol	10	10 U	10 U	12 U	10 U
2-Nitroaniline	25	25 U	25 U	31 U	25 U
2-Nitrophenol	10	10 U	10 U	12 U	10 U
3,3'-Dichlorobenzidine	10	10 UJ	10 UJ	12 U	10 U
3-Nitroaniline	25	25 U	25 U	31 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	31 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	12 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	12 U	10 U
4-Chloroaniline	10	10 UJ	10 UJ	12 UJ	10 UJ
4-Chlorophenyl-phenylether	10	10 U	10 U	12 U	10 U
4-Methylphenol	10	10 U	10 U	12 U	10 U
4-Nitroaniline	25	25 U	25 U	31 U	25 U
4-Nitrophenol	25	25 U	25 U	31 U	25 U
Acenaphthene	10	10 U	10 U	12 U	10 U
Acenaphthylene	10	10 U	10 U	12 U	10 U
Anthracene	10	10 U	10 U	12 U	10 U
Benzo(a)anthracene	10	10 U	10 U	12 U	10 U
Benzo(a)pyrene	10	10 U	10 U	12 U	10 U

LOCATION NAME:		SW-10	SW-11	SW-12	SW-12
STREAM:		UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-NX-W-527-3	SW-11-0.0-0.3-NX-W-528-3	SW-12-0.0-0.3-FD-W-569-3	SW-12-0.0-0.3-NX-W-529-3
DATE SAMPLED:		01/29/92	01/28/92	01/29/92	01/29/92
REMARKS:				Field Duplicate	
Benzo(b)fluoranthene	10	10 U	10 U	12 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	12 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	12 U	10 U
Butylbenzylphthalate	10	10 U	10 U	12 U	10 U
Carbazole	10	10 U	10 U	12 U	10 U
Chrysene	10	10 U	10 U	12 U	10 U
Di-n-butylphthalate	10	10 U	10 U	12 U	3 J
Di-n-octylphthalate	10	10 U	10 U	12 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	12 U	10 U
Dibenzofuran	10	10 U	10 U	12 U	10 U
Diethylphthalate	10	10 U	10 U	12 U	2 J
Dimethylphthalate	10	10 U	10 U	12 U	10 U
Fluoranthene	10	10 U	10 U	12 U	10 U
Fluorene	10	10 U	10 U	12 U	10 U
Hexachlorobenzene	10	10 U	10 U	12 U	10 U
Hexachlorobutadiene	10	10 U	10 U	12 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	12 U	10 U
Hexachloroethane	10	10 U	10 U	12 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	12 U	10 U
Isophorone	10	10 U	10 U	12 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	12 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	12 U	10 U
Naphthalene	10	10 U	10 U	12 U	10 U
Nitrobenzene	10	10 U	10 U	12 U	10 U
Pentachlorophenol	25	R	25 U	31 U	25 U
Phenanthrene	10	10 U	10 U	12 U	10 U
Phenol	10	10 U	10 U	12 U	10 U
Pyrene	10	10 U	10 U	12 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	12 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	12 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	12 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)				
4,4'-DDD	0.10	0.10 UJ	0.0047 J	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		SW-10	SW-11	SW-12	SW-12
STREAM:		UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-NX-W-527-3	SW-11-0.0-0.3-NX-W-528-3	SW-12-0.0-0.3-FD-W-569-3	SW-12-0.0-0.3-NX-W-529-3
DATE SAMPLED:		01/29/92	01/28/92	01/29/92	01/29/92
REMARKS:				Field Duplicate	
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 UJ	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 UJ	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.014 J	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)				
Aluminum	200	160	105	126	121
Antimony	60	31.0 UJ	31 U	31.0 UJ	31.0 UJ
Arsenic	10	2 U	2.0 UJ	2 U	2 U
Barium	200	25.2	10.4 U	11.0	10.6
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1.0 UJ	1 U	1 U
Calcium	5000	8110	4060	3660	3660
Chromium	10	2 U	2 U	3.9 U	2 U
Cobalt	50	3 U	3 U	3 U	3 U
Copper	25	3.3 U	3 U	3 U	3 U
Iron	100	6500	595	1150	1060
Lead	3	1.0 U	1.1 U	4.1 U	3.9 U
Magnesium	5000	2160	1510	1330	1340

LOCATION NAME:		SW-10	SW-11	SW-12	SW-12
STREAM:		UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-NX-W-527-3	SW-11-0.0-0.3-NX-W-528-3	SW-12-0.0-0.3-FD-W-569-3	SW-12-0.0-0.3-NX-W-529-3
DATE SAMPLED:		01/29/92	01/28/92	01/29/92	01/29/92
REMARKS:				Field Duplicate	
Manganese	15	905	182 J	173	173
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	4 U	4 U
Potassium	5000	2350	1090	878	900
Selenium	5	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
Silver	10	5 U	5 U	5 U	5 U
Sodium	5000	7910	10100	9320	9340
Thallium	10	2.0 UJ	2.0 UJ	10 U	2.0 UJ
Vanadium	50	3 U	3 U	3 U	3 U
Zinc	20	17.2 J	11 U	11 U	11 U
METALS - FILTERED	CRDL(ug/L)				
Aluminum	200	66 U	89.2	118	124
Antimony	60	31.0 UJ	31.0 UJ	31.0 UJ	31.0 UJ
Arsenic	10	2 U	2 U	2 U	2 U
Barium	200	24.7	10.6 U	12.8 U	13.4 U
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	1 U	1 U
Calcium	5000	7850	4210	3560	3980
Chromium	10	2 U	2 U	2 U	2 U
Cobalt	50	3 U	3 U	3 U	3 U
Copper	25	3 U	3 U	3 U	3 U
Iron	100	3660 J	473	948 J	932 J
Lead	3	2.7 U	1.9 UJ	2.3 U	3.0 U
Magnesium	5000	2080	1460	1300	1350
Manganese	15	789	172	164	167
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	4 U	4 U	4 U	4 U
Potassium	5000	2140	1130	938	1060
Selenium	5	4.0 UJ	4.0 UJ	4.0 UJ	4.0 UJ
Silver	10	5 U	5 U	5 U	5 U
Sodium	5000	7490	11300	9070	11300
Thallium	10	2 U	2.5 UJ	2 U	2 U
Vanadium	50	3 U	3 U	3 U	3 U
Zinc	20	14.9	11 U	11 U	11 U
WATER QUALITY PARAMETERS					
CYANIDE	CRDL(mg/L)				
Cyanide	10	10 U	50 U	10 U	10 U

LOCATION NAME:		SW-10	SW-11	SW-12	SW-12
STREAM:		UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-10-0.0-0.3-NX-W-527-3	SW-11-0.0-0.3-NX-W-528-3	SW-12-0.0-0.3-FD-W-569-3	SW-12-0.0-0.3-NX-W-529-3
DATE SAMPLED:		01/29/92	01/28/92	01/29/92	01/29/92
REMARKS:				Field Duplicate	
SULFIDE	CRQL(mg/L)				
Sulfide	0.05	1.0 U	1.0 U	1.0 U	1.0 U
TOTAL ORGANIC CARBON	QL(mg/L)				
Total Organic Carbon	0.5	11	7.0	5.6	5.7
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)				
Biochemical Oxygen Demand	1.0	1.3 U	1.4 U	1.2 U	1.6 U
OTHER					
Hardness	(mg/L)	29	16	15	15
pH	--	6.4	6.4	NA	6.4
Specific Conductance	(umhos/cm)	130	100	NA	90
Dissolved Oxygen	(mg/L)	NA	NA	NA	NA

SURFACE WATER - APRIL 1992

SURFACE WATER - APRIL 1992 (04/07/92-04/15/92)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:	SW-02	SW-04	SW-04	SW-05	SW-06
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	SW-02-0.0-0.3-NX-W-620-4	SW-04-0.0-0.3-FD-W-671-4	SW-04-0.0-0.3-NX-W-615-4	SW-05-0.0-0.3-NX-W-616-4	SW-06-0.0-0.3-NX-W-617-4
DATE SAMPLED:	04/08/92	04/08/92	04/08/92	04/09/92	04/09/92
REMARKS:		Field Duplicate			

VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 UJ	10 U	10 UJ	10 UJ	10 UJ
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	1 J	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	QL(ug/L)					
Acrylonitrile	50	50 U	50 U	50 U	50 U	50 U

LOCATION NAME:		SW-02	SW-04	SW-04	SW-05	SW-06
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-620-4	SW-04-0.0-0.3-FD-W-671-4	SW-04-0.0-0.3-NX-W-615-4	SW-05-0.0-0.3-NX-W-616-4	SW-06-0.0-0.3-NX-W-617-4
DATE SAMPLED:		04/08/92	04/08/92	04/08/92	04/09/92	04/09/92
REMARKS:			Field Duplicate			
Ethyl Urethane	100	50 U	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-02	SW-04	SW-04	SW-05	SW-06
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-620-4	SW-04-0.0-0.3-FD-W-671-4	SW-04-0.0-0.3-NX-W-615-4	SW-05-0.0-0.3-NX-W-616-4	SW-06-0.0-0.3-NX-W-617-4
DATE SAMPLED:		04/08/92	04/08/92	04/08/92	04/09/92	04/09/92
REMARKS:			Field Duplicate			
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		SW-02	SW-04	SW-04	SW-05	SW-06
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-620-4	SW-04-0.0-0.3-FD-W-671-4	SW-04-0.0-0.3-NX-W-615-4	SW-05-0.0-0.3-NX-W-616-4	SW-06-0.0-0.3-NX-W-617-4
DATE SAMPLED:		04/08/92	04/08/92	04/08/92	04/09/92	04/09/92
REMARKS:			Field Duplicate			
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
beta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
delta-BHC	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.05 U	0.05 U	0.05 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	102 U	105 U	94.3 U	101 UJ	101 UJ
Antimony	60	16 U	16 U	16 U	16 U	16 U
Arsenic	10	1 U	1 UJ	1 UJ	1 U	1 U
Barium	200	8.6 J	8.6 J	9.1 J	6.6 U	6.8 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	2 U	2 U	2 U	2 UJ	2 UJ
Calcium	5000	3240	3310	3280	3530	3980
Chromium	10	3 U	3 U	3 U	3 UJ	3 UJ
Cobalt	50	3 U	3 U	3 U	3 U	3 U
Copper	25	2 U	2 U	2 U	2 U	2 U
Iron	100	108 U	181 U	180 U	636 J	843 J
Lead	3	2.1 U	2 UJ	1.5 U	2.8 UJ	5.2 UJ
Magnesium	5000	1210	1220	1200	1290	1430

LOCATION NAME:		SW-02	SW-04	SW-04	SW-05	SW-06
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-620-4	SW-04-0.0-0.3-FD-W-671-4	SW-04-0.0-0.3-NX-W-615-4	SW-05-0.0-0.3-NX-W-616-4	SW-06-0.0-0.3-NX-W-617-4
DATE SAMPLED:		04/08/92	04/08/92	04/08/92	04/09/92	04/09/92
REMARKS:			Field Duplicate			
Manganese	15	20.6	97.6	84.1	144	184
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ
Nickel	40	3 U	3 U	3 U	3 U	3 U
Potassium	5000	624	649	636	763	1080
Selenium	5	0 R	0 R	0 R	4 UJ	4 UJ
Silver	10	0 R	0 R	0 R	2 U	2 U
Sodium	5000	8350	8320	8250	8460	9120
Thallium	10	1 UJ	1 UJ	1 UJ	2 UJ	2 UJ
Vanadium	50	2 U	2 U	2 U	2 U	2 U
Zinc	20	11 UJ	11 UJ	11 UJ	11 U	11 U
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	108 U	88.8 U	81.5 U	78 U	66.4 U
Antimony	60	11 U	11 U	11 U	16 U	16 U
Arsenic	10	2 UJ	2 U	2 U	2 U	2 U
Barium	200	8.9 U	6.4 U	11.5 U	9.2 U	6.2 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	1 U	1 U	1 U	2 U	2 U
Calcium	5000	3610	3620	3400	4070	4300
Chromium	10	5 UJ	5 UJ	5 UJ	3 U	3 U
Cobalt	50	2 U	2 U	2 U	3 U	3 U
Copper	25	4 U	4 U	4 U	2 U	2 U
Iron	100	93.4 U	100 U	130 U	866	583 U
Lead	3	1.9 U	2.1 U	2.1 U	2 U	1.4 U
Magnesium	5000	1250	1260	1250	1400	1500
Manganese	15	20.2	83.9	84.6	191	181
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	5 U	5 U	5 U	3 U	3 U
Potassium	5000	756	702	756	997	1080
Selenium	5	4 UJ	4 UJ	4 UJ	4 U	4 U
Silver	10	3 U	3 U	3 U	2 U	2 U
Sodium	5000	10400	10100	8660	9580	10500
Thallium	10	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	50	2 U	2 U	2 U	2 U	2 U
Zinc	20	8 UJ	8 UJ	8 UJ	31.3 J	11 UJ
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10 U	10 U	10 U	10 UJ	10 UJ

LOCATION NAME:		SW-02	SW-04	SW-04	SW-05	SW-06
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-620-4	SW-04-0.0-0.3-FD-W-671-4	SW-04-0.0-0.3-NX-W-615-4	SW-05-0.0-0.3-NX-W-616-4	SW-06-0.0-0.3-NX-W-617-4
DATE SAMPLED:		04/08/92	04/08/92	04/08/92	04/09/92	04/09/92
REMARKS:			Field Duplicate			
AMMONIA	QL(mg/L)					
Ammonia	0.03	0.150	0.0340	0.0500	0.210	0.640
TOTAL ORGANIC CARBON	QL(mg/L)					
Total Organic Carbon	0.5	5.7	5.3	5.5	5.5	6.3
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)					
Biochemical Oxygen Demand	1.0	1.5	1.0	1.2	NA	NA
OTHER						
Hardness	(mg/L)	13	13	13	14	16
pH	--	5.7	NA	6.03	5.91	6.04
Specific Conductance	(umhos/cm)	76	NA	75	74	90
Dissolved Oxygen	(mg/L)	10.21	NA	11.45	11.26	11.14

LOCATION NAME:	SW-07	SW-09	SW-11	SW-12
STREAM:	MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:	SW-07-0.0-0.3-NX-W-618-4	SW-09-0.0-0.3-NX-W-619-4	SW-11-0.0-0.3-NX-W-621-4	SW-12-0.0-0.3-NX-W-622-4
DATE SAMPLED:	04/07/92	04/09/92	04/09/92	04/07/92
REMARKS:				

VOLATILE ORGANICS-CLP	CRQL(ug/L)				
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U
Acetone	10	10 U	10 UJ	10 U	10 UJ
Benzene	10	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U
WATER SOLUBLE ORGANICS	**QL(ug/L)**				
Acrylonitrile	50	50 U	50 U	50 U	50 U

LOCATION NAME:		SW-07	SW-09	SW-11	SW-12
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-07-0.0-0.3-NX-W-618-4	SW-09-0.0-0.3-NX-W-619-4	SW-11-0.0-0.3-NX-W-621-4	SW-12-0.0-0.3-NX-W-622-4
DATE SAMPLED:		04/07/92	04/09/92	04/09/92	04/07/92
REMARKS:					
Ethyl Urethane	100	50 U	50 U	50 U	50 U
N,N-DMF	50	50 U	50 U	50 U	50 U
Urethane	1000	1000 U	1000 U	1000 U	1000 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)				
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U	10 U
3-Nitroaniline	25	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U

LOCATION NAME:	SW-07	SW-09	SW-11	SW-12
STREAM:	MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:	SW-07-0.0-0.3-NX-W-618-4	SW-09-0.0-0.3-NX-W-619-4	SW-11-0.0-0.3-NX-W-621-4	SW-12-0.0-0.3-NX-W-622-4
DATE SAMPLED:	04/07/92	04/09/92	04/09/92	04/07/92
REMARKS:				

Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	**CRQL(ug/L)**				
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.05 U	0.050 U	0.050 U	0.05 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U

LOCATION NAME:		SW-07	SW-09	SW-11	SW-12
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-07-0.0-0.3-NX-W-618-4	SW-09-0.0-0.3-NX-W-619-4	SW-11-0.0-0.3-NX-W-621-4	SW-12-0.0-0.3-NX-W-622-4
DATE SAMPLED:		04/07/92	04/09/92	04/09/92	04/07/92
REMARKS:					
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan I	0.05	0.05 U	0.050 U	0.050 U	0.05 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.05 U	0.050 U	0.050 U	0.05 U
Heptachlor Epoxide	0.05	0.05 U	0.050 U	0.050 U	0.05 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.05 U	0.050 U	0.050 U	0.05 U
alpha-Chlordane	0.05	0.05 U	0.050 U	0.050 U	0.05 U
beta-BHC	0.05	0.05 U	0.050 U	0.050 U	0.05 U
delta-BHC	0.05	0.05 U	0.050 U	0.050 U	0.05 U
gamma-BHC(Lindane)	0.05	0.05 U	0.050 U	0.050 U	0.05 U
gamma-Chlordane	0.05	0.05 U	0.050 U	0.050 U	0.05 U
METALS - UNFILTERED	CRDL(mg/L)				
Aluminum	200	119 U	121 UJ	89.8 UJ	117 U
Antimony	60	16 U	24.8	19.8	16 U
Arsenic	10	1 UJ	1 U	1 U	1 U
Barium	200	12.6 J	8.8 U	9.5 U	15.7 J
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	2 U	2 UJ	2 UJ	2 U
Calcium	5000	3480	2870	4690	4260
Chromium	10	3 U	3 UJ	3.2 UJ	3.2
Cobalt	50	3 U	3 U	3 U	3 U
Copper	25	2 U	2 U	2 U	2 U
Iron	100	1310	304 UJ	861 J	1300
Lead	3	2.8 U	2.3 UJ	5.8 UJ	1.5 U
Magnesium	5000	1220	1050	1590	1500

LOCATION NAME:		SW-07	SW-09	SW-11	SW-12
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-07-0.0-0.3-NX-W-618-4	SW-09-0.0-0.3-NX-W-619-4	SW-11-0.0-0.3-NX-W-621-4	SW-12-0.0-0.3-NX-W-622-4
DATE SAMPLED:		04/07/92	04/09/92	04/09/92	04/07/92
REMARKS:					
Manganese	15	163	51.1	237	212
Mercury	0.2	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Nickel	40	3 U	3.2 U	4.2 U	3 U
Potassium	5000	823	590	1190	1320
Selenium	5	0 R	4 UJ	4 UJ	0 R
Silver	10	0 R	2 U	2 U	0 R
Sodium	5000	9090	8150	9790	10400
Thallium	10	1 UJ	2 UJ	2 UJ	1 UJ
Vanadium	50	2 U	2 U	2 U	2 U
Zinc	20	11 UJ	11 U	11 U	11 UJ
METALS - FILTERED	CRDL(ug/L)				
Aluminum	200	116 U	94 U	65.6 U	63.5 U
Antimony	60	11 U	16 U	16 U	11 U
Arsenic	10	2 UJ	2 U	2 U	2 UJ
Barium	200	12.7 U	9.9 U	8.7 U	16.6 U
Beryllium	5	1 U	1 U	1 U	1 U
Cadmium	5	1.9 U	2 U	2 U	1 U
Calcium	5000	3540 U	3300	5050	4570
Chromium	10	5 UJ	3 U	3 U	5 UJ
Cobalt	50	5.5 U	3 U	3 U	2 U
Copper	25	4 U	2 U	2 U	4 U
Iron	100	1170	271 U	606 U	1050
Lead	3	1.7 U	2.5 UJ	1.6 U	1.2 U
Magnesium	5000	1250	1100	1640	1540
Manganese	15	160	52.8	245	207
Mercury	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40	5 U	3 U	3 U	5 U
Potassium	5000	902	654	1320	1350
Selenium	5	4 UJ	4 U	4 U	4 UJ
Silver	10	3 U	3.1 U	2 U	3 U
Sodium	5000	9070	10600	10500	12500
Thallium	10	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	50	2 U	2 U	2 U	2 U
Zinc	20	8 UJ	11 UJ	11 UJ	8 UJ
WATER QUALITY PARAMETERS					
CYANIDE	CRDL(mg/L)				
Cyanide	10	10 U	10 UJ	10 UJ	10 U

SURFACE WATER - APRIL 1992 (04/07/92-04/15/92)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SW-07	SW-09	SW-11	SW-12
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-07-0.0-0.3-NX-W-618-4	SW-09-0.0-0.3-NX-W-619-4	SW-11-0.0-0.3-NX-W-621-4	SW-12-0.0-0.3-NX-W-622-4
DATE SAMPLED:		04/07/92	04/09/92	04/09/92	04/07/92
REMARKS:					
AMMONIA	QL(mg/L)				
Ammonia	0.03	0.220	0.0300 U	0.570	0.460
TOTAL ORGANIC CARBON	QL(mg/L)				
Total Organic Carbon	0.5	4.9	4.5	7.9	5.7
BIOCHEMICAL OXYGEN DEMAND	QL(mg/L)				
Biochemical Oxygen Demand	1.0	1.0 J	NA	NA	1.7 J
OTHER					
Hardness	(mg/L)	14	11	18	17
pH	--	5.87	5.75	6.08	6.25
Specific Conductance	(umhos/cm)	85	74	98	125
Dissolved Oxygen	(mg/L)	11.38	11.07	11	10.42

SURFACE WATER - MAY 1992

SURFACE WATER - MAY 1992 (05/27/92-06/01/92)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:	SW-02	SW-04	SW-05	SW-06	SW-07
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:	SW-02-0.0-0.3-NX-W-700-5	SW-04-0.0-0.3-NX-W-701-5	SW-05-0.0-0.3-NX-W-702-5	SW-06-0.0-0.3-NX-W-703-5	SW-07-0.0-0.3-NX-W-704-5
DATE SAMPLED:	05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:					

VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
SEMIVOLATILE ORGANICS	**CRQL(ug/L)**					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-02	SW-04	SW-05	SW-06	SW-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-700-5	SW-04-0.0-0.3-NX-W-701-5	SW-05-0.0-0.3-NX-W-702-5	SW-06-0.0-0.3-NX-W-703-5	SW-07-0.0-0.3-NX-W-704-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-02	SW-04	SW-05	SW-06	SW-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-700-5	SW-04-0.0-0.3-NX-W-701-5	SW-05-0.0-0.3-NX-W-702-5	SW-06-0.0-0.3-NX-W-703-5	SW-07-0.0-0.3-NX-W-704-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		SW-02	SW-04	SW-05	SW-06	SW-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-700-5	SW-04-0.0-0.3-NX-W-701-5	SW-05-0.0-0.3-NX-W-702-5	SW-06-0.0-0.3-NX-W-703-5	SW-07-0.0-0.3-NX-W-704-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	194	170	163	208	320
Antimony	60	20 U	20 U	20 U	20 U	20 U
Arsenic	10	2 U	2 U	2 U	2 U	2 U
Barium	200	5.4	4.9	5.7	8.2	14.4
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	3900	3880	4160	4930	4560
Chromium	10	4 U	4 U	4 U	4 U	4 U
Cobalt	50	3 U	3 U	3 U	3 U	3 U
Copper	25	2.1	2 U	2 U	2 U	2.5
Iron	100	234	322	603	1640	6760
Lead	3	2 U	2 U	2 U	2 U	2 U
Magnesium	5000	1350	1350	1410	1660	1550
Manganese	15	21.2	136	176	303	443
Mercury	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	40	20 U	20 U	20 U	20 U	20 U
Potassium	5000	1060 U	1010 U	968 U	1350 U	1540 U
Selenium	5	2 U	2 U	2 U	2 U	2 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	8390	8300	8330	9460	9400

LOCATION NAME:		SW-02	SW-04	SW-05	SW-06	SW-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-700-5	SW-04-0.0-0.3-NX-W-701-5	SW-05-0.0-0.3-NX-W-702-5	SW-06-0.0-0.3-NX-W-703-5	SW-07-0.0-0.3-NX-W-704-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	2 U	2 U	2 U	2 U	2 U
Zinc	20	3.9	4.2	2.8	3.8	4.5
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	159	165	122	120	123
Antimony	60	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ
Arsenic	10	2 U	2.0 U	2 U	2 U	2 U
Barium	200	5.2 U	5.0	3.8 U	6.8 U	13.4 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	3990	3740	4180	5150	4630
Chromium	10	4 U	4 U	4 U	4 U	4 U
Cobalt	50	3 U	3 U	3 U	3 U	3 U
Copper	25	2 U	2.4 U	2 U	2 U	2 U
Iron	100	172 U	259 U	356	759	1380
Lead	3	1 U	1 U	1 U	1 U	1 U
Magnesium	5000	1300	1310	1360	1670	1490
Manganese	15	19.0	125	141	282	376
Mercury	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.10 UJ
Nickel	40	20 U	20 U	20 U	20 U	20 U
Potassium	5000	1290 U	1160 U	1320 U	1390 U	1650 U
Selenium	5	2 U	2 U	2 U	2 U	2 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	9910 U	8260 U	9470 U	10100 U	10100 U
Thallium	10	2 U	2 U	2.0 UJ	2.0 UJ	2.0 UJ
Vanadium	50	2 U	2.2 U	2.6 U	2 U	2.0 U
Zinc	20	4.4 U	4.9 U	2 U	6.7 U	5.8 U
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	10.0 UJ	10.0 UJ	10.0 UJ	210 J
AMMONIA	QL(mg/L)					
Ammonia	0.03	0.0300 U	0.0700	0.120	0.670	1.02

LOCATION NAME:		SW-02	SW-04	SW-05	SW-06	SW-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
M&E SAMPLE ID:		SW-02-0.0-0.3-NX-W-700-5	SW-04-0.0-0.3-NX-W-701-5	SW-05-0.0-0.3-NX-W-702-5	SW-06-0.0-0.3-NX-W-703-5	SW-07-0.0-0.3-NX-W-704-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
OTHER						
Hardness	(mg/L)	15	15	16	19	18
pH	--	5.74	5.89	5.84	5.85	6.26
Specific Conductance	(umhos/cm)	75	75	78	97	94
Dissolved Oxygen	(mg/L)	10.21	9.9	9	9.05	9.7

LOCATION NAME:		SW-09	SW-09	SW-11	SW-12	SW-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0.0-0.3-FD-W-745-5	SW-09-0.0-0.3-NX-W-705-5	SW-11-0.0-0.3-NX-W-706-5	SW-12-0.0-0.3-NX-W-707-5	SW-16-0.0-0.3-NX-W-709-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
VOLATILE ORGANICS-CLP	CRQL(ug/L)					
1,1,1-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U	10 U	10 U	10 U
Acetone	10	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Benzene	10	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10	10 U	10 U	10 U	10 U	10 U
Bromoform	10	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U
Chloroform	10	10 U	10 U	10 U	10 U	10 U
Chloromethane	10	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	10	10 U	10 U	10 U	10 U	10 U
Styrene	10	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10	10 U	10 U	10 U	10 U	10 U
Toluene	10	10 U	10 U	10 U	10 U	10 U
Total Xylenes	10	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U	10 U	10 U	10 U
SEMIVOLATILE ORGANICS	CRQL(ug/L)					
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-09	SW-09	SW-11	SW-12	SW-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0.0-0.3-FD-W-745-5	SW-09-0.0-0.3-NX-W-705-5	SW-11-0.0-0.3-NX-W-706-5	SW-12-0.0-0.3-NX-W-707-5	SW-16-0.0-0.3-NX-W-709-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
3-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U
Carbazole	10	10 U	10 U	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U	10 U	10 U	10 U

LOCATION NAME:		SW-09	SW-09	SW-11	SW-12	SW-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0.0-0.3-FD-W-745-5	SW-09-0.0-0.3-NX-W-705-5	SW-11-0.0-0.3-NX-W-706-5	SW-12-0.0-0.3-NX-W-707-5	SW-16-0.0-0.3-NX-W-709-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
Di-n-octylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U	10 U	10 U
Fluorene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10	10 U	10 U	10 U	10 U	10 U
Phenol	10	10 U	10 U	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)					
4,4'-DDD	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U

LOCATION NAME:		SW-09	SW-09	SW-11	SW-12	SW-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0.0-0.3-FD-W-745-5	SW-09-0.0-0.3-NX-W-705-5	SW-11-0.0-0.3-NX-W-706-5	SW-12-0.0-0.3-NX-W-707-5	SW-16-0.0-0.3-NX-W-709-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
Endosulfan I	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)					
Aluminum	200	179	172	153	132	1140
Antimony	60	20 U	20 U	20 U	20 U	20 U
Arsenic	10	2 U	2 U	2 U	2 U	2 U
Barium	200	8.2	8.2	9.9	17.4	15.2
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	2980	3000	5950	6330	3570
Chromium	10	4 U	4 U	4 U	4 U	4 U
Cobalt	50	3 U	3 U	3 U	3 U	3 U
Copper	25	2 U	2 U	2 U	2.2	2.4
Iron	100	416	390	1420	2510	4890
Lead	3	2 U	2 U	2 U	2 U	3.7
Magnesium	5000	1100	1100	1920	2170	1190
Manganese	15	58.5	58.8	373	434	273
Mercury	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	40	20 U	20 U	20 U	20 U	20 U
Potassium	5000	692 U	950 U	1570 U	2540 U	2730 U
Selenium	5	2 U	2 U	2 U	2 U	2 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	7900	7910	10800	12500	9190

LOCATION NAME:		SW-09	SW-09	SW-11	SW-12	SW-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0.0-0.3-FD-W-745-5	SW-09-0.0-0.3-NX-W-705-5	SW-11-0.0-0.3-NX-W-706-5	SW-12-0.0-0.3-NX-W-707-5	SW-16-0.0-0.3-NX-W-709-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
Thallium	10	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Vanadium	50	2 U	2 U	2 U	2 U	7.3 U
Zinc	20	5.9	4.6	3.7	3.2	12.1
METALS - FILTERED	CRDL(ug/L)					
Aluminum	200	164	128	159	104	437
Antimony	60	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ
Arsenic	10	2 U	2 U	2 U	2 U	2 U
Barium	200	7.9 U	7.5 U	10.5 U	16.9	13.6 U
Beryllium	5	1 U	1 U	1 U	1 U	1 U
Cadmium	5	3 U	3 U	3 U	3 U	3 U
Calcium	5000	2870	3030	6050	6310	3570
Chromium	10	4 U	4 U	4 U	4 U	4 U
Cobalt	50	3 U	3 U	3 U	3 U	3 U
Copper	25	8.7 U	8.7 U	2 U	2 U	4.8 U
Iron	100	242 U	232 U	830	1710	662
Lead	3	1 U	1 U	1 U	1 U	1.2
Magnesium	5000	1070	1050	1910	2130	1110
Manganese	15	53.6	54.8	369	417	175
Mercury	0.2	0.18 J	0.10 UJ	0.10 UJ	0.10 UJ	0.1 U
Nickel	40	20 U	20 U	20 U	20 U	20 U
Potassium	5000	1050 U	1600 U	1550 U	3080 U	3710 U
Selenium	5	2 U	2 U	2 U	2 U	2 U
Silver	10	3 U	3 U	3 U	3 U	3 U
Sodium	5000	7870 U	7800 U	11300 U	13000	11300 U
Thallium	10	2.0 UJ	2.0 UJ	2.0 UJ	2 UJ	2.0 UJ
Vanadium	50	2 U	2.9 U	2 U	2.6 U	2 U
Zinc	20	6.0 U	7.2 U	5.0 U	4.9 U	10.5 U
WATER QUALITY PARAMETERS						
CYANIDE	CRDL(mg/L)					
Cyanide	10	10.0 UJ	45.0 J	10.0 UJ	10.0 UJ	10.0 UJ
AMMONIA	QL(mg/L)					
Ammonia	0.03	0.0310	0.0340	1.43	3.53	0.0600

LOCATION NAME:		SW-09	SW-09	SW-11	SW-12	SW-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
M&E SAMPLE ID:		SW-09-0.0-0.3-FD-W-745-5	SW-09-0.0-0.3-NX-W-705-5	SW-11-0.0-0.3-NX-W-706-5	SW-12-0.0-0.3-NX-W-707-5	SW-16-0.0-0.3-NX-W-709-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
OTHER						
Hardness	(mg/L)	12	12	23	25	14
pH	--	NA	6.25	6.35	6.27	5.72
Specific Conductance	(umhos/cm)	NA	68	112	141	78
Dissolved Oxygen	(mg/L)	NA	9.97	9.1	8.93	9.86

LOCATION NAME:	SW-17	SW-18
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	SW-17-0.0-0.3-NX-W-710-5	SW-18-0.0-0.3-NX-W-708-5
DATE SAMPLED:	06/01/92	06/01/92
REMARKS:		

VOLATILE ORGANICS-CLP	CRQL(ug/L)		
1,1,1-Trichloroethane	10	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U
1,2-Dichloroethene(total)	10	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U
2-Butanone	10	10 U	10 U
2-Hexanone	10	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U
Acetone	10	10 UJ	10 UJ
Benzene	10	10 U	10 U
Bromodichloromethane	10	10 U	10 U
Bromoform	10	10 U	10 U
Bromomethane	10	10 U	10 U
Carbon Disulfide	10	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U
Chlorobenzene	10	10 U	10 U
Chloroethane	10	10 U	10 U
Chloroform	10	10 U	10 U
Chloromethane	10	10 U	10 U
Dibromochloromethane	10	10 U	10 U
Ethylbenzene	10	10 U	10 U
Methylene Chloride	10	10 U	10 U
Styrene	10	10 U	10 U
Tetrachloroethene	10	10 U	10 U
Toluene	10	10 U	10 U
Total Xylenes	10	10 U	10 U
Trichloroethene	10	10 U	10 U
Vinyl Chloride	10	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U
SEMIVOLATILE ORGANICS	**CRQL(ug/L)**		
1,2,4-Trichlorobenzene	10	10 U	10 U

LOCATION NAME:	SW-17	SW-18
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	SW-17-0.0-0.3-NX-W-710-5	SW-18-0.0-0.3-NX-W-708-5
DATE SAMPLED:	06/01/92	06/01/92
REMARKS:		

1,2-Dichlorobenzene	10	10 U	10 U
1,3-Dichlorobenzene	10	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U
2,2'-oxybis(1-Chloropropane)	10	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U
2-Chlorophenol	10	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U
2-Methylphenol	10	10 U	10 U
2-Nitroaniline	25	25 U	25 U
2-Nitrophenol	10	10 U	10 U
3,3'-Dichlorobenzidine	10	10 UJ	10 UJ
3-Nitroaniline	25	25 U	25 UJ
4,6-Dinitro-2-methylphenol	25	25 U	25 U
4-Bromophenyl-phenylether	10	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U
4-Chloroaniline	10	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U
4-Methylphenol	10	10 U	10 U
4-Nitroaniline	25	25 U	25 U
4-Nitrophenol	25	25 U	25 U
Acenaphthene	10	10 U	10 U
Acenaphthylene	10	10 U	10 U
Anthracene	10	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U
Benzo(g,h,i)perylene	10	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U
Carbazole	10	10 U	10 U
Chrysene	10	10 U	10 U
Di-n-butylphthalate	10	10 U	10 U

LOCATION NAME:		SW-17	SW-18
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:		SW-17-0.0-0.3-NX-W-710-5	SW-18-0.0-0.3-NX-W-708-5
DATE SAMPLED:		06/01/92	06/01/92
REMARKS:			
Di-n-octylphthalate	10	10 U	10 U
Dibenz(a,h)anthracene	10	10 U	10 U
Dibenzofuran	10	10 U	10 U
Diethylphthalate	10	10 U	10 U
Dimethylphthalate	10	10 U	10 U
Fluoranthene	10	10 U	10 U
Fluorene	10	10 U	10 U
Hexachlorobenzene	10	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U
Hexachloroethane	10	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U
Isophorone	10	10 U	10 U
N-Nitroso-di-n-propylamine	10	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U
Naphthalene	10	10 U	10 U
Nitrobenzene	10	10 U	10 U
Pentachlorophenol	25	25 U	25 U
Phenanthrene	10	10 U	10 U
Phenol	10	10 U	10 U
Pyrene	10	10 U	10 U
bis(2-Chloroethoxy)methane	10	10 U	10 U
bis(2-Chloroethyl) ether	10	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U
PESTICIDES/PCBs	CRQL(ug/L)		
4,4'-DDD	0.10	0.10 U	0.10 U
4,4'-DDE	0.10	0.10 U	0.10 U
4,4'-DDT	0.10	0.10 U	0.10 U
Aldrin	0.05	0.050 U	0.050 U
Aroclor-1016	1.0	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U
Aroclor-1260	1.0	1.0 U	1.0 U
Dieldrin	0.10	0.10 U	0.10 U

LOCATION NAME:	SW-17	SW-18
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	SW-17-0.0-0.3-NX-W-710-5	SW-18-0.0-0.3-NX-W-708-5
DATE SAMPLED:	06/01/92	06/01/92
REMARKS:		

Endosulfan I	0.05	0.050 U	0.050 U
Endosulfan II	0.10	0.10 U	0.10 U
Endosulfan Sulfate	0.10	0.10 U	0.10 U
Endrin	0.10	0.10 U	0.10 U
Endrin Aldehyde	0.10	0.10 U	0.10 U
Endrin Ketone	0.10	0.10 U	0.10 U
Heptachlor	0.05	0.050 U	0.050 U
Heptachlor Epoxide	0.05	0.050 U	0.050 U
Methoxychlor	0.50	0.50 U	0.50 U
Toxaphene	5.0	5.0 U	5.0 U
alpha-BHC	0.05	0.050 U	0.050 U
alpha-Chlordane	0.05	0.050 U	0.050 U
beta-BHC	0.05	0.050 U	0.050 U
delta-BHC	0.05	0.050 U	0.050 U
gamma-BHC(Lindane)	0.05	0.050 U	0.050 U
gamma-Chlordane	0.05	0.050 U	0.050 U
METALS - UNFILTERED	CRDL(mg/L)		
Aluminum	200	367	424
Antimony	60	20 U	20 U
Arsenic	10	2 U	2 U
Barium	200	7.2	7.9
Beryllium	5	1 U	1 U
Cadmium	5	3 U	3 U
Calcium	5000	3540	3230
Chromium	10	4 U	4 U
Cobalt	50	3 U	3 U
Copper	25	2 U	2.1
Iron	100	1270	1360
Lead	3	2 U	2 U
Magnesium	5000	1200	1110
Manganese	15	205	185
Mercury	0.2	0.1 U	0.1 U
Nickel	40	20 U	20 U
Potassium	5000	1790 U	1420 U
Selenium	5	2 U	2 U
Silver	10	3 U	3 U
Sodium	5000	7580	7040

LOCATION NAME:	SW-17	SW-18
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	SW-17-0.0-0.3-NX-W-710-5	SW-18-0.0-0.3-NX-W-708-5
DATE SAMPLED:	06/01/92	06/01/92
REMARKS:		

Thallium	10	1.0 UJ	1.0 UJ
Vanadium	50	4.1 U	3.4 U
Zinc	20	5.2	8.2
METALS - FILTERED	CRDL(ug/L)		
Aluminum	200	265	348
Antimony	60	20.0 UJ	20.0 UJ
Arsenic	10	2 U	2 U
Barium	200	6.6 U	6.7 U
Beryllium	5	1 U	1 U
Cadmium	5	3 U	3 U
Calcium	5000	3760	3460
Chromium	10	4 U	4 U
Cobalt	50	3 U	3 U
Copper	25	2 U	7.1 U
Iron	100	519	523
Lead	3	1 U	1 U
Magnesium	5000	1180	1120
Manganese	15	143	122
Mercury	0.2	0.1 U	0.1 U
Nickel	40	20 U	20 U
Potassium	5000	1790 U	1620 U
Selenium	5	2 U	2 U
Silver	10	3 U	3 U
Sodium	5000	8230 U	7860 U
Thallium	10	2.0 UJ	2.0 UJ
Vanadium	50	2.6 U	2 U
Zinc	20	14.9 U	15.1 U
		WATER QUALITY PARAMETERS	
CYANIDE	CRDL(mg/L)		
Cyanide	10	10.0 UJ	10.0 UJ
AMMONIA	QL(mg/L)		
Ammonia	0.03	0.100	0.0800

LOCATION NAME:	SW-17	SW-18
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER
M&E SAMPLE ID:	SW-17-0.0-0.3-NX-W-710-5	SW-18-0.0-0.3-NX-W-708-5
DATE SAMPLED:	06/01/92	06/01/92
REMARKS:		

OTHER

Hardness	(mg/L)	14	13
pH	--	5.67	5.56
Specific Conductance	(umhos/cm)	69	64
Dissolved Oxygen	(mg/L)	9.05	8.93

D-12 COMPLETE ANALYTICAL DATA, SEDIMENTS

- JUNE 1991
- SEPTEMBER/OCTOBER 1991
- MAY 1992

SEDIMENT - JUNE 1991

SEDIMENTS - JUNE 1991 (06/20/91-06/27/91)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0-0.5-NX-06-20-D-049	SE-02-0-0.5-NX-06-25-D-050	SE-03-0-0.5-NX-06-24-D-051	SE-04-0-0.5-NX-06-24-D-052	SE-05-0-0.5-NX-06-24-D-053
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	5	7 U	7 U	10 U	7 U	9 U
1,1,2,2-Tetrachloroethane	5	7 U	7 U	10 U	7 U	9 U
1,1,2-Trichloroethane	5	7 U	7 U	10 U	7 U	9 U
1,1-Dichloroethane	5	7 U	7 U	10 U	7 U	9 U
1,1-Dichloroethene	5	7 U	7 U	10 U	7 U	9 U
1,2-Dichloroethane	5	7 U	7 U	10 U	7 U	9 U
1,2-Dichloroethene(total)	5	7 U	7 U	10 U	7 U	9 U
1,2-Dichloropropane	5	7 U	7 U	10 U	7 U	9 U
2-Butanone	10	14 U	13 U	21 U	14 U	18 U
2-Hexanone	10	14 U	13 U	21 U	14 U	18 U
4-Methyl-2-pentanone	10	14 U	13 U	21 U	14 U	18 U
Acetone	10	32 UJ	35 UJ	140 UJ	54 UJ	18 UJ
Benzene	5	7 U	7 U	10 U	7 U	9 U
Bromodichloromethane	5	7 U	7 U	10 U	7 U	9 U
Bromoform	5	7 U	7 U	10 U	7 U	9 U
Bromomethane	10	14 U	13 U	21 U	14 U	18 U
Carbon Disulfide	5	7 U	7 U	10 U	7 U	9 U
Carbon Tetrachloride	5	7 U	7 U	10 U	7 U	9 U
Chlorobenzene	5	7 U	7 U	10 U	7 U	9 U
Chloroethane	10	14 U	13 U	21 U	14 U	18 U
Chloroform	5	7 U	7 U	10 U	7 U	9 U
Chloromethane	10	14 U	13 U	21 U	14 U	18 U
Dibromochloromethane	5	7 U	7 U	10 U	7 U	9 U
Ethylbenzene	5	7 U	7 U	10 U	7 U	9 U
Methylene Chloride	5	7 U	7 U	10 U	7 U	9 U
Styrene	5	7 U	7 U	10 U	7 U	9 U
Tetrachloroethene	5	7 U	7 U	10 U	7 U	9 U
Toluene	5	7 U	7 U	10 U	7 U	9 U
Total Xylenes	5	7 U	7 U	10 J	7 U	9 U
Trichloroethene	5	7 U	7 U	10 U	7 J	9 U
Vinyl Acetate	10	14 U	13 U	21 U	14 U	18 U
Vinyl Chloride	10	14 U	13 U	21 U	14 U	18 U
cis-1,3-Dichloropropene	5	7 U	7 U	10 U	7 U	9 U
trans-1,3-Dichloropropene	5	7 U	7 U	10 U	7 U	9 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	910 U	870 U	1400 U	930 U	1200 U

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0-0.5-NX-06-20-D-049	SE-02-0-0.5-NX-06-25-D-050	SE-03-0-0.5-NX-06-24-D-051	SE-04-0-0.5-NX-06-24-D-052	SE-05-0-0.5-NX-06-24-D-053
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
1,2-Dichlorobenzene	330	910 U	870 U	1400 U	930 U	1200 U
1,3-Dichlorobenzene	330	910 U	870 U	1400 U	930 U	1200 U
1,4-Dichlorobenzene	330	910 U	870 U	1400 U	930 U	1200 U
2,4,5-Trichlorophenol	1600	4400 U	4200 U	6600 U	4500 U	5800 U
2,4,6-Trichlorophenol	330	910 U	870 U	1400 U	930 U	1200 U
2,4-Dichlorophenol	330	910 U	870 U	1400 U	930 U	1200 U
2,4-Dimethylphenol	330	910 U	870 U	1400 U	930 U	1200 U
2,4-Dinitrophenol	1600	4400 U	4200 U	6600 U	4500 U	5800 U
2,4-Dinitrotoluene	330	910 U	870 U	1400 U	930 U	1200 U
2,6-Dinitrotoluene	330	910 U	870 U	1400 U	930 U	1200 U
2-Chloronaphthalene	330	910 U	870 U	1400 U	930 U	1200 U
2-Chlorophenol	330	910 U	870 U	1400 U	930 U	1200 U
2-Methylnaphthalene	330	910 U	870 U	1400 U	930 U	1200 U
2-Methylphenol	330	910 U	870 U	1400 U	930 U	1200 U
2-Nitroaniline	1600	4400 U	4200 U	6600 U	4500 U	5800 U
2-Nitrophenol	330	910 U	870 U	1400 U	930 U	1200 U
3,3'-Dichlorobenzidine	660	1800 U	1700 U	2700 U	1900 U	2400 U
3-Nitroaniline	1600	4400 U	4200 U	6600 U	4500 U	5800 U
4,6-Dinitro-2-methylphenol	1600	4400 U	4200 U	6600 U	4500 U	5800 U
4-Bromophenyl-phenylether	330	910 U	870 U	1400 U	930 U	1200 U
4-Chloro-3-methylphenol	330	910 U	870 U	1400 U	930 U	1200 U
4-Chloroaniline	330	910 U	870 U	1400 U	930 U	1200 U
4-Chlorophenyl-phenylether	330	910 U	870 U	1400 U	930 U	1200 U
4-Methylphenol	330	910 U	870 U	1400 U	930 U	1200 U
4-Nitroaniline	1600	4400 U	4200 U	6600 U	4500 U	5800 U
4-Nitrophenol	1600	4400 U	4200 U	6600 U	4500 U	5800 U
Acenaphthene	330	910 U	870 U	1400 U	930 U	1200 U
Acenaphthylene	330	910 U	870 U	1400 U	930 U	1200 U
Anthracene	330	910 U	870 U	1400 U	930 U	1200 U
Benzo(a)anthracene	330	910 U	870 U	1400 U	930 U	1200 U
Benzo(a)pyrene	330	910 U	870 U	1400 U	930 U	1200 U
Benzo(b)fluoranthene	330	910 U	870 U	1400 U	930 U	1200 U
Benzo(g,h,i)perylene	330	910 U	870 U	1400 U	930 U	1200 U
Benzo(k)fluoranthene	330	910 U	870 U	1400 U	930 U	1200 U
Benzoic Acid	1600	4400 U	4200 U	6600 U	4500 U	5800 U
Benzyl Alcohol	330	910 U	870 U	1400 U	930 U	1200 U
Butylbenzylphthalate	330	910 U	870 U	1400 U	930 U	1200 U
Chrysene	330	910 U	870 U	1400 U	930 U	1200 U
Di-n-butylphthalate	330	910 U	870 U	1400 U	930 U	1200 U

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0-0.5-NX-06-20-D-049	SE-02-0-0.5-NX-06-25-D-050	SE-03-0-0.5-NX-06-24-D-051	SE-04-0-0.5-NX-06-24-D-052	SE-05-0-0.5-NX-06-24-D-053
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
Di-n-octylphthalate	330	910 U	870 U	1400 U	930 U	1200 U
Dibenz(a,h)anthracene	330	910 U	870 U	1400 U	930 U	1200 U
Dibenzofuran	330	910 U	870 U	1400 U	930 U	1200 U
Diethylphthalate	330	910 U	870 U	1400 U	930 U	1200 U
Dimethylphthalate	330	910 U	870 U	1400 U	930 U	1200 U
Fluoranthene	330	910 U	870 U	1400 U	930 U	1200 U
Fluorene	330	910 U	870 U	1400 U	930 U	1200 U
Hexachlorobenzene	330	910 U	870 U	1400 U	930 U	1200 U
Hexachlorobutadiene	330	910 U	870 U	1400 U	930 U	1200 U
Hexachlorocyclopentadiene	330	910 U	870 U	1400 U	930 U	1200 U
Hexachloroethane	330	910 U	870 U	1400 U	930 U	1200 U
Indeno(1,2,3-cd)pyrene	330	910 U	870 U	1400 U	930 U	1200 U
Isophorone	330	910 U	870 U	1400 U	930 U	1200 U
N-Nitroso-di-n-propylamine	330	910 U	870 U	1400 U	930 U	1200 U
N-Nitrosodiphenylamine	330	910 U	870 U	1400 U	930 U	1200 U
Naphthalene	330	910 U	870 U	1400 U	930 U	1200 U
Nitrobenzene	330	910 U	870 U	1400 U	930 U	1200 U
Pentachlorophenol	1600	4400 U	4200 U	6600 U	4500 U	5800 U
Phenanthrene	330	910 U	870 U	1400 U	930 U	1200 U
Phenol	330	910 U	870 U	1400 U	930 U	1200 U
Pyrene	330	910 U	870 U	1400 U	930 U	1200 U
bis(2-Chloroethoxy)methane	330	910 U	870 U	1400 U	930 U	1200 U
bis(2-Chloroethyl) ether	330	910 U	870 U	1400 U	930 U	1200 U
bis(2-Chloroisopropyl) ether	330	910 U	870 U	1400 U	930 U	1200 U
bis(2-Ethylhexyl)phthalate	330	910 U	870 U	1400 U	930 U	1200 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	16.0	22.0 U	21.0 U	34.0 U	22.0 U	29.0 U
4,4'-DDE	16.0	22.0 U	21.0 U	34.0 U	22.0 U	29.0 U
4,4'-DDT	16.0	22.0 U	21.0 U	34.0 U	22.0 U	29.0 U
Aldrin	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
Aroclor-1016	80.0	110.0 U	110.0 U	170.0 U	110.0 U	150.0 U
Aroclor-1221	80.0	110.0 U	110.0 U	170.0 U	110.0 U	150.0 U
Aroclor-1232	80.0	110.0 U	110.0 U	170.0 U	110.0 U	150.0 U
Aroclor-1242	80.0	110.0 U	110.0 U	170.0 U	110.0 U	150.0 U
Aroclor-1248	80.0	110.0 U	110.0 U	170.0 U	110.0 U	150.0 U
Aroclor-1254	160.0	220.0 U	210.0 U	340.0 U	220.0 U	290.0 U
Aroclor-1260	160.0	220.0 U	210.0 U	340.0 U	220.0 U	290.0 U

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0-0.5-NX-06-20-D-049	SE-02-0-0.5-NX-06-25-D-050	SE-03-0-0.5-NX-06-24-D-051	SE-04-0-0.5-NX-06-24-D-052	SE-05-0-0.5-NX-06-24-D-053
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
Dieldrin	16.0	22.0 U	21.0 U	34.0 U	22.0 U	29.0 U
Endosulfan I	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
Endosulfan II	16.0	22.0 U	21.0 U	34.0 U	22.0 U	29.0 U
Endosulfan Sulfate	16.0	22.0 UJ	21.0 UJ	34.0 UJ	22.0 UJ	29.0 UJ
Endrin	16.0	22.0 U	21.0 U	34.0 U	22.0 U	29.0 U
Endrin Ketone	16.0	22.0 UJ	21.0 UJ	34.0 UJ	22.0 UJ	29.0 UJ
Heptachlor	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
Heptachlor Epoxide	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
Methoxychlor	80.0	110.0 UJ	110.0 UJ	170.0 UJ	110.0 UJ	150.0 UJ
Toxaphene	160.0	220.0 U	210.0 U	340.0 U	220.0 U	290.0 U
alpha-BHC	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
alpha-Chlordane	80.0	110.0 U	110.0 U	170.0 U	110.0 U	150.0 U
beta-BHC	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
delta-BHC	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
gamma-BHC(Lindane)	8.0	11.0 U	11.0 U	17.0 U	11.0 U	15.0 U
gamma-Chlordane	80.0	110.0 U	110.0 U	170.0 U	110.0 U	150.0 U
METALS	CRDL(mg/kg)					
Aluminum	200	6050	749	1780	5710	6280
Antimony	60	4.6 UJ	2.8 UJ	3.8 UJ	2.9 UJ	3.9 UJ
Arsenic	10	0.98 U	0.49 U	0.77 U	1.7	2.1
Barium	200	13.6	2.7	7.8	26.2	17.0
Beryllium	5	0.84 U	0.25 U	0.40	2.0	0.74
Cadmium	5	0.81 U	0.25 U	0.36 U	0.31 U	0.35 U
Calcium	5000	378	128 U	1270	753	547
Chromium	10	4.4	1.9 U	2.4 U	8.7	8.7
Cobalt	50	3.2 U	0.50 U	1.7 U	3.7	4.2
Copper	25	3.3	2.4 U	4.0 U	7.1 U	8.4 U
Iron	100	7530	780	1380	11600	4320
Lead	3	10.8	2.7 U	18.0 U	4.5 U	4.7 U
Magnesium	5000	1100	176 U	294 U	1030	1040
Manganese	15	74.4	13.5	97.3	87.4	171
Mercury	0.2	0.13 U	0.11 U	0.18 U	0.12 U	0.17 U
Nickel	40	4.1	1.4	1.37 U	5.9	9.5
Potassium	5000	549	111 U	132 U	206 U	194 U
Selenium	5	0.98 U	0.98 U	1.55 U	1.09 U	2.1 J
Silver	10	1.08 U	0.50 U	0.69 U	0.53 U	0.71 U
Sodium	5000	47.1	36.6 U	71.8 U	65.6 U	66.4 U

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0-0.5-NX-06-20-D-049	SE-02-0-0.5-NX-06-25-D-050	SE-03-0-0.5-NX-06-24-D-051	SE-04-0-0.5-NX-06-24-D-052	SE-05-0-0.5-NX-06-24-D-053
DATE SAMPLED:		06/20/91	06/25/91	06/24/91	06/24/91	06/24/91
REMARKS:						
Thallium	10	0.73 U	0.25 U	0.39 U	0.27 U	0.37 U
Vanadium	50	10.8	1.4 U	6.2	13.3	14.2
Zinc	20	25.2	6.0 U	17.1 U	39.4 U	44.8 U
SOIL QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.2	8.70	22.0	16.8	15.0	27.0
CYANIDE	CRDL(mg/kg)					
Cyanide	10	0.33 U	0.30 U	0.47 U	0.34 U	0.47 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	31.9	25.9	66.3	30.1	48.4
Organic Content	(%)	2.8	1.0	14.7	1.1	5.3
Solids Content	(%)	68.1	74.1	33.6	69.9	51.5
GRAIN SIZE						
Clay	(%)	2.9	0.4	1.9	11.8	4.1
Gravel	(%)	6.6	0.8	1.5	1.9	2.9
Sand	(%)	56.9	95	87.8	37.7	50.4
Silt	(%)	33.5	3.8	8.8	48.5	42.5

LOCATION NAME:		SD-06	SD-06	SD-07	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0-0.5-FD-06-21-D-073	SE-06-0-0.5-NX-06-21-D-054	SE-07-0-0.5-NX-06-25-D-055	SE-08-0-0.5-NX-06-25-D-056	SE-09-0-0.5-FD-06-20-D-074
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				Field Duplicate
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	5	9 U	10 U	6 U	8 UJ	7 U
1,1,2,2-Tetrachloroethane	5	9 U	10 U	6 U	8 UJ	7 U
1,1,2-Trichloroethane	5	9 U	10 U	6 U	8 UJ	7 U
1,1-Dichloroethane	5	9 U	10 U	6 U	8 UJ	7 U
1,1-Dichloroethene	5	9 U	10 U	6 U	8 UJ	7 U
1,2-Dichloroethane	5	9 U	10 U	6 U	8 UJ	7 U
1,2-Dichloroethene(total)	5	9 U	10 U	6 U	5 J	7 U
1,2-Dichloropropane	5	9 U	10 U	6 U	8 UJ	7 U
2-Butanone	10	18 U	21 U	13 U	17 UJ	15 U
2-Hexanone	10	18 U	21 U	13 U	17 UJ	15 U
4-Methyl-2-pentanone	10	18 U	21 U	13 U	17 UJ	15 U
Acetone	10	39 UJ	36 UJ	40 UJ	110 UJ	47 UJ
Benzene	5	9 U	10 U	6 U	8 UJ	7 U
Bromodichloromethane	5	9 U	10 U	6 U	8 UJ	7 U
Bromoform	5	9 U	10 U	6 U	8 UJ	7 U
Bromomethane	10	18 U	21 U	13 U	17 UJ	15 U
Carbon Disulfide	5	9 U	10 U	6 U	9 J	7 U
Carbon Tetrachloride	5	9 U	10 U	6 U	8 UJ	7 U
Chlorobenzene	5	9 U	10 U	6 U	8 UJ	7 U
Chloroethane	10	18 U	21 U	13 U	17 UJ	15 U
Chloroform	5	9 U	10 U	6 U	8 UJ	7 U
Chloromethane	10	18 U	21 U	13 U	17 UJ	15 U
Dibromochloromethane	5	9 U	10 U	6 U	8 UJ	7 U
Ethylbenzene	5	9 U	10 U	6 U	8 J	7 U
Methylene Chloride	5	9 U	10 U	6 U	11 UJ	7 U
Styrene	5	9 U	10 U	6 U	8 UJ	7 U
Tetrachloroethene	5	9 U	10 U	6 U	8 UJ	7 U
Toluene	5	9 U	10 U	6 U	8 UJ	7 U
Total Xylenes	5	9 U	10 U	8	67 J	7 UJ
Trichloroethene	5	9 UJ	10 J	8	150 J	7 J
Vinyl Acetate	10	18 U	21 U	13 U	17 UJ	15 U
Vinyl Chloride	10	18 U	21 U	13 U	17 UJ	15 U
cis-1,3-Dichloropropene	5	9 U	10 U	6 U	8 UJ	7 U
trans-1,3-Dichloropropene	5	9 U	10 U	6 U	8 UJ	7 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	1200 U	1400 U	840 U	1100 U	970 U

LOCATION NAME:		SD-06	SD-06	SD-07	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:	SE-06-0-0.5-	FD-06-21-D-073	SE-06-0-0.5-NX-06-21-D-054	SE-07-0-0.5-NX-06-25-D-055	SE-08-0-0.5-NX-06-25-D-056	SE-09-0-0.5-FD-06-20-D-074
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				Field Duplicate
1,2-Dichlorobenzene	330	1200 U	1400 U	840 U	1100 U	970 U
1,3-Dichlorobenzene	330	1200 U	1400 U	840 U	1100 U	970 U
1,4-Dichlorobenzene	330	1200 U	1400 U	840 U	1100 U	970 U
2,4,5-Trichlorophenol	1600	5600 U	6700 U	4100 U	5400 U	4700 U
2,4,6-Trichlorophenol	330	1200 U	1400 U	840 U	1100 U	970 U
2,4-Dichlorophenol	330	1200 U	1400 U	840 U	1100 U	970 U
2,4-Dimethylphenol	330	1200 U	1400 U	840 U	1100 U	970 U
2,4-Dinitrophenol	1600	5600 U	6700 U	4100 U	5400 U	4700 U
2,4-Dinitrotoluene	330	1200 U	1400 U	840 U	1100 U	970 U
2,6-Dinitrotoluene	330	1200 U	1400 U	840 U	1100 U	970 U
2-Chloronaphthalene	330	1200 U	1400 U	840 U	1100 U	970 U
2-Chlorophenol	330	1200 U	1400 U	840 U	1100 U	970 U
2-Methylnaphthalene	330	1200 U	1400 U	840 U	1100 U	970 U
2-Methylphenol	330	1200 U	1400 U	840 U	1100 U	970 U
2-Nitroaniline	1600	5600 U	6700 U	4100 U	5400 U	4700 U
2-Nitrophenol	330	1200 U	1400 U	840 U	1100 U	970 U
3,3'-Dichlorobenzidine	660	2300 U	2700 U	1700 U	2200 U	1900 U
3-Nitroaniline	1600	5600 U	6700 U	4100 U	5400 U	4700 U
4,6-Dinitro-2-methylphenol	1600	5600 U	6700 U	4100 U	5400 U	4700 U
4-Bromophenyl-phenylether	330	1200 U	1400 U	840 U	1100 U	970 U
4-Chloro-3-methylphenol	330	1200 U	1400 U	840 U	1100 U	970 U
4-Chloroaniline	330	1200 U	1400 U	840 U	1100 U	970 U
4-Chlorophenyl-phenylether	330	1200 U	1400 U	840 U	1100 U	970 U
4-Methylphenol	330	1200 U	1400 U	840 U	1100 U	970 U
4-Nitroaniline	1600	5600 U	6700 U	4100 U	5400 U	4700 U
4-Nitrophenol	1600	5600 U	6700 U	4100 U	5400 U	4700 U
Acenaphthene	330	1200 U	1400 U	840 U	1100 U	970 U
Acenaphthylene	330	1200 U	1400 U	840 U	1100 U	970 U
Anthracene	330	1200 U	1400 U	840 U	1100 U	970 U
Benzo(a)anthracene	330	1200 U	1400 U	840 U	1100 U	970 U
Benzo(a)pyrene	330	1200 U	1400 U	840 U	140 J	970 U
Benzo(b)fluoranthene	330	1200 U	1400 U	840 U	130 J	970 U
Benzo(g,h,i)perylene	330	1200 U	1400 U	840 U	1100 U	970 U
Benzo(k)fluoranthene	330	1200 U	1400 U	840 U	130 J	970 U
Benzoic Acid	1600	5600 U	6700 U	4100 U	5400 U	4700 U
Benzyl Alcohol	330	1200 U	1400 U	840 U	1100 U	970 U
Butylbenzylphthalate	330	1200 U	440 J	840 U	1100 U	970 U
Chrysene	330	1200 U	1400 U	840 U	180 J	970 U
Di-n-butylphthalate	330	1200 U	1400 U	840 U	1100 U	970 U

LOCATION NAME:		SD-06	SD-06	SD-07	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0-0.5-FD-06-21-D-073	SE-06-0-0.5-NX-06-21-D-054	SE-07-0-0.5-NX-06-25-D-055	SE-08-0-0.5-NX-06-25-D-056	SE-09-0-0.5-FD-06-20-D-074
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				Field Duplicate
Di-n-octylphthalate	330	1200 U	1400 U	840 U	1100 U	970 U
Dibenz(a,h)anthracene	330	1200 U	1400 U	840 U	1100 U	970 U
Dibenzofuran	330	1200 U	1400 U	840 U	1100 U	970 U
Diethylphthalate	330	1200 U	1400 U	840 U	1100 U	970 U
Dimethylphthalate	330	1200 U	1400 U	840 U	1100 U	970 U
Fluoranthene	330	1200 U	1400 U	840 U	330 J	970 U
Fluorene	330	1200 U	1400 U	840 U	1100 U	970 U
Hexachlorobenzene	330	1200 U	1400 U	840 U	1100 U	970 U
Hexachlorobutadiene	330	1200 U	1400 U	840 U	1100 U	970 U
Hexachlorocyclopentadiene	330	1200 U	1400 U	840 U	1100 U	970 U
Hexachloroethane	330	1200 U	1400 U	840 U	1100 U	970 U
Indeno(1,2,3-cd)pyrene	330	1200 U	1400 U	840 U	1100 U	970 U
Isophorone	330	1200 U	1400 U	840 U	1100 U	970 U
N-Nitroso-di-n-propylamine	330	1200 U	1400 U	840 U	1100 U	970 U
N-Nitrosodiphenylamine	330	1200 U	1400 U	840 U	1100 U	970 U
Naphthalene	330	1200 U	1400 U	840 U	1100 U	970 U
Nitrobenzene	330	1200 U	1400 U	840 U	1100 U	970 U
Pentachlorophenol	1600	5600 U	6700 U	4100 U	5400 U	4700 U
Phenanthrene	330	1200 U	1400 U	840 U	220 J	970 U
Phenol	330	1200 U	1400 U	840 U	1100 U	970 U
Pyrene	330	1200 U	1400 U	840 U	280 J	970 U
bis(2-Chloroethoxy)methane	330	1200 U	1400 U	840 U	1100 U	970 U
bis(2-Chloroethyl) ether	330	1200 U	1400 U	840 U	1100 U	970 U
bis(2-Chloroisopropyl) ether	330	1200 U	1400 U	840 U	1100 U	970 U
bis(2-Ethylhexyl)phthalate	330	1200 U	1400 U	840 U	1100 U	970 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	16.0	28.0 U	33.0 U	20.0 U	27.0 UJ	23.0 U
4,4'-DDE	16.0	28.0 U	33.0 U	20.0 U	27.0 U	23.0 U
4,4'-DDT	16.0	28.0 U	33.0 U	20.0 U	27.0 UJ	23.0 U
Aldrin	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
Aroclor-1016	80.0	140.0 U	160.0 U	100.0 U	130.0 U	120.0 U
Aroclor-1221	80.0	140.0 U	160.0 U	100.0 U	130.0 U	120.0 U
Aroclor-1232	80.0	140.0 U	160.0 U	100.0 U	130.0 U	120.0 U
Aroclor-1242	80.0	140.0 U	160.0 U	100.0 U	130.0 U	120.0 U
Aroclor-1248	80.0	140.0 U	160.0 U	100.0 U	130.0 U	120.0 U
Aroclor-1254	160.0	280.0 U	330.0 U	200.0 U	270.0 U	230.0 U
Aroclor-1260	160.0	280.0 U	330.0 U	200.0 U	270.0 U	230.0 U

LOCATION NAME:		SD-06	SD-06	SD-07	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0-0.5-FD-06-21-D-073	SE-06-0-0.5-NX-06-21-D-054	SE-07-0-0.5-NX-06-25-D-055	SE-08-0-0.5-NX-06-25-D-056	SE-09-0-0.5-FD-06-20-D-074
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				Field Duplicate
Dieldrin	16.0	28.0 U	33.0 U	20.0 U	27.0 U	23.0 U
Endosulfan I	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
Endosulfan II	16.0	28.0 U	33.0 U	20.0 U	27.0 UJ	23.0 U
Endosulfan Sulfate	16.0	28.0 UJ	33.0 UJ	20.0 UJ	27.0 UJ	23.0 UJ
Endrin	16.0	28.0 U	33.0 U	20.0 U	27.0 UJ	23.0 U
Endrin Ketone	16.0	28.0 UJ	33.0 UJ	20.0 UJ	27.0 UJ	23.0 UJ
Heptachlor	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
Heptachlor Epoxide	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
Methoxychlor	80.0	140.0 UJ	160.0 UJ	100.0 UJ	130.0 UJ	120.0 UJ
Toxaphene	160.0	280.0 U	330.0 U	200.0 U	270.0 U	230.0 U
alpha-BHC	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
alpha-Chlordane	80.0	140.0 U	160.0 U	100.0 U	130.0 U	120.0 U
beta-BHC	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
delta-BHC	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
gamma-BHC(Lindane)	8.0	14.0 U	16.0 U	10.0 U	13.0 U	12.0 U
gamma-Chlordane	80.0	140.0 U	160.0 U	100.0 U	130.0 U	120.0 U
METALS	CRDL(mg/kg)					
Aluminum	200	3360	3260	1820	1890	3270
Antimony	60	5.2 UJ	5.4 UJ	2.7 UJ	3.2 UJ	4.7 UJ
Arsenic	10	1.21 U	1.30 U	1.1	0.79	1.08 U
Barium	200	10.1	10.6	7.0	9.7	13.8
Beryllium	5	0.95 U	1.5	0.29	0.44	1.0 U
Cadmium	5	0.92 U	0.96 U	0.38 U	0.40 U	0.83 U
Calcium	5000	955	1070	233 U	443 U	335
Chromium	10	2.7	2.23 U	1.8 U	3.3 U	2.0
Cobalt	50	5.2	3.2 U	1.1 U	1.1 U	1.9 U
Copper	25	3.37 U	3.51 U	3.8 U	4.0 U	3.03 U
Iron	100	7870	8130	6490	4020	2790
Lead	3	9.2	12.6	3.6 U	9.8 U	5.6
Magnesium	5000	505	471	439 U	337 U	512
Manganese	15	184	202	56.6	72.0	40.3
Mercury	0.2	0.14 U	0.19 U	0.11 U	0.13 U	0.13 U
Nickel	40	2.2	1.92 U	2.3	1.9	1.7 U
Potassium	5000	192	189	222 U	130 U	186
Selenium	5	1.21 U	1.30 U	0.98 U	1.13 U	1.08 U
Silver	10	1.23 U	1.28 U	0.49 U	0.58 U	1.10 U
Sodium	5000	116	114	41.2 U	57.0 U	38.2

LOCATION NAME:		SD-06	SD-06	SD-07	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0-0.5-FD-06-21-D-073	SE-06-0-0.5-NX-06-21-D-054	SE-07-0-0.5-NX-06-25-D-055	SE-08-0-0.5-NX-06-25-D-056	SE-09-0-0.5-FD-06-20-D-074
DATE SAMPLED:		06/21/91	06/21/91	06/25/91	06/25/91	06/20/91
REMARKS:		Field Duplicate				Field Duplicate
Thallium	10	0.91 U	0.97 U	0.24 U	0.28 U	0.81 U
Vanadium	50	7.4	8.3	3.5	4.1	4.6
Zinc	20	19.7	21.3	13.9 U	17.8 U	16.4
SOIL QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.2	130.0	128.00	34.0	75.4	3.80
CYANIDE	CRDL(mg/kg)					
Cyanide	10	0.38 U	0.45 U	0.29 U	0.39 U	0.33 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	44.4	46.6	15.6	47.7	32.6
Organic Content	(%)	5.8	6.0	1.4	5.1	2.7
Solids Content	(%)	55.6	53.4	55.2	52.4	67.4
GRAIN SIZE						
Clay	(%)	4.2	3.6	0.4	2.7	1.3
Gravel	(%)	1.4	3.9	2.4	0.3	6
Sand	(%)	76.9	75.8	93.8	84.1	73.8
Silt	(%)	17.5	16.7	3.4	12.9	18.9

LOCATION NAME:		SD-09	SD-10	SD-12	SD-13	SD-14
STREAM:		MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.3
M&E SAMPLE ID:		SE-09-0-0.5-NX-06-20-D-057	SE-10-0-0.5-NX-06-20-D-058	SE-12-0-0.5-NX-06-25-D-060	SE-13-0-0.5-NX-06-20-D-061	SE-14-0-0.3-NX-06-19-D-062
DATE SAMPLED:		06/20/91	06/20/91	06/25/91	06/20/91	06/19/91
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	5	7 U	9 U	6 U	9 U	8 U
1,1,2,2-Tetrachloroethane	5	7 U	9 U	6 U	9 U	8 U
1,1,2-Trichloroethane	5	7 U	9 U	6 U	9 U	8 U
1,1-Dichloroethane	5	7 U	9 U	6 U	9 U	8 U
1,1-Dichloroethene	5	7 U	9 U	6 U	9 U	8 U
1,2-Dichloroethane	5	7 U	9 U	6 U	9 U	8 U
1,2-Dichloroethene(total)	5	7 U	9 U	6 U	9 U	8 U
1,2-Dichloropropane	5	7 U	9 U	6 U	9 U	8 U
2-Butanone	10	14 U	18 U	12 U	19 U	17 U
2-Hexanone	10	14 U	18 U	12 U	19 U	17 U
4-Methyl-2-pentanone	10	14 U	18 U	12 U	19 U	17 U
Acetone	10	20 UJ	44 UJ	27 UJ	23 UJ	71 UJ
Benzene	5	7 U	9 U	6 U	9 U	8 U
Bromodichloromethane	5	7 U	9 U	6 U	9 U	8 U
Bromoform	5	7 U	9 U	6 U	9 U	8 U
Bromomethane	10	14 U	18 U	12 U	19 U	17 U
Carbon Disulfide	5	7 U	9 U	6 U	9 U	8 U
Carbon Tetrachloride	5	7 U	9 U	6 U	9 U	8 U
Chlorobenzene	5	7 U	9 U	6 U	9 U	8 U
Chloroethane	10	14 U	18 U	12 U	19 U	17 U
Chloroform	5	7 U	9 U	6 U	9 U	8 U
Chloromethane	10	14 U	18 U	12 U	19 U	17 U
Dibromochloromethane	5	7 U	9 U	6 U	9 U	8 U
Ethylbenzene	5	7 U	9 U	6 U	9 U	8 U
Methylene Chloride	5	7 U	9 U	7 U	9 U	8 U
Styrene	5	7 U	9 U	6 U	9 U	8 U
Tetrachloroethene	5	7 U	9 U	6 U	9 U	8 U
Toluene	5	7 U	9 U	6 U	9 U	8 U
Total Xylenes	5	7 J	9 U	6 U	9 U	8 U
Trichloroethene	5	10	9 U	6 U	6 J	8 U
Vinyl Acetate	10	14 U	18 U	12 U	19 U	17 U
Vinyl Chloride	10	14 U	18 U	12 U	19 U	17 U
cis-1,3-Dichloropropene	5	7 U	9 U	6 U	9 U	8 U
trans-1,3-Dichloropropene	5	7 U	9 U	6 U	9 U	8 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	890 U	1200 U	820 U	1200 U	1100 U

LOCATION NAME:		SD-09	SD-10	SD-12	SD-13	SD-14
STREAM:		MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.3
M&E SAMPLE ID:		SE-09-0-0.5-NX-06-20-D-057	SE-10-0-0.5-NX-06-20-D-058	SE-12-0-0.5-NX-06-25-D-060	SE-13-0-0.5-NX-06-20-D-061	SE-14-0-0.3-NX-06-19-D-062
DATE SAMPLED:		06/20/91	06/20/91	06/25/91	06/20/91	06/19/91
REMARKS:						
1,2-Dichlorobenzene	330	890 U	1200 U	820 U	1200 U	1100 U
1,3-Dichlorobenzene	330	890 U	1200 U	820 U	1200 U	1100 U
1,4-Dichlorobenzene	330	890 U	1200 U	820 U	1200 U	1100 U
2,4,5-Trichlorophenol	1600	4300 U	5900 U	4000 U	6000 U	5400 U
2,4,6-Trichlorophenol	330	890 U	1200 U	820 U	1200 U	1100 U
2,4-Dichlorophenol	330	890 U	1200 U	820 U	1200 U	1100 U
2,4-Dimethylphenol	330	890 U	1200 U	820 U	1200 U	1100 U
2,4-Dinitrophenol	1600	4300 U	5900 U	4000 U	6000 U	5400 U
2,4-Dinitrotoluene	330	890 U	1200 U	820 U	1200 U	1100 U
2,6-Dinitrotoluene	330	890 U	1200 U	820 U	1200 U	1100 U
2-Chloronaphthalene	330	890 U	1200 U	820 U	1200 U	1100 U
2-Chlorophenol	330	890 U	1200 U	820 U	1200 U	1100 U
2-Methylnaphthalene	330	890 U	1200 U	820 U	1200 U	1100 U
2-Methylphenol	330	890 U	1200 U	820 U	1200 U	1100 U
2-Nitroaniline	1600	4300 U	5900 U	4000 U	6000 U	5400 U
2-Nitrophenol	330	890 U	1200 U	820 U	1200 U	1100 U
3,3'-Dichlorobenzidine	660	1800 U	2400 U	1600 U	2500 U	2200 U
3-Nitroaniline	1600	4300 U	5900 U	4000 U	6000 U	5400 U
4,6-Dinitro-2-methylphenol	1600	4300 U	5900 U	4000 U	6000 U	5400 U
4-Bromophenyl-phenylether	330	890 U	1200 U	820 U	1200 U	1100 U
4-Chloro-3-methylphenol	330	890 U	1200 U	820 U	1200 U	1100 U
4-Chloroaniline	330	890 U	1200 U	820 U	1200 U	1100 U
4-Chlorophenyl-phenylether	330	890 U	1200 U	820 U	1200 U	1100 U
4-Methylphenol	330	890 U	1200 U	820 U	1200 U	1100 U
4-Nitroaniline	1600	4300 U	5900 U	4000 U	6000 U	5400 U
4-Nitrophenol	1600	4300 U	5900 U	4000 U	6000 U	5400 U
Acenaphthene	330	890 U	1200 U	820 U	1200 U	1100 U
Acenaphthylene	330	890 U	1200 U	820 U	1200 U	1100 U
Anthracene	330	890 U	1200 U	820 U	1200 U	1100 U
Benzo(a)anthracene	330	890 U	1200 U	820 U	1200 U	1100 U
Benzo(a)pyrene	330	890 U	1200 U	820 U	1200 U	1100 U
Benzo(b)fluoranthene	330	890 U	1200 U	820 U	1200 U	1100 U
Benzo(g,h,i)perylene	330	890 U	1200 U	820 U	1200 U	1100 U
Benzo(k)fluoranthene	330	890 U	1200 U	820 U	1200 U	1100 U
Benzoic Acid	1600	4300 U	5900 U	4000 U	6000 U	5400 U
Benzyl Alcohol	330	890 U	1200 U	820 U	1200 U	1100 U
Butylbenzylphthalate	330	890 U	1200 U	820 U	1200 U	1100 U
Chrysene	330	890 U	1200 U	820 U	1200 U	1100 U
Di-n-butylphthalate	330	890 U	1200 U	820 U	1200 U	1100 U

LOCATION NAME:		SD-09	SD-10	SD-12	SD-13	SD-14
STREAM:		MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.3
M&E SAMPLE ID:		SE-09-0-0.5-NX-06-20-D-057	SE-10-0-0.5-NX-06-20-D-058	SE-12-0-0.5-NX-06-25-D-060	SE-13-0-0.5-NX-06-20-D-061	SE-14-0-0.3-NX-06-19-D-062
DATE SAMPLED:		06/20/91	06/20/91	06/25/91	06/20/91	06/19/91
REMARKS:						
Di-n-octylphthalate	330	890 U	1200 U	820 U	1200 U	1100 U
Dibenz(a,h)anthracene	330	890 U	1200 U	820 U	1200 U	1100 U
Dibenzofuran	330	890 U	1200 U	820 U	1200 U	1100 U
Diethylphthalate	330	890 U	1200 U	820 U	1200 U	1100 U
Dimethylphthalate	330	890 U	1200 U	820 U	1200 U	1100 U
Fluoranthene	330	890 U	1200 U	820 U	1200 U	1100 U
Fluorene	330	890 U	1200 U	820 U	1200 U	1100 U
Hexachlorobenzene	330	890 U	1200 U	820 U	1200 U	1100 U
Hexachlorobutadiene	330	890 U	1200 U	820 U	1200 U	1100 U
Hexachlorocyclopentadiene	330	890 U	1200 U	820 U	1200 U	1100 U
Hexachloroethane	330	890 U	1200 U	820 U	1200 U	1100 U
Indeno(1,2,3-cd)pyrene	330	890 U	1200 U	820 U	1200 U	1100 U
Isophorone	330	890 U	1200 U	820 U	1200 U	1100 U
N-Nitroso-di-n-propylamine	330	890 U	1200 U	820 U	1200 U	1100 U
N-Nitrosodiphenylamine	330	890 U	1200 U	820 U	1200 U	1100 U
Naphthalene	330	890 U	1200 U	820 U	1200 U	1100 U
Nitrobenzene	330	890 U	1200 U	820 U	1200 U	1100 U
Pentachlorophenol	1600	4300 U	5900 U	4000 U	6000 U	5400 U
Phenanthrene	330	890 U	1200 U	820 U	1200 U	1100 U
Phenol	330	890 U	1200 U	820 U	1200 U	1100 U
Pyrene	330	890 U	1200 U	820 U	1200 U	1100 U
bis(2-Chloroethoxy)methane	330	890 U	1200 U	820 U	1200 U	1100 U
bis(2-Chloroethyl) ether	330	890 U	1200 U	820 U	1200 U	1100 U
bis(2-Chloroisopropyl) ether	330	890 U	1200 U	820 U	1200 U	1100 U
bis(2-Ethylhexyl)phthalate	330	890 U	1200 U	820 U	1200 U	1100 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	16.0	21.0 U	29.0 U	20.0 U	31.0 UJ	27.0 UJ
4,4'-DDE	16.0	21.0 U	29.0 U	20.0 U	31.0 U	27.0 U
4,4'-DDT	16.0	21.0 U	29.0 U	20.0 U	31.0 UJ	27.0 UJ
Aldrin	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
Aroclor-1016	80.0	110.0 U	150.0 U	99.0 U	150.0 U	130.0 U
Aroclor-1221	80.0	110.0 U	150.0 U	99.0 U	150.0 U	130.0 U
Aroclor-1232	80.0	110.0 U	150.0 U	99.0 U	150.0 U	130.0 U
Aroclor-1242	80.0	110.0 U	150.0 U	99.0 U	150.0 U	130.0 U
Aroclor-1248	80.0	110.0 U	150.0 U	99.0 U	150.0 U	130.0 U
Aroclor-1254	160.0	210.0 U	290.0 U	200.0 U	310.0 U	270.0 U
Aroclor-1260	160.0	210.0 U	290.0 U	200.0 U	310.0 U	270.0 U

LOCATION NAME:		SD-09	SD-10	SD-12	SD-13	SD-14
STREAM:		MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.3
M&E SAMPLE ID:		SE-09-0-0.5-NX-06-20-D-057	SE-10-0-0.5-NX-06-20-D-058	SE-12-0-0.5-NX-06-25-D-060	SE-13-0-0.5-NX-06-20-D-061	SE-14-0-0.3-NX-06-19-D-062
DATE SAMPLED:		06/20/91	06/20/91	06/25/91	06/20/91	06/19/91
REMARKS:						
Dieldrin	16.0	21.0 U	29.0 U	20.0 U	31.0 U	27.0 U
Endosulfan I	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
Endosulfan II	16.0	21.0 U	29.0 U	20.0 U	31.0 UJ	27.0 UJ
Endosulfan Sulfate	16.0	21.0 UJ	29.0 UJ	20.0 UJ	31.0 UJ	27.0 UJ
Endrin	16.0	21.0 U	29.0 U	20.0 U	31.0 U	27.0 UJ
Endrin Ketone	16.0	21.0 UJ	29.0 UJ	20.0 UJ	31.0 UJ	27.0 UJ
Heptachlor	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
Heptachlor Epoxide	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
Methoxychlor	80.0	110.0 UJ	150.0 UJ	99.0 UJ	150.0 UJ	130.0 UJ
Toxaphene	160.0	210.0 U	290.0 U	200.0 U	310.0 U	270.0 U
alpha-BHC	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
alpha-Chlordane	80.0	110.0 U	150.0 U	99.0 U	150.0 U	130.0 U
beta-BHC	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
delta-BHC	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
gamma-BHC(Lindane)	8.0	11.0 U	15.0 U	9.9 U	15.0 U	13.0 U
gamma-Chlordane	80.0	110.0 U	150.0 U	99.0 U	150.0 U	130.0 U
METALS	CRDL(mg/kg)					
Aluminum	200	3310	3210	1360	5010	5640
Antimony	60	4.5 UJ	7.0 UJ	2.5 UJ	5.4 UJ	4.9 UJ
Arsenic	10	1.10 U	2.0	0.52	1.24 U	1.10 U
Barium	200	14.1	64.6	7.3	22.2	15.7
Beryllium	5	1.2	1.2	0.29	0.99 U	1.3
Cadmium	5	0.79 U	1.18 U	0.23 U	0.95 U	0.86 U
Calcium	5000	343	1070	251 U	921	486
Chromium	10	2.9	2.76 U	1.1 U	3.5	3.6
Cobalt	50	1.05 U	4.4 U	0.49 U	2.2 U	2.2 U
Copper	25	2.90 U	4.33 U	3.0 U	3.50 U	4.2
Iron	100	3070	113000	5670	3490	4800
Lead	3	4.7	7.4	2.8 U	17.6	21.7
Magnesium	5000	550	597	257 U	653	764
Manganese	15	43.6	1150 J	37.3	84.0	68.4
Mercury	0.2	0.11 U	0.17 U	0.11 U	0.16 U	0.16 U
Nickel	40	2.0	3.0	1.5	2.4	3.0
Potassium	5000	195	415	209 U	207	308
Selenium	5	1.10 U	1.46 U	0.95 U	1.24 U	1.10 U
Silver	10	1.05 U	1.58 U	0.45 U	1.27 U	1.15 U
Sodium	5000	38.0	84.6	58.5 U	82.3	50.1

LOCATION NAME:		SD-09	SD-10	SD-12	SD-13	SD-14
STREAM:		MITCHELL BROOK	UNNAMED BROOK	MITCHELL BROOK	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.3
M&E SAMPLE ID:		SE-09-0-0.5-NX-06-20-D-057	SE-10-0-0.5-NX-06-20-D-058	SE-12-0-0.5-NX-06-25-D-060	SE-13-0-0.5-NX-06-20-D-061	SE-14-0-0.3-NX-06-19-D-062
DATE SAMPLED:		06/20/91	06/20/91	06/25/91	06/20/91	06/19/91
REMARKS:						
Thallium	10	0.83 U	1.10 U	0.24 U	0.93 U	0.82 U
Vanadium	50	5.1	15.2	2.6 U	7.6	7.2
Zinc	20	18.2	236	14.0 U	30.6	23.1
SOIL QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	0.2	3.60	25.00	13.0	33.00	21.00
CYANIDE	CRDL(mg/kg)					
Cyanide	10	0.35 U	0.49 U	0.30 U	0.41 U	0.38 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	31.3	46.7	19.6	45.9	37.0
Organic Content	(%)	8.0	4.7	0.8	7.0	4.2
Solids Content	(%)	68.7	53.2	80.5	54.1	63.1
GRAIN SIZE						
Clay	(%)	2.5	10.4	0.4	2.3	3.6
Gravel	(%)	3.3	3	1	13.8	8.7
Sand	(%)	75.3	67.7	97	57.3	65.4
Silt	(%)	18.9	18.8	1.6	26.5	22.2

LOCATION NAME:	SD-15
STREAM:	MITCHELL BROOK
SAMPLE DEPTH (FT):	0.0-0.5
M&E SAMPLE ID:	SE-15-0-0.5-NX-06-25-D-063
DATE SAMPLED:	06/25/91
REMARKS:	

VOLATILE ORGANICS-CLP	CRQL(ug/kg)	
1,1,1-Trichloroethane	5	6 U
1,1,2,2-Tetrachloroethane	5	6 U
1,1,2-Trichloroethane	5	6 U
1,1-Dichloroethane	5	6 U
1,1-Dichloroethene	5	6 U
1,2-Dichloroethane	5	6 U
1,2-Dichloroethene(total)	5	6 U
1,2-Dichloropropane	5	6 U
2-Butanone	10	13 U
2-Hexanone	10	13 U
4-Methyl-2-pentanone	10	13 U
Acetone	10	13 UJ
Benzene	5	6 U
Bromodichloromethane	5	6 U
Bromoform	5	6 U
Bromomethane	10	13 U
Carbon Disulfide	5	6 U
Carbon Tetrachloride	5	6 U
Chlorobenzene	5	6 U
Chloroethane	10	13 U
Chloroform	5	6 U
Chloromethane	10	13 U
Dibromochloromethane	5	6 U
Ethylbenzene	5	6 U
Methylene Chloride	5	6 U
Styrene	5	6 U
Tetrachloroethene	5	6 U
Toluene	5	6 U
Total Xylenes	5	6 U
Trichloroethene	5	6 U
Vinyl Acetate	10	13 U
Vinyl Chloride	10	13 U
cis-1,3-Dichloropropene	5	6 U
trans-1,3-Dichloropropene	5	6 U

SEMIVOLATILE ORGANICS	CRQL(ug/kg)	
1,2,4-Trichlorobenzene	330	850 U

LOCATION NAME: SD-15
STREAM: MITCHELL BROOK
SAMPLE DEPTH (FT): 0.0-0.5
M&E SAMPLE ID: SE-15-0-0.5-NX-06-25-D-063
DATE SAMPLED: 06/25/91

REMARKS:

1,2-Dichlorobenzene	330	850 U
1,3-Dichlorobenzene	330	850 U
1,4-Dichlorobenzene	330	850 U
2,4,5-Trichlorophenol	1600	4100 U
2,4,6-Trichlorophenol	330	850 U
2,4-Dichlorophenol	330	850 U
2,4-Dimethylphenol	330	850 U
2,4-Dinitrophenol	1600	4100 U
2,4-Dinitrotoluene	330	850 U
2,6-Dinitrotoluene	330	850 U
2-Chloronaphthalene	330	850 U
2-Chlorophenol	330	850 U
2-Methylnaphthalene	330	850 U
2-Methylphenol	330	850 U
2-Nitroaniline	1600	4100 U
2-Nitrophenol	330	850 U
3,3'-Dichlorobenzidine	660	1700 U
3-Nitroaniline	1600	4100 U
4,6-Dinitro-2-methylphenol	1600	4100 U
4-Bromophenyl-phenylether	330	850 U
4-Chloro-3-methylphenol	330	850 U
4-Chloroaniline	330	850 U
4-Chlorophenyl-phenylether	330	850 U
4-Methylphenol	330	850 U
4-Nitroaniline	1600	4100 U
4-Nitrophenol	1600	4100 U
Acenaphthene	330	850 U
Acenaphthylene	330	850 U
Anthracene	330	850 U
Benzo(a)anthracene	330	850 U
Benzo(a)pyrene	330	850 U
Benzo(b)fluoranthene	330	850 U
Benzo(g,h,i)perylene	330	850 UJ
Benzo(k)fluoranthene	330	850 U
Benzoic Acid	1600	4100 U
Benzyl Alcohol	330	850 U
Butylbenzylphthalate	330	850 U
Chrysene	330	850 U
Di-n-butylphthalate	330	850 U

LOCATION NAME: SD-15
STREAM: MITCHELL BROOK
SAMPLE DEPTH (FT): 0.0-0.5
M&E SAMPLE ID: SE-15-0-0.5-NX-06-25-D-063
DATE SAMPLED: 06/25/91

REMARKS:

Di-n-octylphthalate	330	850 U
Dibenz(a,h)anthracene	330	850 U
Dibenzofuran	330	850 U
Diethylphthalate	330	850 U
Dimethylphthalate	330	850 U
Fluoranthene	330	850 U
Fluorene	330	850 U
Hexachlorobenzene	330	850 U
Hexachlorobutadiene	330	850 U
Hexachlorocyclopentadiene	330	850 U
Hexachloroethane	330	850 U
Indeno(1,2,3-cd)pyrene	330	850 U
Isophorone	330	850 U
N-Nitroso-di-n-propylamine	330	850 U
N-Nitrosodiphenylamine	330	850 U
Naphthalene	330	850 U
Nitrobenzene	330	850 U
Pentachlorophenol	1600	4100 U
Phenanthrene	330	850 U
Phenol	330	850 U
Pyrene	330	850 U
bis(2-Chloroethoxy)methane	330	850 U
bis(2-Chloroethyl) ether	330	850 U
bis(2-Chloroisopropyl) ether	330	850 U
bis(2-Ethylhexyl)phthalate	330	850 U

PESTICIDES/PCBs	CRQL(ug/kg)	
4,4'-DDD	16.0	20.0 UJ
4,4'-DDE	16.0	20.0 U
4,4'-DDT	16.0	20.0 UJ
Aldrin	8.0	10.0 U
Aroclor-1016	80.0	100.0 U
Aroclor-1221	80.0	100.0 U
Aroclor-1232	80.0	100.0 U
Aroclor-1242	80.0	100.0 U
Aroclor-1248	80.0	100.0 U
Aroclor-1254	160.0	200.0 U
Aroclor-1260	160.0	200.0 U

LOCATION NAME: SD-15
STREAM: MITCHELL BROOK
SAMPLE DEPTH (FT): 0.0-0.5
M&E SAMPLE ID: SE-15-0-0.5-NX-06-25-D-063
DATE SAMPLED: 06/25/91

REMARKS:

Dieldrin	16.0	20.0	U
Endosulfan I	8.0	10.0	U
Endosulfan II	16.0	20.0	UJ
Endosulfan Sulfate	16.0	20.0	UJ
Endrin	16.0	20.0	UJ
Endrin Ketone	16.0	20.0	UJ
Heptachlor	8.0	10.0	U
Heptachlor Epoxide	8.0	10.0	U
Methoxychlor	80.0	100.0	UJ
Toxaphene	160.0	200.0	U
alpha-BHC	8.0	10.0	U
alpha-Chlordane	80.0	100.0	U
beta-BHC	8.0	10.0	U
delta-BHC	8.0	10.0	U
gamma-BHC(Lindane)	8.0	10.0	U
gamma-Chlordane	80.0	100.0	U

METALS	CRDL(mg/kg)		
Aluminum	200	2740	
Antimony	60	2.7	UJ
Arsenic	10	0.50	U
Barium	200	8.2	
Beryllium	5	0.34	
Cadmium	5	0.34	U
Calcium	5000	205	U
Chromium	10	2.9	U
Cobalt	50	1.2	U
Copper	25	4.5	U
Iron	100	2750	
Lead	3	7.7	U
Magnesium	5000	506	
Manganese	15	36.3	
Mercury	0.2	0.11	U
Nickel	40	2.3	
Potassium	5000	224	U
Selenium	5	0.99	U
Silver	10	0.49	U
Sodium	5000	37.4	U

LOCATION NAME:	SD-15
STREAM:	MITCHELL BROOK
SAMPLE DEPTH (FT):	0.0-0.5
M&E SAMPLE ID:	SE-15-0-0.5-NX-06-25-D-063
DATE SAMPLED:	06/25/91
REMARKS:	

Thallium	10	0.25 U
Vanadium	50	3.8
Zinc	20	18.1 U

SOIL QUALITY PARAMETERS

SULFIDE	CRQL(mg/L)	
Sulfide	0.2	7.2
CYANIDE	CRDL(mg/kg)	
Cyanide	10	0.30 U
TOTAL COMBUSTIBLE ORGANICS		
Moisture Content	(%)	21.2
Organic Content	(%)	1.7
Solids Content	(%)	78.8
GRAIN SIZE		
Clay	(%)	0
Gravel	(%)	3.2
Sand	(%)	83
Silt	(%)	13.8

SEDIMENT - SEPTEMBER/OCTOBER 1991

LOCATION NAME:	SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:	SE-01-0.0-0.5-NX-D-224-2	SE-02-0.0-0.5-NX-D-225-2	SE-03-0.0-0.5-NX-D-226-2	SE-04-0.0-0.5-NX-D-227-2	SE-05-0.0-0.5-NX-D-228-2
DATE SAMPLED:	10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:					

VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	15 U	15 U	21 U	14 U	20 U
1,1,2,2-Tetrachloroethane	10	15 U	15 U	21 U	14 U	20 U
1,1,2-Trichloroethane	10	15 U	15 U	21 U	14 U	20 U
1,1-Dichloroethane	10	15 U	15 U	21 U	14 U	20 U
1,1-Dichloroethene	10	15 U	15 U	21 U	14 U	20 U
1,2-Dichloroethane	10	15 U	15 U	21 U	14 U	20 U
1,2-Dichloroethene(total)	10	15 U	15 U	21 U	14 U	20 U
1,2-Dichloropropane	10	15 U	15 U	21 U	14 U	20 U
2-Butanone	10	15 U	15 U	21 U	14 U	20 U
2-Hexanone	10	15 U	15 U	21 U	14 U	20 U
4-Methyl-2-pentanone	10	15 U	15 U	21 U	14 U	20 U
Acetone	10	440 U	42 J	210 J	95 U	110 U
Benzene	10	15 U	15 U	21 U	14 U	20 U
Bromodichloromethane	10	15 U	15 U	21 U	14 U	20 U
Bromoform	10	15 U	15 U	21 U	14 U	20 U
Bromomethane	10	15 U	15 U	21 U	14 U	20 U
Carbon Disulfide	10	15 U	15 U	21 U	14 U	20 U
Carbon Tetrachloride	10	15 U	15 U	21 U	14 U	20 U
Chlorobenzene	10	15 U	15 U	21 U	14 U	20 U
Chloroethane	10	15 U	15 U	21 U	14 U	20 U
Chloroform	10	15 U	15 U	21 U	14 U	20 U
Chloromethane	10	15 U	15 U	21 U	14 U	20 U
Dibromochloromethane	10	15 U	15 U	21 U	14 U	20 U
Ethylbenzene	10	15 U	15 U	21 U	14 U	3 J
Methylene Chloride	10	27 UJ	20 UJ	34 UJ	15 U	26 U
Styrene	10	15 U	15 U	21 U	14 U	20 U
Tetrachloroethene	10	15 U	15 U	21 U	14 U	20 U
Toluene	10	15 U	15 U	21 U	14 U	20 U
Total Xylenes	10	15 U	15 U	21 U	14 U	8 J
Trichloroethene	10	15 U	15 U	21 U	14 U	20 U
Vinyl Chloride	10	15 U	15 U	21 U	14 U	20 U
cis-1,3-Dichloropropene	10	15 U	15 U	21 U	14 U	20 U
trans-1,3-Dichloropropene	10	15 U	15 U	21 U	14 U	20 U
SEMIVOLATILE ORGANICS	**CRQL(ug/kg)**					
1,2,4-Trichlorobenzene	330	490 U	480 U	700 U	480 UJ	670 U

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0.0-0.5-NX-D-224-2	SE-02-0.0-0.5-NX-D-225-2	SE-03-0.0-0.5-NX-D-226-2	SE-04-0.0-0.5-NX-D-227-2	SE-05-0.0-0.5-NX-D-228-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
1,2-Dichlorobenzene	330	490 U	480 U	700 U	480 UJ	670 U
1,3-Dichlorobenzene	330	490 U	480 U	700 U	480 UJ	670 U
1,4-Dichlorobenzene	330	490 U	480 U	700 U	480 UJ	670 U
2,2'-oxybis(1-Chloropropane)	330	490 U	480 U	700 U	480 UJ	670 U
2,4,5-Trichlorophenol	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
2,4,6-Trichlorophenol	330	490 U	480 U	700 U	480 UJ	670 U
2,4-Dichlorophenol	330	490 U	480 U	700 U	480 UJ	670 U
2,4-Dimethylphenol	330	490 U	480 U	700 U	480 UJ	670 U
2,4-Dinitrophenol	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
2,4-Dinitrotoluene	330	490 U	480 U	700 U	480 UJ	670 U
2,6-Dinitrotoluene	330	490 U	480 U	700 U	480 UJ	670 U
2-Chloronaphthalene	330	490 U	480 U	700 U	480 UJ	670 U
2-Chlorophenol	330	490 U	480 U	700 U	480 UJ	670 U
2-Methylnaphthalene	330	490 U	480 U	700 U	480 UJ	670 U
2-Methylphenol	330	490 U	480 U	700 U	480 UJ	670 U
2-Nitroaniline	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
2-Nitrophenol	330	490 U	480 U	700 U	480 UJ	670 U
3,3'-Dichlorobenzidine	330	490 U	480 U	700 U	480 UJ	670 U
3-Nitroaniline	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
4,6-Dinitro-2-methylphenol	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
4-Bromophenyl-phenylether	330	490 U	480 U	700 U	480 UJ	670 U
4-Chloro-3-methylphenol	330	490 U	480 U	700 U	480 UJ	670 U
4-Chloroaniline	330	490 U	480 U	700 U	480 UJ	670 U
4-Chlorophenyl-phenylether	330	490 U	480 U	700 U	480 UJ	670 U
4-Methylphenol	330	490 U	480 U	700 U	480 UJ	670 U
4-Nitroaniline	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
4-Nitrophenol	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
Acenaphthene	330	490 U	480 U	700 U	480 UJ	670 U
Acenaphthylene	330	490 U	480 U	700 U	480 UJ	670 U
Anthracene	330	490 U	480 U	700 U	480 UJ	670 U
Benzo(a)anthracene	330	490 U	480 U	700 U	480 UJ	670 U
Benzo(a)pyrene	330	490 U	480 U	700 U	480 UJ	670 U
Benzo(b)fluoranthene	330	490 U	480 U	700 U	480 UJ	670 U
Benzo(g,h,i)perylene	330	490 U	480 U	700 U	480 UJ	670 U
Benzo(k)fluoranthene	330	490 U	480 U	700 U	480 UJ	670 U
Butylbenzylphthalate	330	490 U	480 U	700 U	480 UJ	670 U
Carbazole	330	490 U	480 U	700 U	480 UJ	670 U
Chrysene	330	490 U	480 U	700 U	480 UJ	670 U
Di-n-butylphthalate	330	490 U	480 U	700 U	480 UJ	670 U

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0.0-0.5-NX-D-224-2	SE-02-0.0-0.5-NX-D-225-2	SE-03-0.0-0.5-NX-D-226-2	SE-04-0.0-0.5-NX-D-227-2	SE-05-0.0-0.5-NX-D-228-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
Di-n-octylphthalate	330	490 U	480 U	700 UJ	480 UJ	670 U
Dibenz(a,h)anthracene	330	490 U	480 U	700 U	480 UJ	670 U
Dibenzofuran	330	490 U	480 U	700 U	480 UJ	670 U
Diethylphthalate	330	490 U	480 U	700 U	480 UJ	670 U
Dimethylphthalate	330	490 U	480 U	700 U	480 UJ	670 U
Fluoranthene	330	490 U	480 U	700 U	480 UJ	670 U
Fluorene	330	490 U	480 U	700 U	480 UJ	670 U
Hexachlorobenzene	330	490 U	480 U	700 U	480 UJ	670 U
Hexachlorobutadiene	330	490 U	480 U	700 U	480 UJ	670 U
Hexachlorocyclopentadiene	330	490 U	480 U	700 U	480 UJ	670 U
Hexachloroethane	330	490 U	480 U	700 U	480 UJ	670 U
Indeno(1,2,3-cd)pyrene	330	490 U	480 U	700 U	480 UJ	670 U
Isophorone	330	490 U	480 U	700 U	480 UJ	670 U
N-Nitroso-di-n-propylamine	330	490 U	480 U	700 U	480 UJ	670 U
N-Nitrosodiphenylamine	330	490 U	480 U	700 U	480 UJ	670 U
Naphthalene	330	490 U	480 U	700 U	480 UJ	670 U
Nitrobenzene	330	490 U	480 U	700 U	480 UJ	670 U
Pentachlorophenol	800	1200 U	1200 U	1700 U	1200 UJ	1600 U
Phenanthrene	330	490 U	480 U	700 U	480 UJ	670 U
Phenol	330	490 U	480 U	700 U	480 UJ	670 U
Pyrene	330	490 U	480 U	39 J	480 UJ	670 U
bis(2-Chloroethoxy)methane	330	490 U	480 U	700 U	480 UJ	670 U
bis(2-Chloroethyl) ether	330	490 U	480 U	700 U	480 UJ	670 U
bis(2-Ethylhexyl)phthalate	330	490 U	480 U	700 U	480 UJ	670 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
4,4'-DDE	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
4,4'-DDT	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
Aldrin	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
Aroclor-1016	33.0	49.0 UJ	48.0 UJ	70.0 U	47 U	R
Aroclor-1221	67.0	99.0 UJ	97.0 UJ	140.0 U	96 U	R
Aroclor-1232	33.0	49.0 UJ	48.0 UJ	70.0 U	47 U	R
Aroclor-1242	33.0	49.0 UJ	48.0 UJ	70.0 U	47 U	R
Aroclor-1248	33.0	49.0 UJ	48.0 UJ	70.0 U	47 U	R
Aroclor-1254	33.0	49.0 UJ	48.0 UJ	70.0 U	47 U	R
Aroclor-1260	33.0	49.0 UJ	48.0 UJ	70.0 U	47 U	R
Dieldrin	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0.0-0.5-NX-D-224-2	SE-02-0.0-0.5-NX-D-225-2	SE-03-0.0-0.5-NX-D-226-2	SE-04-0.0-0.5-NX-D-227-2	SE-05-0.0-0.5-NX-D-228-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
Endosulfan I	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
Endosulfan II	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
Endosulfan Sulfate	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
Endrin	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
Endrin Aldehyde	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
Endrin Ketone	3.3	4.9 UJ	4.8 UJ	7.0 U	4.7 U	R
Heptachlor	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
Heptachlor Epoxide	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
Methoxychlor	17.0	25.0 UJ	25.0 UJ	36.0 U	24 U	R
Toxaphene	170.0	250.0 UJ	250.0 UJ	360.0 U	240 U	R
alpha-BHC	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
alpha-Chlordane	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
beta-BHC	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
delta-BHC	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
gamma-BHC(Lindane)	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
gamma-Chlordane	1.7	2.5 UJ	2.5 UJ	3.6 U	2.4 U	R
METALS	CRDL(mg/kg)					
Aluminum	200	8650	1260	2300	6780	8420
Antimony	60	7.3 U	8.1 U	14.1 U	7.2 U	9.4 U
Arsenic	10	1.2	0.33 U	0.56 U	0.43	1.2
Barium	200	21.5	3.1	8.1	30.5	20.6
Beryllium	5	0.93 U	0.33 U	0.56 U	2.3	0.97 U
Cadmium	5	0.88 U	0.98 U	1.7 U	0.86 U	1.1 U
Calcium	5000	751 J	350 J	1760 J	1290 J	884 J
Chromium	10	11.1	3.7 U	11.5 J	12.4	11.4
Cobalt	50	5.0	2.0 U	3.4 U	5.8	6.5
Copper	25	8.8 U	1.3 U	10.8 U	3.3 U	6.8 U
Iron	100	10500	1020	1570	16400	6170
Lead	3	12.2 J	7.2 J	24.2 J	6.4 J	4.3 J
Magnesium	5000	1550	373	362	1250	1430
Manganese	15	113	20.4	106	193	207
Mercury	0.2	0.15 U	0.16 U	0.28 U	0.14 U	0.19 U
Nickel	40	7.3	5.2 U	9.0 U	4.6 U	12.8
Potassium	5000	775	144 U	250 U	277	488
Selenium	5	0.29 U	0.52	0.56 U	0.37 J	1.3 J
Silver	10	0.88 U	0.98 U	1.7 U	0.86 U	1.1 U
Sodium	5000	63.9 U	40.3 U	92.7 U	74.8 U	75.8 U

LOCATION NAME:		SD-01	SD-02	SD-03	SD-04	SD-05
STREAM:		MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-01-0.0-0.5-NX-D-224-2	SE-02-0.0-0.5-NX-D-225-2	SE-03-0.0-0.5-NX-D-226-2	SE-04-0.0-0.5-NX-D-227-2	SE-05-0.0-0.5-NX-D-228-2
DATE SAMPLED:		10/01/91	10/01/91	10/01/91	10/02/91	10/02/91
REMARKS:						
Thallium	10	0.29 U	0.33 U	0.56 U	0.29 U	0.38 U
Vanadium	50	16.8	2.0	8.6	17.4	17.7
Zinc	20	33.7	5.9 U	27.7 U	43.6	49.8
SOIL QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	8	12 UJ	13 UJ	17 UJ	11 UJ	16 UJ
CYANIDE	CRDL(mg/kg)					
Cyanide	20	3.7 U	4.1 U	7.1 U	3.6 U	4.7 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	37.2	33.9	54.6	31.0	51.6
Organic Content	(%)	4.7	2.8	9.3	1.8	7.8
Solids Content	(%)	62.9	66.1	45.3	68.9	48.5
GRAIN SIZE						
Clay	(%)	7.5	2.6	4.5	11.6	4.9
Gravel	(%)	1.8	1	0.7	3	4.2
Sand	(%)	51.2	89.7	87.3	31.1	49.2
Silt	(%)	39.5	6.7	7.5	54.2	41.7

LOCATION NAME:		SD-06	SD-07	SD-08	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0.0-0.5-NX-D-229-2	SE-07-0.0-0.5-NX-D-230-2	SE-08-0.0-0.5-FD-D-324-2	SE-08-0.0-0.5-NX-D-231-2	SE-09-0.0-0.5-NX-D-237-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	14 U	13 U	16 U	19 U	20 U
1,1,2,2-Tetrachloroethane	10	14 U	13 U	16 U	19 U	20 U
1,1,2-Trichloroethane	10	14 U	13 U	16 U	19 U	20 U
1,1-Dichloroethane	10	14 U	13 U	16 U	19 U	20 U
1,1-Dichloroethene	10	14 U	13 U	16 U	R	R
1,2-Dichloroethane	10	14 U	13 U	16 U	19 U	20 U
1,2-Dichloroethene(total)	10	14 U	13 U	16 U	19 U	20 U
1,2-Dichloropropane	10	14 U	13 U	16 U	19 U	20 U
2-Butanone	10	14 U	46	16 U	47 J	35 U
2-Hexanone	10	14 U	13 U	16 U	19 U	20 U
4-Methyl-2-pentanone	10	14 U	13 U	16 U	19 U	20 U
Acetone	10	110 U	190	130 J	300 J	200
Benzene	10	14 U	13 U	16 U	R	R
Bromodichloromethane	10	14 U	13 U	16 U	19 U	20 U
Bromoform	10	14 U	13 U	16 U	19 U	20 U
Bromomethane	10	14 U	13 U	16 U	19 U	20 U
Carbon Disulfide	10	14 U	13 U	18	25 J	20 U
Carbon Tetrachloride	10	14 U	13 U	16 U	19 U	20 U
Chlorobenzene	10	14 U	13 U	16 U	R	R
Chloroethane	10	14 U	13 U	16 U	19 U	20 U
Chloroform	10	14 U	13 U	16 U	19 U	20 U
Chloromethane	10	14 U	13 U	16 U	19 U	20 U
Dibromochloromethane	10	14 U	13 U	16 U	19 U	20 U
Ethylbenzene	10	14 U	13 U	16 U	19 U	20 U
Methylene Chloride	10	21 U	18 U	44 U	38 U	40 U
Styrene	10	14 U	13 U	16 U	19 U	20 U
Tetrachloroethene	10	14 U	13 U	16 U	4 J	2 J
Toluene	10	14 U	13 U	16 U	R	R
Total Xylenes	10	14 U	13 U	16 U	19 U	20 U
Trichloroethene	10	14 U	13 U	16 U	R	R
Vinyl Chloride	10	14 U	13 U	16 U	19 U	20 U
cis-1,3-Dichloropropene	10	14 U	13 U	16 U	19 U	20 U
trans-1,3-Dichloropropene	10	14 U	13 U	16 U	19 U	20 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	470 U	410 UJ	R	610 UJ	650 UJ

LOCATION NAME:		SD-06	SD-07	SD-08	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0.0-0.5-NX-D-229-2	SE-07-0.0-0.5-NX-D-230-2	SE-08-0.0-0.5-FD-D-324-2	SE-08-0.0-0.5-NX-D-231-2	SE-09-0.0-0.5-NX-D-237-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
1,2-Dichlorobenzene	330	470 U	410 UJ	R	610 UJ	650 UJ
1,3-Dichlorobenzene	330	470 U	410 UJ	R	610 UJ	650 UJ
1,4-Dichlorobenzene	330	470 U	410 UJ	R	610 UJ	650 UJ
2,2'-oxybis(1-Chloropropane)	330	470 U	410 UJ	R	610 UJ	650 UJ
2,4,5-Trichlorophenol	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
2,4,6-Trichlorophenol	330	470 U	410 UJ	R	610 UJ	650 UJ
2,4-Dichlorophenol	330	470 U	410 UJ	R	610 UJ	650 UJ
2,4-Dimethylphenol	330	470 U	410 UJ	R	610 UJ	650 UJ
2,4-Dinitrophenol	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
2,4-Dinitrotoluene	330	470 U	410 UJ	R	610 UJ	650 UJ
2,6-Dinitrotoluene	330	470 U	410 UJ	R	610 UJ	650 UJ
2-Chloronaphthalene	330	470 U	410 UJ	R	610 UJ	650 UJ
2-Chlorophenol	330	470 U	410 UJ	R	610 UJ	650 UJ
2-Methylnaphthalene	330	470 U	410 UJ	R	610 UJ	650 UJ
2-Methylphenol	330	470 U	410 UJ	R	610 UJ	650 UJ
2-Nitroaniline	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
2-Nitrophenol	330	470 U	410 UJ	R	610 UJ	650 UJ
3,3'-Dichlorobenzidine	330	470 U	410 UJ	R	610 UJ	650 UJ
3-Nitroaniline	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
4,6-Dinitro-2-methylphenol	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
4-Bromophenyl-phenylether	330	470 U	410 UJ	R	610 UJ	650 UJ
4-Chloro-3-methylphenol	330	470 U	410 UJ	R	610 UJ	650 UJ
4-Chloroaniline	330	470 U	410 UJ	R	610 UJ	650 UJ
4-Chlorophenyl-phenylether	330	470 U	410 UJ	R	610 UJ	650 UJ
4-Methylphenol	330	470 U	410 UJ	R	610 UJ	650 UJ
4-Nitroaniline	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
4-Nitrophenol	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
Acenaphthene	330	470 U	410 UJ	R	610 UJ	650 UJ
Acenaphthylene	330	470 U	410 UJ	R	610 UJ	650 UJ
Anthracene	330	470 U	410 UJ	R	610 UJ	650 UJ
Benzo(a)anthracene	330	470 U	410 UJ	R	610 UJ	650 UJ
Benzo(a)pyrene	330	470 U	410 UJ	R	610 UJ	650 UJ
Benzo(b)fluoranthene	330	470 U	410 UJ	R	610 UJ	650 UJ
Benzo(g,h,i)perylene	330	470 U	410 UJ	R	610 UJ	650 UJ
Benzo(k)fluoranthene	330	470 U	410 UJ	R	610 UJ	650 UJ
Butylbenzylphthalate	330	470 U	410 UJ	R	610 UJ	650 UJ
Carbazole	330	470 U	410 UJ	R	610 UJ	650 UJ
Chrysene	330	470 U	410 UJ	R	610 UJ	650 UJ
Di-n-butylphthalate	330	470 U	410 UJ	R	610 UJ	650 J

LOCATION NAME:		SD-06	SD-07	SD-08	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0.0-0.5-NX-D-229-2	SE-07-0.0-0.5-NX-D-230-2	SE-08-0.0-0.5-FD-D-324-2	SE-08-0.0-0.5-NX-D-231-2	SE-09-0.0-0.5-NX-D-237-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
Di-n-octylphthalate	330	470 U	410 UJ	R	610 UJ	650 UJ
Dibenz(a,h)anthracene	330	470 U	410 UJ	R	610 UJ	650 UJ
Dibenzofuran	330	470 U	410 UJ	R	610 UJ	650 UJ
Diethylphthalate	330	470 U	410 UJ	R	610 UJ	650 UJ
Dimethylphthalate	330	470 U	410 UJ	R	610 UJ	650 UJ
Fluoranthene	330	470 U	410 UJ	R	610 UJ	34 J
Fluorene	330	470 U	410 UJ	R	610 UJ	650 UJ
Hexachlorobenzene	330	470 U	410 UJ	R	610 UJ	650 UJ
Hexachlorobutadiene	330	470 U	410 UJ	R	610 UJ	650 UJ
Hexachlorocyclopentadiene	330	470 U	410 UJ	R	610 UJ	650 UJ
Hexachloroethane	330	470 U	410 UJ	R	610 UJ	650 UJ
Indeno(1,2,3-cd)pyrene	330	470 U	410 UJ	R	610 UJ	650 UJ
Isophorone	330	470 U	410 UJ	R	610 UJ	650 UJ
N-Nitroso-di-n-propylamine	330	470 U	410 UJ	R	610 UJ	650 UJ
N-Nitrosodiphenylamine	330	470 U	410 UJ	R	610 UJ	650 UJ
Naphthalene	330	470 U	410 UJ	R	610 UJ	650 UJ
Nitrobenzene	330	470 U	410 UJ	R	610 UJ	650 UJ
Pentachlorophenol	800	1100 U	1000 UJ	R	1500 UJ	1600 UJ
Phenanthrene	330	470 U	410 UJ	R	610 UJ	650 UJ
Phenol	330	470 U	410 UJ	R	610 UJ	650 UJ
Pyrene	330	470 U	410 UJ	R	610 UJ	40 J
bis(2-Chloroethoxy)methane	330	470 U	410 UJ	R	610 UJ	650 UJ
bis(2-Chloroethyl) ether	330	470 U	410 UJ	R	610 UJ	650 UJ
bis(2-Ethylhexyl)phthalate	330	470 U	410 UJ	R	610 UJ	650 UJ
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	R	4.1 U	5.2 U	R	8.2
4,4'-DDE	3.3	R	4.1 U	5.2 U	R	4.9 J
4,4'-DDT	3.3	R	4.1 U	5.2 U	R	6.5 U
Aldrin	1.7	R	2.1 U	2.7 U	R	3.4 U
Aroclor-1016	33.0	R	41 U	52 U	R	65 U
Aroclor-1221	67.0	R	84 U	100 U	R	130 U
Aroclor-1232	33.0	R	41 U	52 U	R	65 U
Aroclor-1242	33.0	R	41 U	52 U	R	65 U
Aroclor-1248	33.0	R	41 U	52 U	R	65 U
Aroclor-1254	33.0	R	41 U	52 U	R	65 U
Aroclor-1260	33.0	R	41 U	52 U	R	65 U
Dieldrin	3.3	R	4.1 U	5.2 U	R	6.5 U

LOCATION NAME:		SD-06	SD-07	SD-08	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0.0-0.5-NX-D-229-2	SE-07-0.0-0.5-NX-D-230-2	SE-08-0.0-0.5-FD-D-324-2	SE-08-0.0-0.5-NX-D-231-2	SE-09-0.0-0.5-NX-D-237-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
Endosulfan I	1.7	R	2.1 U	2.7 U	R	3.4 U
Endosulfan II	3.3	R	4.1 U	5.2 U	R	6.5 U
Endosulfan Sulfate	3.3	R	4.1 U	5.2 U	R	6.5 U
Endrin	3.3	R	4.1 U	5.2 U	R	6.5 U
Endrin Aldehyde	3.3	R	4.1 U	5.2 U	R	6.5 U
Endrin Ketone	3.3	R	4.1 U	5.2 U	R	6.5 U
Heptachlor	1.7	R	2.1 U	2.7 U	R	3.4 U
Heptachlor Epoxide	1.7	R	2.1 U	2.7 U	R	3.4 U
Methoxychlor	17.0	R	21 U	27 U	R	34 U
Toxaphene	170.0	R	210 U	270 U	R	340 U
alpha-BHC	1.7	R	2.1 U	2.7 U	R	3.4 U
alpha-Chlordane	1.7	R	2.1 U	2.7 U	R	3.4 U
beta-BHC	1.7	R	2.1 U	2.7 U	R	3.4 U
delta-BHC	1.7	R	2.1 U	2.7 U	R	3.4 U
gamma-BHC(Lindane)	1.7	R	2.1 U	2.7 U	R	3.4 U
gamma-Chlordane	1.7	R	2.1 U	2.7 U	R	3.4 U
METALS	CRDL(mg/kg)					
Aluminum	200	1870	5970	3080	3430	4780
Antimony	60	8.0 U	7.2 UJ	8.3 UJ	8.1 UJ	9.1 U
Arsenic	10	0.84	0.66 J	0.33 UJ	0.32 UJ	0.7
Barium	200	6.3	21.5	9.6	9.2	19.2
Beryllium	5	0.32 U	0.80 U	0.46 U	0.45 U	1.0 U
Cadmium	5	0.96 U	0.86 UJ	0.99 UJ	0.97 UJ	1.1 U
Calcium	5000	350 J	949	605	718	543
Chromium	10	18.1	5.4 U	4.5 U	5.3 U	5.5 U
Cobalt	50	1.9	2.8	2.0 U	1.9	3.0
Copper	25	5.8 U	4.5 U	2.3 U	13.9 U	7.4 U
Iron	100	8940	14600	2590	3000	5010
Lead	3	5.6 J	8.9 J	4.9 J	4.3 J	15.8 J
Magnesium	5000	2560	933	382	430	708
Manganese	15	53.3	222	40.2	58.3	70.9
Mercury	0.2	0.16 U	0.14 U	0.17 UJ	0.16 UJ	0.18 UJ
Nickel	40	20.5	4.6 U	5.3 U	5.2 U	8.4 U
Potassium	5000	248	583	146 U	149	423
Selenium	5	0.32 U	0.29 U	0.62 U	0.49 U	0.4 U
Silver	10	0.96 U	0.86 U	0.99 U	0.97 U	1.1 U
Sodium	5000	41.5 U	67.4	68.7	57.7	54.1 U

LOCATION NAME:		SD-06	SD-07	SD-08	SD-08	SD-09
STREAM:		SAUGATUCKET RIVER	MITCHELL BROOK	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-06-0.0-0.5-NX-D-229-2	SE-07-0.0-0.5-NX-D-230-2	SE-08-0.0-0.5-FD-D-324-2	SE-08-0.0-0.5-NX-D-231-2	SE-09-0.0-0.5-NX-D-237-2
DATE SAMPLED:		10/02/91	10/04/91	10/02/91	10/02/91	10/04/91
REMARKS:				Field Duplicate		
Thallium	10	0.32 U	0.29 U	0.33 U	0.32 U	0.37
Vanadium	50	3.9	10.5	3.5	4.1	8.4
Zinc	20	17.8 U	24.9 U	10.9 U	12.9 U	33.6 J
SOIL QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	8	11 UJ	11 UJ	13 UJ	13 UJ	16 UJ
CYANIDE	CRDL(mg/kg)					
Cyanide	20	4.0 U	3.6 U	4.1 U	4.0 U	4.6 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	33.4	22.0	36.8	37.4	46.6
Organic Content	(%)	4.3	2.3	4.1	4.2	7.4
Solids Content	(%)	66.6	77.9	63.3	62.7	53.3
GRAIN SIZE						
Clay	(%)	0	1.4	4	4.2	1.3
Gravel	(%)	1.6	7.7	0.1	0	7.3
Sand	(%)	93.4	77.9	64.3	64.4	67.6
Silt	(%)	5	12.9	31.5	31.1	23.8

LOCATION NAME:		SD-10	SD-10	SD-11	SD-12	SD-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-10-0.0-0.5-FD-D-323-2	SE-10-0.0-0.5-NX-D-236-2	SE-11-0.0-0.5-NX-D-234-2	SE-12-0.0-0.5-NX-D-235-2	SE-13-0.0-0.5-NX-D-233-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	18 U	18 U	24 U	12 U	17 U
1,1,2,2-Tetrachloroethane	10	18 U	18 U	24 U	12 U	17 U
1,1,2-Trichloroethane	10	18 U	18 U	24 U	12 U	17 U
1,1-Dichloroethane	10	18 U	18 U	24 U	12 U	17 U
1,1-Dichloroethene	10	18 U	18 U	24 U	12 U	17 U
1,2-Dichloroethane	10	18 U	18 U	24 U	12 U	17 U
1,2-Dichloroethene(total)	10	18 U	18 U	24 U	12 U	17 U
1,2-Dichloropropane	10	18 U	18 U	24 U	12 U	17 U
2-Butanone	10	18 U	18 U	24 U	12 U	17 U
2-Hexanone	10	18 U	18 U	24 U	12 U	17 U
4-Methyl-2-pentanone	10	18 U	3 J	24 U	12 U	17 U
Acetone	10	79 U	95 U	40 U	17 U	19 U
Benzene	10	18 U	18 U	24 U	1 J	17 U
Bromodichloromethane	10	18 U	18 U	24 U	12 U	17 U
Bromoform	10	18 U	18 U	24 U	12 U	17 U
Bromomethane	10	18 U	18 U	24 U	12 U	17 U
Carbon Disulfide	10	18 U	18 U	24 U	12 U	17 U
Carbon Tetrachloride	10	18 U	18 U	24 U	12 U	17 U
Chlorobenzene	10	18 U	18 U	24 U	12 U	17 U
Chloroethane	10	18 U	18 U	24 U	12 U	17 U
Chloroform	10	18 U	18 U	24 U	12 U	17 U
Chloromethane	10	18 U	18 U	24 U	12 U	17 U
Dibromochloromethane	10	18 U	18 U	24 U	12 U	17 U
Ethylbenzene	10	18 U	18 U	24 U	12 U	17 U
Methylene Chloride	10	50 U	43 U	42 U	12 U	27 U
Styrene	10	18 U	18 U	24 U	12 U	17 U
Tetrachloroethene	10	18 U	18 U	24 U	12 U	17 U
Toluene	10	18 U	18 U	24 U	12 U	17 U
Total Xylenes	10	18 U	18 U	24 U	12 U	17 U
Trichloroethene	10	18 U	18 U	24 U	12 U	17 U
Vinyl Chloride	10	18 U	18 U	24 U	12 U	17 U
cis-1,3-Dichloropropene	10	18 U	18 U	24 U	12 U	17 U
trans-1,3-Dichloropropene	10	18 U	18 U	24 U	12 U	17 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	R	R	800 UJ	400 UJ	550 UJ

LOCATION NAME:		SD-10	SD-10	SD-11	SD-12	SD-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-10-0.0-0.5-FD-D-323-2	SE-10-0.0-0.5-NX-D-236-2	SE-11-0.0-0.5-NX-D-234-2	SE-12-0.0-0.5-NX-D-235-2	SE-13-0.0-0.5-NX-D-233-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
1,2-Dichlorobenzene	330	R	R	800 UJ	400 UJ	550 UJ
1,3-Dichlorobenzene	330	R	R	800 UJ	400 UJ	550 UJ
1,4-Dichlorobenzene	330	R	R	800 UJ	400 UJ	550 UJ
2,2'-oxybis(1-Chloropropane)	330	R	R	800 UJ	400 UJ	550 UJ
2,4,5-Trichlorophenol	800	R	R	1900 UJ	980 UJ	1300 UJ
2,4,6-Trichlorophenol	330	R	R	800 UJ	400 UJ	550 UJ
2,4-Dichlorophenol	330	R	R	800 UJ	400 UJ	550 UJ
2,4-Dimethylphenol	330	R	R	800 UJ	400 UJ	550 UJ
2,4-Dinitrophenol	800	R	R	1900 UJ	980 UJ	1300 UJ
2,4-Dinitrotoluene	330	R	R	800 UJ	400 UJ	550 UJ
2,6-Dinitrotoluene	330	R	R	800 UJ	400 UJ	550 UJ
2-Chloronaphthalene	330	R	R	800 UJ	400 UJ	550 UJ
2-Chlorophenol	330	R	R	800 UJ	400 UJ	550 UJ
2-Methylnaphthalene	330	R	R	800 UJ	400 UJ	550 UJ
2-Methylphenol	330	R	R	800 UJ	400 UJ	550 UJ
2-Nitroaniline	800	R	R	1900 UJ	980 UJ	1300 UJ
2-Nitrophenol	330	R	R	800 UJ	400 UJ	550 UJ
3,3'-Dichlorobenzidine	330	R	R	800 UJ	400 UJ	550 UJ
3-Nitroaniline	800	R	R	1900 UJ	980 UJ	1300 UJ
4,6-Dinitro-2-methylphenol	800	R	R	1900 UJ	980 UJ	1300 UJ
4-Bromophenyl-phenylether	330	R	R	800 UJ	400 UJ	550 UJ
4-Chloro-3-methylphenol	330	R	R	800 UJ	400 UJ	550 UJ
4-Chloroaniline	330	R	R	800 UJ	400 UJ	550 UJ
4-Chlorophenyl-phenylether	330	R	R	800 UJ	400 UJ	550 UJ
4-Methylphenol	330	R	R	800 UJ	400 UJ	550 UJ
4-Nitroaniline	800	R	R	1900 UJ	980 UJ	1300 UJ
4-Nitrophenol	800	R	R	1900 UJ	980 UJ	1300 UJ
Acenaphthene	330	R	R	800 UJ	400 UJ	550 UJ
Acenaphthylene	330	R	R	800 UJ	400 UJ	550 UJ
Anthracene	330	R	R	800 UJ	400 UJ	550 UJ
Benzo(a)anthracene	330	R	R	800 UJ	400 UJ	550 UJ
Benzo(a)pyrene	330	R	R	800 UJ	400 UJ	550 UJ
Benzo(b)fluoranthene	330	R	R	800 UJ	400 UJ	550 UJ
Benzo(g,h,i)perylene	330	R	R	800 UJ	400 UJ	550 UJ
Benzo(k)fluoranthene	330	R	R	800 UJ	400 UJ	550 UJ
Butylbenzylphthalate	330	R	R	800 UJ	400 UJ	550 UJ
Carbazole	330	R	R	800 UJ	400 UJ	550 UJ
Chrysene	330	R	R	800 UJ	400 UJ	550 UJ
Di-n-butylphthalate	330	R	R	800 UJ	400 UJ	550 UJ

LOCATION NAME:		SD-10	SD-10	SD-11	SD-12	SD-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-10-0.0-0.5-FD-D-323-2	SE-10-0.0-0.5-NX-D-236-2	SE-11-0.0-0.5-NX-D-234-2	SE-12-0.0-0.5-NX-D-235-2	SE-13-0.0-0.5-NX-D-233-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
Di-n-octylphthalate	330	R	R	800 UJ	400 UJ	550 UJ
Dibenz(a,h)anthracene	330	R	R	800 UJ	400 UJ	550 UJ
Dibenzofuran	330	R	R	800 UJ	400 UJ	550 UJ
Diethylphthalate	330	R	R	800 UJ	400 UJ	550 UJ
Dimethylphthalate	330	R	R	800 UJ	400 UJ	550 UJ
Fluoranthene	330	R	R	800 UJ	400 UJ	33 J
Fluorene	330	R	R	800 UJ	400 UJ	550 UJ
Hexachlorobenzene	330	R	R	800 UJ	400 UJ	550 UJ
Hexachlorobutadiene	330	R	R	800 UJ	400 UJ	550 UJ
Hexachlorocyclopentadiene	330	R	R	800 UJ	400 UJ	550 UJ
Hexachloroethane	330	R	R	800 UJ	400 UJ	550 UJ
Indeno(1,2,3-cd)pyrene	330	R	R	800 UJ	400 UJ	550 UJ
Isophorone	330	R	R	800 UJ	400 UJ	550 UJ
N-Nitroso-di-n-propylamine	330	R	R	800 UJ	400 UJ	550 UJ
N-Nitrosodiphenylamine	330	R	R	800 UJ	400 UJ	550 UJ
Naphthalene	330	R	R	800 UJ	400 UJ	550 UJ
Nitrobenzene	330	R	R	800 UJ	400 UJ	550 UJ
Pentachlorophenol	800	R	R	1900 UJ	980 UJ	1300 UJ
Phenanthrene	330	R	R	800 UJ	400 UJ	550 UJ
Phenol	330	R	R	800 UJ	400 UJ	550 UJ
Pyrene	330	R	R	800 UJ	400 UJ	35 J
bis(2-Chloroethoxy)methane	330	R	R	800 UJ	400 UJ	550 UJ
bis(2-Chloroethyl) ether	330	R	R	800 UJ	400 UJ	550 UJ
bis(2-Ethylhexyl)phthalate	330	R	R	800 UJ	400 UJ	550 UJ
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	5.9 U	5.8 U	R	4.0 U	5.5 U
4,4'-DDE	3.3	0.82 J	0.47 J	R	4.0 U	5.5 U
4,4'-DDT	3.3	0.91 J	0.89 J	R	4.0 U	5.5 U
Aldrin	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
Aroclor-1016	33.0	59.0 U	58.0 U	R	40 U	55 U
Aroclor-1221	67.0	120.0 U	120.0 U	R	82 U	110 U
Aroclor-1232	33.0	59.0 U	58.0 U	R	40 U	55 U
Aroclor-1242	33.0	59.0 U	58.0 U	R	40 U	55 U
Aroclor-1248	33.0	59.0 U	58.0 U	R	40 U	55 U
Aroclor-1254	33.0	59.0 U	58.0 U	R	40 U	55 U
Aroclor-1260	33.0	59.0 U	58.0 U	R	40 U	55 U
Dieldrin	3.3	1.5 J	1.1 J	R	4.0 U	5.5 U

LOCATION NAME:	SD-10	SD-10	SD-11	SD-12	SD-13
STREAM:	UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:	SE-10-0.0-0.5-FD-D-323-2	SE-10-0.0-0.5-NX-D-236-2	SE-11-0.0-0.5-NX-D-234-2	SE-12-0.0-0.5-NX-D-235-2	SE-13-0.0-0.5-NX-D-233-2
DATE SAMPLED:	10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:	Field Duplicate				
Endosulfan I	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
Endosulfan II	3.3	0.31 J	5.8 U	R	4.0 U	5.5 U
Endosulfan Sulfate	3.3	5.9 U	5.8 U	R	4.0 U	5.5 U
Endrin	3.3	5.9 U	5.8 U	R	4.0 U	5.5 U
Endrin Aldehyde	3.3	5.9 U	5.8 U	R	4.0 U	5.5 U
Endrin Ketone	3.3	5.9 U	5.8 U	R	4.0 U	5.5 U
Heptachlor	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
Heptachlor Epoxide	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
Methoxychlor	17.0	2.8 J	2.3 J	R	21 U	28 U
Toxaphene	170.0	300.0 U	300.0 U	R	210 U	280 U
alpha-BHC	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
alpha-Chlordane	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
beta-BHC	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
delta-BHC	1.7	3.0 U	0.45 J	R	2.1 U	2.8 U
gamma-BHC(Lindane)	1.7	3.0 U	3.0 U	R	2.1 U	2.8 U
gamma-Chlordane	1.7	0.23 J	3.0 U	R	2.1 U	2.8 U
METALS	CRDL(mg/kg)					
Aluminum	200	3930	4070	2820	1660	6080
Antimony	60	58.6 J	65.5 J	10.3 UJ	6.0 UJ	8.3 UJ
Arsenic	10	4.1	5.0	0.41 UJ	0.59 J	0.35 J
Barium	200	47.7 J	45.9 J	12.1	10.5	25.6
Beryllium	5	1.2	1.1	0.58 U	0.24 U	2.0 U
Cadmium	5	1.0 UJ	1.2 UJ	1.20 UJ	0.72 UJ	1.3 J
Calcium	5000	1190	1060	1100	290	852
Chromium	10	2.0 UJ	2.4 UJ	3.7 U	2.6 U	6.0 U
Cobalt	50	7.8	3.6	2.5 U	1.4 U	4.4
Copper	25	45.4 J	66.7 J	5.0 U	1.6 U	6.0 U
Iron	100	87100	84000	2530	6500	5350
Lead	3	10.7 J	476 J	16.5 J	3.5 J	27.7 J
Magnesium	5000	771	861	473	350	825
Manganese	15	547 J	512 J	50.3	41.1	88.1
Mercury	0.2	0.14 UJ	0.19 UJ	0.21 UJ	0.12 UJ	0.17 UJ
Nickel	40	3.4	3.51 U	6.6 U	3.8 U	5.3 U
Potassium	5000	651	656	182 U	230	250
Selenium	5	1.4 UJ	1.5 UJ	0.64 U	0.24 U	0.66 U
Silver	10	1.3 UJ	1.6 UJ	1.2 U	0.72 U	1.0 U
Sodium	5000	94.3 U	96.6 U	59.6	48.4	63.5

LOCATION NAME:		SD-10	SD-10	SD-11	SD-12	SD-13
STREAM:		UNNAMED BROOK	UNNAMED BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-10-0.0-0.5-FD-D-323-2	SE-10-0.0-0.5-NX-D-236-2	SE-11-0.0-0.5-NX-D-234-2	SE-12-0.0-0.5-NX-D-235-2	SE-13-0.0-0.5-NX-D-233-2
DATE SAMPLED:		10/07/91	10/07/91	10/03/91	10/03/91	10/03/91
REMARKS:		Field Duplicate				
Thallium	10	0.34 U	0.38 U	0.41 U	0.24 U	0.33 U
Vanadium	50	12.4	12.3	4.5	3.1 U	11.5
Zinc	20	202 J	255 J	28.6 U	14.0 U	31.4 U
SOIL QUALITY PARAMETERS						
SULFIDE	CRQL(mg/L)					
Sulfide	8	59 UJ	15 UJ	17 UJ	850 J	14 UJ
CYANIDE	CRDL(mg/kg)					
Cyanide	20	8.34 U	10.13 U	5.1 U	3.0 U	4.2 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	49.9	45.6	56.7	18.2	42.9
Organic Content	(%)	6.2	5.8	9.1	0.8	7.6
Solids Content	(%)	50.1	54.5	43.2	81.8	57.1
GRAIN SIZE						
Clay	(%)	7.2	8.4	0	0.3	3.2
Gravel	(%)	1.1	0.6	1.2	0.2	10.6
Sand	(%)	64.1	63.8	83.1	97.3	57
Silt	(%)	27.6	27.2	15.7	2.2	29.1

LOCATION NAME:	SD-14	SD-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):	0.0-0.5	0.0-0.5
M&E SAMPLE ID:	SE-14-0.0-0.5-NX-D-232-2	SE-15-0.0-0.5-NX-D-238-2
DATE SAMPLED:	10/04/91	10/04/91
REMARKS:		

VOLATILE ORGANICS-CLP	CRQL(ug/kg)		
1,1,1-Trichloroethane	10	22 U	18 U
1,1,2,2-Tetrachloroethane	10	22 U	18 U
1,1,2-Trichloroethane	10	22 U	18 U
1,1-Dichloroethane	10	22 U	18 U
1,1-Dichloroethene	10	22 U	18 U
1,2-Dichloroethane	10	22 U	18 U
1,2-Dichloroethene(total)	10	22 U	18 U
1,2-Dichloropropane	10	22 U	18 U
2-Butanone	10	22 U	18 U
2-Hexanone	10	22 U	18 U
4-Methyl-2-pentanone	10	22 U	18 U
Acetone	10	22 U	29 U
Benzene	10	22 U	18 U
Bromodichloromethane	10	22 U	18 U
Bromoform	10	22 U	18 U
Bromomethane	10	22 U	18 U
Carbon Disulfide	10	22 U	18 U
Carbon Tetrachloride	10	22 U	18 U
Chlorobenzene	10	22 U	18 U
Chloroethane	10	22 U	18 U
Chloroform	10	22 U	5 J
Chloromethane	10	22 U	18 U
Dibromochloromethane	10	22 U	18 U
Ethylbenzene	10	22 U	18 U
Methylene Chloride	10	22 U	23 U
Styrene	10	22 U	18 U
Tetrachloroethene	10	3 J	18 U
Toluene	10	22 U	18 U
Total Xylenes	10	22 U	18 U
Trichloroethene	10	22 U	18 U
Vinyl Chloride	10	22 U	18 U
cis-1,3-Dichloropropene	10	22 U	18 U
trans-1,3-Dichloropropene	10	22 U	18 U
SEMIVOLATILE ORGANICS	**CRQL(ug/kg)**		
1,2,4-Trichlorobenzene	330	710 UJ	600 UJ

LOCATION NAME:		SD-14	SD-15
STREAM:		MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.5	0.0-0.5
M&E SAMPLE ID:		SE-14-0.0-0.5-NX-D-232-2	SE-15-0.0-0.5-NX-D-238-2
DATE SAMPLED:		10/04/91	10/04/91
REMARKS:			
1,2-Dichlorobenzene	330	710 UJ	600 UJ
1,3-Dichlorobenzene	330	710 UJ	600 UJ
1,4-Dichlorobenzene	330	710 UJ	600 UJ
2,2'-oxybis(1-Chloropropane)	330	710 UJ	600 UJ
2,4,5-Trichlorophenol	800	1700 UJ	1500 UJ
2,4,6-Trichlorophenol	330	710 UJ	600 UJ
2,4-Dichlorophenol	330	710 UJ	600 UJ
2,4-Dimethylphenol	330	710 UJ	600 UJ
2,4-Dinitrophenol	800	1700 UJ	1500 UJ
2,4-Dinitrotoluene	330	710 UJ	600 UJ
2,6-Dinitrotoluene	330	710 UJ	600 UJ
2-Chloronaphthalene	330	710 UJ	600 UJ
2-Chlorophenol	330	710 UJ	600 UJ
2-Methylnaphthalene	330	710 UJ	600 UJ
2-Methylphenol	330	710 UJ	600 UJ
2-Nitroaniline	800	1700 UJ	1500 UJ
2-Nitrophenol	330	710 UJ	600 UJ
3,3'-Dichlorobenzidine	330	710 UJ	600 UJ
3-Nitroaniline	800	1700 UJ	1500 UJ
4,6-Dinitro-2-methylphenol	800	1700 UJ	1500 UJ
4-Bromophenyl-phenylether	330	710 UJ	600 UJ
4-Chloro-3-methylphenol	330	710 UJ	600 UJ
4-Chloroaniline	330	710 UJ	600 UJ
4-Chlorophenyl-phenylether	330	710 UJ	600 UJ
4-Methylphenol	330	710 UJ	600 UJ
4-Nitroaniline	800	1700 UJ	1500 UJ
4-Nitrophenol	800	1700 UJ	1500 UJ
Acenaphthene	330	710 UJ	600 UJ
Acenaphthylene	330	710 UJ	600 UJ
Anthracene	330	710 UJ	600 UJ
Benzo(a)anthracene	330	710 UJ	600 UJ
Benzo(a)pyrene	330	710 UJ	600 UJ
Benzo(b)fluoranthene	330	710 UJ	600 UJ
Benzo(g,h,i)perylene	330	710 UJ	600 UJ
Benzo(k)fluoranthene	330	710 UJ	600 UJ
Butylbenzylphthalate	330	710 UJ	600 UJ
Carbazole	330	710 UJ	600 UJ
Chrysene	330	710 UJ	600 UJ
Di-n-butylphthalate	330	710 UJ	600 UJ

LOCATION NAME:	SD-14	SD-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):	0.0-0.5	0.0-0.5
M&E SAMPLE ID:	SE-14-0.0-0.5-NX-D-232-2	SE-15-0.0-0.5-NX-D-238-2
DATE SAMPLED:	10/04/91	10/04/91
REMARKS:		

Di-n-octylphthalate	330	710 UJ	600 UJ
Dibenz(a,h)anthracene	330	710 UJ	600 UJ
Dibenzofuran	330	710 UJ	600 UJ
Diethylphthalate	330	710 UJ	600 UJ
Dimethylphthalate	330	710 UJ	600 UJ
Fluoranthene	330	710 UJ	31 J
Fluorene	330	710 UJ	600 UJ
Hexachlorobenzene	330	710 UJ	600 UJ
Hexachlorobutadiene	330	710 UJ	600 UJ
Hexachlorocyclopentadiene	330	710 UJ	600 UJ
Hexachloroethane	330	710 UJ	600 UJ
Indeno(1,2,3-cd)pyrene	330	710 UJ	600 UJ
Isophorone	330	710 UJ	600 UJ
N-Nitroso-di-n-propylamine	330	710 UJ	600 UJ
N-Nitrosodiphenylamine	330	710 UJ	600 UJ
Naphthalene	330	710 UJ	600 UJ
Nitrobenzene	330	710 UJ	600 UJ
Pentachlorophenol	800	1700 UJ	1500 UJ
Phenanthrene	330	710 UJ	600 UJ
Phenol	330	710 UJ	600 UJ
Pyrene	330	710 UJ	40 J
bis(2-Chloroethoxy)methane	330	710 UJ	600 UJ
bis(2-Chloroethyl) ether	330	710 UJ	600 UJ
bis(2-Ethylhexyl)phthalate	330	710 UJ	600 UJ
PESTICIDES/PCBs	CRQL(ug/kg)		
4,4'-DDD	3.3	7.1 U	5.9 U
4,4'-DDE	3.3	7.1 U	1.6 J
4,4'-DDT	3.3	7.1 U	5.9 U
Aldrin	1.7	3.7 U	3.1 U
Aroclor-1016	33.0	71 U	59 U
Aroclor-1221	67.0	140 U	120 U
Aroclor-1232	33.0	71 U	59 U
Aroclor-1242	33.0	71 U	59 U
Aroclor-1248	33.0	71 U	59 U
Aroclor-1254	33.0	71 U	59 U
Aroclor-1260	33.0	71 U	59 U
Dieldrin	3.3	7.1 U	5.9 U

LOCATION NAME:	SD-14	SD-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):	0.0-0.5	0.0-0.5
M&E SAMPLE ID:	SE-14-0.0-0.5-NX-D-232-2	SE-15-0.0-0.5-NX-D-238-2
DATE SAMPLED:	10/04/91	10/04/91
REMARKS:		

Endosulfan I	1.7	3.7 U	3.1 U
Endosulfan II	3.3	7.1 U	5.9 U
Endosulfan Sulfate	3.3	7.1 U	5.9 U
Endrin	3.3	7.1 U	5.9 U
Endrin Aldehyde	3.3	7.1 U	5.9 U
Endrin Ketone	3.3	7.1 U	5.9 U
Heptachlor	1.7	3.7 U	3.1 U
Heptachlor Epoxide	1.7	3.7 U	3.1 U
Methoxychlor	17.0	37 U	31 U
Toxaphene	170.0	370 U	310 U
alpha-BHC	1.7	3.7 U	3.1 U
alpha-Chlordane	1.7	3.7 U	3.1 U
beta-BHC	1.7	3.7 U	3.1 U
delta-BHC	1.7	3.7 U	3.1 U
gamma-BHC(Lindane)	1.7	3.7 U	3.1 U
gamma-Chlordane	1.7	3.7 U	3.1 U
METALS	CRDL(mg/kg)		
Aluminum	200	3670	4530
Antimony	60	6.6 UJ	9.1 UJ
Arsenic	10	0.26 UJ	0.37 UJ
Barium	200	9.3	13.3
Beryllium	5	0.55 U	0.64 U
Cadmium	5	0.79 UJ	1.1 UJ
Calcium	5000	339	524
Chromium	10	4.5 U	4.6 U
Cobalt	50	2.0	2.2 U
Copper	25	3.1 U	11.0 U
Iron	100	5130	7040
Lead	3	8.9 J	12.1 J
Magnesium	5000	635	752
Manganese	15	47.7	78.7
Mercury	0.2	0.13 UJ	0.18 U
Nickel	40	4.2 U	5.9 U
Potassium	5000	270	258
Selenium	5	0.26 U	0.37 U
Silver	10	0.79 U	1.1 U
Sodium	5000	31.5	56.5

LOCATION NAME:	SD-14	SD-15
STREAM:	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):	0.0-0.5	0.0-0.5
M&E SAMPLE ID:	SE-14-0.0-0.5-NX-D-232-2	SE-15-0.0-0.5-NX-D-238-2
DATE SAMPLED:	10/04/91	10/04/91
REMARKS:		

Thallium	10	0.26 U	0.37
Vanadium	50	6.0	8.0
Zinc	20	20.7 U	43.9 J

SOIL QUALITY PARAMETERS

SULFIDE	CRQL(mg/L)		
Sulfide	8	11 UJ	13 UJ
CYANIDE	CRDL(mg/kg)		
Cyanide	20	3.3 U	4.6 U
TOTAL COMBUSTIBLE ORGANICS			
Moisture Content	(%)	22.4	40.7
Organic Content	(%)	2.2	5.0
Solids Content	(%)	77.7	59.3
GRAIN SIZE			
Clay	(%)	0	0.6
Gravel	(%)	12.9	3.5
Sand	(%)	75.1	79.2
Silt	(%)	12	16.6

SEDIMENT - MAY 1992

SEDIMENTS - MAY 1992 (05/27/92-06/01/92)
ROSE HILL ANALYTICAL DATA

LOCATION NAME:		SD-02	SD-04	SD-05	SD-06	SD-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-02-0.0-0.3-NX-D-711-5	SE-04-0.0-0.3-NX-D-712-5	SE-05-0.0-0.3-NX-D-713-5	SE-06-0.0-0.3-NX-D-714-5	SE-07-0.0-0.3-NX-D-715-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	13 U	12 U	13 U	13 U	12 U
1,1,2,2-Tetrachloroethane	10	13 U	12 U	13 U	13 U	12 U
1,1,2-Trichloroethane	10	13 U	12 U	13 U	13 U	12 U
1,1-Dichloroethane	10	13 U	12 U	13 U	13 U	12 U
1,1-Dichloroethene	10	13 U	12 U	13 U	13 U	12 U
1,2-Dichloroethane	10	13 U	12 U	13 U	13 U	12 U
1,2-Dichloroethene(total)	10	13 U	12 U	13 U	13 U	12 U
1,2-Dichloropropane	10	13 U	12 U	13 U	13 U	12 U
2-Butanone	10	13 U	13 U	21 U	13 U	12 U
2-Hexanone	10	13 U	12 U	13 U	13 U	12 U
4-Methyl-2-pentanone	10	13 U	12 U	13 U	13 U	12 U
Acetone	10	120 UJ	220 UJ	160 UJ	100 UJ	54 U
Benzene	10	13 U	12 U	13 U	13 U	12 U
Bromodichloromethane	10	13 U	12 U	13 U	13 U	12 U
Bromoform	10	13 U	12 U	13 U	13 U	12 U
Bromomethane	10	13 U	12 U	13 U	13 U	12 U
Carbon Disulfide	10	13 U	12 U	13 U	13 U	12 U
Carbon Tetrachloride	10	13 U	12 U	13 U	13 U	12 U
Chlorobenzene	10	13 U	12 U	13 U	13 U	12 U
Chloroethane	10	13 U	12 U	13 U	13 U	12 U
Chloroform	10	13 U	12 U	13 U	13 U	12 U
Chloromethane	10	13 U	12 U	13 U	13 U	12 U
Dibromochloromethane	10	13 U	12 U	13 U	13 U	12 U
Ethylbenzene	10	13 U	12 U	13 U	13 U	12 U
Methylene Chloride	10	52 U	75 U	53 U	51 U	12 U
Styrene	10	13 U	12 U	13 U	13 U	12 U
Tetrachloroethene	10	13 U	12 U	13 U	13 U	12 U
Toluene	10	13 U	12 U	13 U	13 U	12 U
Total Xylenes	10	13 U	12 U	13 U	13 U	12 U
Trichloroethene	10	13 U	12 U	13 U	13 U	12 U
Vinyl Chloride	10	13 U	12 U	13 U	13 U	12 U
cis-1,3-Dichloropropene	10	13 U	12 U	13 U	13 U	12 U
trans-1,3-Dichloropropene	10	13 U	12 U	13 U	13 U	12 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	400 U	390 U	430 U	400 U	350 U

LOCATION NAME:		SD-02	SD-04	SD-05	SD-06	SD-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-02-0.0-0.3-NX-D-711-5	SE-04-0.0-0.3-NX-D-712-5	SE-05-0.0-0.3-NX-D-713-5	SE-06-0.0-0.3-NX-D-714-5	SE-07-0.0-0.3-NX-D-715-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
1,2-Dichlorobenzene	330	400 U	390 U	430 U	400 U	350 U
1,3-Dichlorobenzene	330	400 U	390 U	430 U	400 U	350 U
1,4-Dichlorobenzene	330	400 U	390 U	430 U	400 U	350 U
2,2'-oxybis(1-Chloropropane)	330	400 U	390 U	430 U	400 U	350 U
2,4,5-Trichlorophenol	800	970 U	930 U	1000 U	980 U	850 U
2,4,6-Trichlorophenol	330	400 U	390 U	430 U	400 U	350 U
2,4-Dichlorophenol	330	400 U	390 U	430 U	400 U	350 U
2,4-Dimethylphenol	330	400 U	390 U	430 U	400 U	350 U
2,4-Dinitrophenol	800	970 U	930 U	1000 U	980 U	850 U
2,4-Dinitrotoluene	330	400 U	390 U	430 U	400 U	350 U
2,6-Dinitrotoluene	330	400 U	390 U	430 U	400 U	350 U
2-Chloronaphthalene	330	400 U	390 U	430 U	400 U	350 U
2-Chlorophenol	330	400 U	390 U	430 U	400 U	350 U
2-Methylnaphthalene	330	400 U	390 U	430 U	400 U	350 U
2-Methylphenol	330	400 U	390 U	430 U	400 U	350 U
2-Nitroaniline	800	970 U	930 U	1000 U	980 U	850 U
2-Nitrophenol	330	400 U	390 U	430 U	400 U	350 U
3,3'-Dichlorobenzidine	330	400 U	390 UJ	430 UJ	400 UJ	350 UJ
3-Nitroaniline	800	970 UJ	930 UJ	1000 UJ	980 UJ	850 U
4,6-Dinitro-2-methylphenol	800	970 U	930 U	1000 U	980 U	850 U
4-Bromophenyl-phenylether	330	400 U	390 U	430 U	400 U	350 U
4-Chloro-3-methylphenol	330	400 U	390 U	430 U	400 U	350 U
4-Chloroaniline	330	400 U	390 U	430 U	400 U	350 UJ
4-Chlorophenyl-phenylether	330	400 U	390 U	430 U	400 U	350 U
4-Methylphenol	330	400 U	390 U	430 U	400 U	350 U
4-Nitroaniline	800	970 U	930 U	1000 U	980 U	850 U
4-Nitrophenol	800	970 U	930 U	1000 U	980 U	850 U
Acenaphthene	330	400 U	390 U	430 U	400 U	350 U
Acenaphthylene	330	400 U	390 U	430 U	400 U	350 U
Anthracene	330	400 U	390 U	430 U	400 U	350 U
Benzo(a)anthracene	330	400 U	390 U	430 U	400 U	350 U
Benzo(a)pyrene	330	400 U	390 U	430 U	400 U	350 U
Benzo(b)fluoranthene	330	400 U	390 U	430 U	400 U	350 U
Benzo(g,h,i)perylene	330	400 U	390 U	430 U	400 U	350 U
Benzo(k)fluoranthene	330	400 U	390 U	430 U	400 U	350 U
Butylbenzylphthalate	330	400 U	390 U	430 U	400 U	350 U
Carbazole	330	400 U	390 U	430 U	400 U	350 U
Chrysene	330	400 U	390 U	430 U	400 U	350 U
Di-n-butylphthalate	330	400 U	390 U	430 U	400 U	350 U

LOCATION NAME:		SD-02	SD-04	SD-05	SD-06	SD-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-02-0.0-0.3-NX-D-711-5	SE-04-0.0-0.3-NX-D-712-5	SE-05-0.0-0.3-NX-D-713-5	SE-06-0.0-0.3-NX-D-714-5	SE-07-0.0-0.3-NX-D-715-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
Di-n-octylphthalate	330	400 U	390 U	430 U	400 U	350 U
Dibenz(a,h)anthracene	330	400 U	390 U	430 U	400 U	350 U
Dibenzofuran	330	400 U	390 U	430 U	400 U	350 U
Diethylphthalate	330	400 U	390 U	430 U	400 U	350 U
Dimethylphthalate	330	400 U	390 U	430 U	400 U	350 U
Fluoranthene	330	400 U	390 U	430 U	400 U	350 U
Fluorene	330	400 U	390 U	430 U	400 U	350 U
Hexachlorobenzene	330	400 U	390 U	430 U	400 U	350 U
Hexachlorobutadiene	330	400 U	390 U	430 U	400 U	350 U
Hexachlorocyclopentadiene	330	400 U	390 U	430 U	400 U	350 U
Hexachloroethane	330	400 U	390 U	430 U	400 U	350 U
Indeno(1,2,3-cd)pyrene	330	400 U	390 U	430 U	400 U	350 U
Isophorone	330	400 U	390 U	430 U	400 U	350 U
N-Nitroso-di-n-propylamine	330	400 U	390 U	430 U	400 U	350 U
N-Nitrosodiphenylamine	330	400 U	390 U	430 U	400 U	350 U
Naphthalene	330	400 U	390 U	430 U	400 U	350 U
Nitrobenzene	330	400 U	390 U	430 U	400 U	350 U
Pentachlorophenol	800	970 U	930 U	1000 U	980 U	850 U
Phenanthrene	330	400 U	390 U	430 U	400 U	350 U
Phenol	330	400 U	390 U	430 U	400 U	350 U
Pyrene	330	400 U	390 U	430 U	400 U	350 U
bis(2-Chloroethoxy)methane	330	400 U	390 U	430 U	400 U	350 U
bis(2-Chloroethyl) ether	330	400 U	390 U	430 U	400 U	350 U
bis(2-Ethylhexyl)phthalate	330	400 U	390 U	430 U	400 U	350 U
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
4,4'-DDE	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
4,4'-DDT	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
Aldrin	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
Aroclor-1016	33.0	40 U	38 U	43 U	41 U	36 U
Aroclor-1221	67.0	82 U	78 U	87 U	84 U	73 U
Aroclor-1232	33.0	40 U	38 U	43 U	41 U	36 U
Aroclor-1242	33.0	40 U	38 U	43 U	41 U	36 U
Aroclor-1248	33.0	40 U	38 U	43 U	41 U	36 U
Aroclor-1254	33.0	40 U	38 U	43 U	41 U	36 U
Aroclor-1260	33.0	40 U	38 U	43 U	41 U	36 U
Dieldrin	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U

LOCATION NAME:		SD-02	SD-04	SD-05	SD-06	SD-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-02-0.0-0.3-NX-D-711-5	SE-04-0.0-0.3-NX-D-712-5	SE-05-0.0-0.3-NX-D-713-5	SE-06-0.0-0.3-NX-D-714-5	SE-07-0.0-0.3-NX-D-715-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
Endosulfan I	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
Endosulfan II	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
Endosulfan Sulfate	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
Endrin	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
Endrin Aldehyde	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
Endrin Ketone	3.3	4.0 U	3.8 U	4.3 U	4.1 U	3.6 U
Heptachlor	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
Heptachlor Epoxide	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
Methoxychlor	17.0	21 U	20 U	22 U	21 U	19 U
Toxaphene	170.0	210 U	200 U	220 U	210 U	190 U
alpha-BHC	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
alpha-Chlordane	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
beta-BHC	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
delta-BHC	1.7	2.1 U	0.49 J	0.76 J	0.46 J	0.67 J
gamma-BHC(Lindane)	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
gamma-Chlordane	1.7	2.1 U	2.0 U	2.2 U	2.1 U	1.9 U
METALS	CRDL(mg/kg)					
Aluminum	200	836	1440	1540	1800	2640
Antimony	60	4.7 UJ	4.4 UJ	4.9 UJ	4.7 UJ	4.4 UJ
Arsenic	10	0.22 U	0.21 U	6.1	2.0 J	0.61
Barium	200	2.9	8.6	13.7 J	6.9	11.5
Beryllium	5	0.12 U	0.11 U	0.25	0.79	0.42
Cadmium	5	0.35 U	0.33 U	0.36 U	0.35 U	0.33 U
Calcium	5000	107 U	281	366	258	208
Chromium	10	1.6	1.5	1.4	1.3	2.5
Cobalt	50	0.35 U	1.3	0.91	1.4	1.8
Copper	25	0.24 U	0.58 U	R	0.58 U	0.91 U
Iron	100	885	4240	25900	12500	12400
Lead	3	5.1	6.2	5.2	3.9	2.4
Magnesium	5000	114	245	140	333	613
Manganese	15	22.6	200	177	74.6	241
Mercury	0.2	0.05 UJ	0.05 UJ	0.05 UJ	0.04 UJ	0.04 UJ
Nickel	40	2.4 U	2.2 U	2.4 U	4.7	2.2 U
Potassium	5000	286 U	326 U	236 U	403 U	609 U
Selenium	5	0.43	0.31 U	0.26 U	0.21 U	0.19 U
Silver	10	0.35 U	0.33 U	0.36 U	0.35 U	0.33 U
Sodium	5000	155 U	122 U	R	117 U	108 U

LOCATION NAME:		SD-02	SD-04	SD-05	SD-06	SD-07
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	SAUGATUCKET RIVER	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-02-0.0-0.3-NX-D-711-5	SE-04-0.0-0.3-NX-D-712-5	SE-05-0.0-0.3-NX-D-713-5	SE-06-0.0-0.3-NX-D-714-5	SE-07-0.0-0.3-NX-D-715-5
DATE SAMPLED:		05/29/92	05/28/92	05/29/92	05/28/92	05/27/92
REMARKS:						
Thallium	10	0.22 U	0.21 U	0.26 U	0.21 U	0.19 U
Vanadium	50	1.6 U	3.4 U	3.4 J	4.3 U	6.4
Zinc	20	3.0 U	13.0 U	11.2	14.7 U	16.4 U
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	2.72 U	2.60 U	2.70 U	2.62 U	2.44 U
AMMONIA	QL(mg/kg)					
Ammonia	0.75	1.04 U	1.13 U	3.17	1.05 U	0.980 U
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	31	27.7	31.8	30	24.1
Organic Content	(%)	1.3	1.6	2.6	1.8	1.2
Solids Content	(%)	76.3	78.3	75.8	76.9	80.6
GRAIN SIZE						
Clay	(%)	0	0	0	0	0
Gravel	(%)	14.7	13	33.2	1.4	8.2
Sand	(%)	80.5	82.5	64.6	95.8	90.1
Silt	(%)	4.8	4.5	2.2	2.8	1.7

LOCATION NAME:		SD-09	SD-09	SD-11	SD-12	SD-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-09-0.0-0.3-FD-D-746-5	SE-09-0.0-0.3-NX-D-716-5	SE-11-0.0-0.3-NX-D-717-5	SE-12-0.0-0.3-NX-D-718-5	SE-16-0.0-0.3-NX-D-720-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
VOLATILE ORGANICS-CLP	CRQL(ug/kg)					
1,1,1-Trichloroethane	10	12 U	12 U	17 U	11 U	12 U
1,1,2,2-Tetrachloroethane	10	12 U	12 U	17 U	11 U	12 U
1,1,2-Trichloroethane	10	12 U	12 U	17 U	11 U	12 U
1,1-Dichloroethane	10	12 U	12 U	17 U	11 U	12 U
1,1-Dichloroethene	10	12 U	12 U	17 U	11 U	12 U
1,2-Dichloroethane	10	12 U	12 U	17 U	11 U	12 U
1,2-Dichloroethene(total)	10	12 U	12 U	17 U	11 U	12 U
1,2-Dichloropropane	10	12 U	12 U	17 U	11 U	12 U
2-Butanone	10	12 U	12 U	17 U	11 U	12 U
2-Hexanone	10	12 U	12 U	17 U	11 U	12 U
4-Methyl-2-pentanone	10	12 U	12 U	17 U	11 U	12 U
Acetone	10	68 U	130 U	110 U	25 U	32 UJ
Benzene	10	12 U	12 U	17 U	11 U	12 U
Bromodichloromethane	10	12 U	12 U	17 U	11 U	12 U
Bromoform	10	12 U	12 U	17 U	11 U	12 U
Bromomethane	10	12 U	12 U	17 U	11 U	12 U
Carbon Disulfide	10	12 U	12 U	17 U	11 U	12 U
Carbon Tetrachloride	10	12 U	12 U	17 U	11 U	12 U
Chlorobenzene	10	12 U	12 U	17 U	11 U	12 U
Chloroethane	10	12 U	12 U	17 U	11 U	12 U
Chloroform	10	12 U	12 U	17 U	11 U	12 U
Chloromethane	10	12 U	12 U	17 U	11 U	12 U
Dibromochloromethane	10	12 U	12 U	17 U	11 U	12 U
Ethylbenzene	10	12 U	12 U	17 U	11 U	12 U
Methylene Chloride	10	12 U	12 U	17 U	11 U	17 U
Styrene	10	12 U	12 U	17 U	11 U	12 U
Tetrachloroethene	10	12 U	12 U	17 U	11 U	12 U
Toluene	10	12 U	12 U	17 U	11 U	12 U
Total Xylenes	10	12 U	12 U	17 U	11 U	12 U
Trichloroethene	10	12 U	12 U	17 U	11 U	12 U
Vinyl Chloride	10	12 U	12 U	17 U	11 U	12 U
cis-1,3-Dichloropropene	10	12 U	12 U	17 U	11 U	12 U
trans-1,3-Dichloropropene	10	12 U	12 U	17 U	11 U	12 U
SEMIVOLATILE ORGANICS	CRQL(ug/kg)					
1,2,4-Trichlorobenzene	330	380 U	400 U	500 U	360 U	390 UJ

LOCATION NAME:		SD-09	SD-09	SD-11	SD-12	SD-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-09-0.0-0.3-FD-D-746-5	SE-09-0.0-0.3-NX-D-716-5	SE-11-0.0-0.3-NX-D-717-5	SE-12-0.0-0.3-NX-D-718-5	SE-16-0.0-0.3-NX-D-720-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
1,2-Dichlorobenzene	330	380 U	400 U	500 U	360 U	390 UJ
1,3-Dichlorobenzene	330	380 U	400 U	500 U	360 U	390 UJ
1,4-Dichlorobenzene	330	380 U	400 U	500 U	360 U	390 UJ
2,2'-oxybis(1-Chloropropane)	330	380 U	400 U	500 U	360 U	390 UJ
2,4,5-Trichlorophenol	800	920 U	970 U	1200 U	870 U	960 UJ
2,4,6-Trichlorophenol	330	380 U	400 U	500 U	360 U	390 UJ
2,4-Dichlorophenol	330	380 U	400 U	500 U	360 U	390 UJ
2,4-Dimethylphenol	330	380 U	400 U	500 U	360 U	390 UJ
2,4-Dinitrophenol	800	920 U	970 U	1200 U	870 U	960 UJ
2,4-Dinitrotoluene	330	380 U	400 U	500 U	360 U	390 UJ
2,6-Dinitrotoluene	330	380 U	400 U	500 U	360 U	390 UJ
2-Chloronaphthalene	330	380 U	400 U	500 U	360 U	390 UJ
2-Chlorophenol	330	380 U	400 U	500 U	360 U	390 UJ
2-Methylnaphthalene	330	380 U	400 U	500 U	360 U	390 UJ
2-Methylphenol	330	380 U	400 U	500 U	360 U	390 UJ
2-Nitroaniline	800	920 U	970 U	1200 U	870 U	960 UJ
2-Nitrophenol	330	380 U	400 U	500 U	360 U	390 UJ
3,3'-Dichlorobenzidine	330	380 UJ	400 UJ	500 UJ	360 UJ	390 UJ
3-Nitroaniline	800	920 U	970 U	1200 U	870 U	960 UJ
4,6-Dinitro-2-methylphenol	800	920 U	970 U	1200 U	870 U	960 UJ
4-Bromophenyl-phenylether	330	380 U	400 U	500 U	360 U	390 UJ
4-Chloro-3-methylphenol	330	380 U	400 U	500 U	360 U	390 UJ
4-Chloroaniline	330	380 UJ	400 UJ	500 UJ	360 UJ	390 UJ
4-Chlorophenyl-phenylether	330	380 U	400 U	500 U	360 U	390 UJ
4-Methylphenol	330	380 U	400 U	500 U	360 U	390 UJ
4-Nitroaniline	800	920 U	970 U	1200 U	870 U	960 UJ
4-Nitrophenol	800	920 U	970 U	1200 U	870 U	960 UJ
Acenaphthene	330	380 U	400 U	500 U	360 U	390 UJ
Acenaphthylene	330	380 U	400 U	500 U	360 U	390 UJ
Anthracene	330	380 U	400 U	64 J	360 U	390 UJ
Benzo(a)anthracene	330	380 U	400 U	500 U	360 U	390 UJ
Benzo(a)pyrene	330	380 U	400 U	500 U	360 U	390 UJ
Benzo(b)fluoranthene	330	380 U	400 U	500 U	360 U	390 UJ
Benzo(g,h,i)perylene	330	380 U	400 U	500 U	360 U	390 UJ
Benzo(k)fluoranthene	330	380 U	400 U	500 U	360 U	390 UJ
Butylbenzylphthalate	330	380 U	400 U	500 U	360 U	390 UJ
Carbazole	330	380 U	400 U	500 U	360 U	390 UJ
Chrysene	330	380 U	400 U	500 U	360 U	390 UJ
Di-n-butylphthalate	330	380 U	400 U	500 U	360 U	390 UJ

LOCATION NAME:		SD-09	SD-09	SD-11	SD-12	SD-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-09-0.0-0.3-FD-D-746-5	SE-09-0.0-0.3-NX-D-716-5	SE-11-0.0-0.3-NX-D-717-5	SE-12-0.0-0.3-NX-D-718-5	SE-16-0.0-0.3-NX-D-720-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
Di-n-octylphthalate	330	380 U	400 U	500 U	360 U	390 UJ
Dibenz(a,h)anthracene	330	380 U	400 U	500 U	360 U	390 UJ
Dibenzofuran	330	380 U	400 U	500 U	360 U	390 UJ
Diethylphthalate	330	380 U	400 U	500 U	360 U	390 UJ
Dimethylphthalate	330	380 U	400 U	500 U	360 U	390 UJ
Fluoranthene	330	380 U	400 U	81 J	360 U	390 UJ
Fluorene	330	380 U	400 U	500 U	360 U	390 UJ
Hexachlorobenzene	330	380 U	400 U	500 U	360 U	390 UJ
Hexachlorobutadiene	330	380 U	400 U	500 U	360 U	390 UJ
Hexachlorocyclopentadiene	330	380 U	400 U	500 U	360 U	390 UJ
Hexachloroethane	330	380 U	400 U	500 U	360 U	390 UJ
Indeno(1,2,3-cd)pyrene	330	380 U	400 U	500 U	360 U	390 UJ
Isophorone	330	380 U	400 U	500 U	360 U	390 UJ
N-Nitroso-di-n-propylamine	330	380 U	400 U	500 U	360 U	390 UJ
N-Nitrosodiphenylamine	330	380 U	400 U	500 U	360 U	390 UJ
Naphthalene	330	380 U	400 U	500 U	360 U	390 UJ
Nitrobenzene	330	380 U	400 U	500 U	360 U	390 UJ
Pentachlorophenol	800	920 U	970 U	1200 U	870 U	960 UJ
Phenanthrene	330	380 U	400 U	57 J	360 U	390 UJ
Phenol	330	380 U	400 U	500 U	360 U	390 UJ
Pyrene	330	380 U	400 U	39 J	360 U	390 UJ
bis(2-Chloroethoxy)methane	330	380 U	400 U	500 U	360 U	390 UJ
bis(2-Chloroethyl) ether	330	380 U	400 U	500 U	360 U	390 UJ
bis(2-Ethylhexyl)phthalate	330	380 U	400 U	500 U	360 U	390 UJ
PESTICIDES/PCBs	CRQL(ug/kg)					
4,4'-DDD	3.3	4.1 U	3.9 U	8.0	3.8 U	4.0 U
4,4'-DDE	3.3	4.1 U	3.9 U	4.3 J	3.8 U	4.0 U
4,4'-DDT	3.3	4.1 U	3.9 U	5.3 U	3.8 U	4.0 U
Aldrin	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
Aroclor-1016	33.0	41 U	39 U	53 U	38 U	40 U
Aroclor-1221	67.0	83 U	79 U	110 U	76 U	82 U
Aroclor-1232	33.0	41 U	39 U	53 U	38 U	40 U
Aroclor-1242	33.0	41 U	39 U	53 U	38 U	40 U
Aroclor-1248	33.0	41 U	39 U	53 U	38 U	40 U
Aroclor-1254	33.0	41 U	39 U	53 U	38 U	40 U
Aroclor-1260	33.0	41 U	39 U	53 U	38 U	40 U
Dieldrin	3.3	4.1 U	3.9 U	5.3 U	3.8 U	4.0 U

LOCATION NAME:		SD-09	SD-09	SD-11	SD-12	SD-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-09-0.0-0.3-FD-D-746-5	SE-09-0.0-0.3-NX-D-716-5	SE-11-0.0-0.3-NX-D-717-5	SE-12-0.0-0.3-NX-D-718-5	SE-16-0.0-0.3-NX-D-720-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
Endosulfan I	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
Endosulfan II	3.3	4.1 U	3.9 U	5.3 U	3.8 U	4.0 U
Endosulfan Sulfate	3.3	4.1 U	3.9 U	5.3 U	3.8 U	4.0 U
Endrin	3.3	4.1 U	3.9 U	5.3 U	3.8 U	4.0 U
Endrin Aldehyde	3.3	4.1 U	3.9 U	5.3 U	3.8 U	4.0 U
Endrin Ketone	3.3	4.1 U	3.9 U	5.3 U	3.8 U	4.0 U
Heptachlor	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
Heptachlor Epoxide	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
Methoxychlor	17.0	21 U	20 U	27 U	19 U	21 U
Toxaphene	170.0	210 U	200 U	270 U	190 U	210 U
alpha-BHC	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
alpha-Chlordane	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
beta-BHC	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
delta-BHC	1.7	2.1 U	0.60 J	1.3 J	0.73 J	0.57 J
gamma-BHC(Lindane)	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
gamma-Chlordane	1.7	2.1 U	2.0 U	2.7 U	1.9 U	2.1 U
METALS	CRDL(mg/kg)					
Aluminum	200	1770	2010	1860	1860	2170
Antimony	60	4.8 UJ	4.6 UJ	7.3 UJ	3.8 UJ	4.7 UJ
Arsenic	10	0.50	0.24 U	0.34 U	1.1	0.87
Barium	200	5.6	6.8	10.5	10.8	8.4
Beryllium	5	0.12 U	0.11 U	0.18 U	0.27	0.27
Cadmium	5	0.36 U	0.34 U	0.55 U	0.56 U	0.35 U
Calcium	5000	179	174	555	232	242
Chromium	10	1.3	1.4	2.2	1.5	2.1
Cobalt	50	0.36 U	1.0	0.55 U	1.0	1.2
Copper	25	1.1 U	1.1 U	1.8 U	0.72 U	1.0 U
Iron	100	3860	4110	3680	9630	8640
Lead	3	4.1	3.1	7.6	2.3	4.1
Magnesium	5000	384	483	329	388	506
Manganese	15	55.5	60.8	75.9	79.9	57.8
Mercury	0.2	0.05 UJ	0.05 UJ	0.09 UJ	0.05 UJ	0.05 UJ
Nickel	40	2.4 U	2.3 U	3.6 U	3.8	2.4 U
Potassium	5000	355 U	536 U	338 U	651 U	402 U
Selenium	5	0.22 U	0.24 U	0.34 U	0.41 U	0.24 U
Silver	10	0.36 U	0.34 U	0.55 U	0.56 U	0.35 U
Sodium	5000	165 U	121 U	201 U	106 U	162 U

LOCATION NAME:		SD-09	SD-09	SD-11	SD-12	SD-16
STREAM:		MITCHELL BROOK	MITCHELL BROOK	SAUGATUCKET RIVER	MITCHELL BROOK	MITCHELL BROOK
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-09-0.0-0.3-FD-D-746-5	SE-09-0.0-0.3-NX-D-716-5	SE-11-0.0-0.3-NX-D-717-5	SE-12-0.0-0.3-NX-D-718-5	SE-16-0.0-0.3-NX-D-720-5
DATE SAMPLED:		05/27/92	05/27/92	05/27/92	05/26/92	06/01/92
REMARKS:		Field Duplicate				
Thallium	10	0.22 U	0.24 U	0.34 U	0.41 U	0.24 U
Vanadium	50	3.6 U	4.0 U	4.5 U	4.5 U	4.4 U
Zinc	20	9.3 U	12.6 U	14.5 U	12.6 U	11.9 U
SOIL QUALITY PARAMETERS						
CYANIDE	CRDL(mg/kg)					
Cyanide	20	2.51 U	2.59 U	3.75 U	0.57 U	2.61 U
AMMONIA	QL(mg/kg)					
Ammonia	0.75	1.07 U	1.04 U	2.01	25.6	4.36
TOTAL COMBUSTIBLE ORGANICS						
Moisture Content	(%)	31.8	31.2	97.9	16.9	26.6
Organic Content	(%)	1.3	1.2	5.6	1.1	1.8
Solids Content	(%)	75.9	76.2	50.5	85.5	79
GRAIN SIZE						
Clay	(%)	0	0	0	0	0
Gravel	(%)	13.2	8.1	0.7	7.5	0.9
Sand	(%)	84.2	88.7	93.1	91	95.7
Silt	(%)	2.6	3.2	6.2	1.5	3.4

LOCATION NAME:	SD-17	SD-18
STREAM:	SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):	0.0-0.3	0.0-0.3
M&E SAMPLE ID:	SE-17-0.0-0.3-NX-D-721-5	SE-18-0.0-0.3-NX-D-719-5
DATE SAMPLED:	06/01/92	06/01/92
REMARKS:		

VOLATILE ORGANICS-CLP	CRQL(ug/kg)		
1,1,1-Trichloroethane	10	12 U	15 U
1,1,2,2-Tetrachloroethane	10	12 U	15 U
1,1,2-Trichloroethane	10	12 U	15 U
1,1-Dichloroethane	10	12 U	15 U
1,1-Dichloroethene	10	12 U	15 U
1,2-Dichloroethane	10	12 U	15 U
1,2-Dichloroethene(total)	10	12 U	15 U
1,2-Dichloropropane	10	12 U	15 U
2-Butanone	10	12 U	15 U
2-Hexanone	10	12 U	15 U
4-Methyl-2-pentanone	10	12 U	15 U
Acetone	10	22 UJ	21 UJ
Benzene	10	12 U	15 U
Bromodichloromethane	10	12 U	15 U
Bromoform	10	12 U	15 U
Bromomethane	10	12 U	15 U
Carbon Disulfide	10	12 U	15 U
Carbon Tetrachloride	10	12 U	15 U
Chlorobenzene	10	12 U	15 U
Chloroethane	10	12 U	15 U
Chloroform	10	12 U	15 U
Chloromethane	10	12 U	15 U
Dibromochloromethane	10	12 U	15 U
Ethylbenzene	10	12 U	15 U
Methylene Chloride	10	17 U	16 U
Styrene	10	12 U	15 U
Tetrachloroethene	10	12 U	15 U
Toluene	10	12 U	15 U
Total Xylenes	10	12 U	15 U
Trichloroethene	10	12 U	15 U
Vinyl Chloride	10	12 U	15 U
cis-1,3-Dichloropropene	10	12 U	15 U
trans-1,3-Dichloropropene	10	12 U	15 U
SEMIVOLATILE ORGANICS	**CRQL(ug/kg)**		
1,2,4-Trichlorobenzene	330	390 U	460 U

LOCATION NAME:		SD-17	SD-18
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-17-0.0-0.3-NX-D-721-5	SE-18-0.0-0.3-NX-D-719-5
DATE SAMPLED:		06/01/92	06/01/92
REMARKS:			
1,2-Dichlorobenzene	330	390 U	460 U
1,3-Dichlorobenzene	330	390 U	460 U
1,4-Dichlorobenzene	330	390 U	460 U
2,2'-oxybis(1-Chloropropane)	330	390 U	460 U
2,4,5-Trichlorophenol	800	940 U	1100 U
2,4,6-Trichlorophenol	330	390 U	460 U
2,4-Dichlorophenol	330	390 U	460 U
2,4-Dimethylphenol	330	390 U	460 U
2,4-Dinitrophenol	800	940 U	1100 U
2,4-Dinitrotoluene	330	390 U	460 U
2,6-Dinitrotoluene	330	390 U	460 U
2-Chloronaphthalene	330	390 U	460 U
2-Chlorophenol	330	390 U	460 U
2-Methylnaphthalene	330	390 U	460 U
2-Methylphenol	330	390 U	460 U
2-Nitroaniline	800	940 U	1100 U
2-Nitrophenol	330	390 U	460 U
3,3'-Dichlorobenzidine	330	390 U	460 U
3-Nitroaniline	800	940 UJ	1100 UJ
4,6-Dinitro-2-methylphenol	800	940 U	1100 U
4-Bromophenyl-phenylether	330	390 U	460 U
4-Chloro-3-methylphenol	330	390 U	460 U
4-Chloroaniline	330	390 U	460 U
4-Chlorophenyl-phenylether	330	390 U	460 U
4-Methylphenol	330	390 U	460 U
4-Nitroaniline	800	940 U	1100 U
4-Nitrophenol	800	940 U	1100 U
Acenaphthene	330	390 U	460 U
Acenaphthylene	330	390 U	460 U
Anthracene	330	390 U	460 U
Benzo(a)anthracene	330	390 U	460 U
Benzo(a)pyrene	330	390 U	460 U
Benzo(b)fluoranthene	330	390 U	460 U
Benzo(g,h,i)perylene	330	390 U	460 U
Benzo(k)fluoranthene	330	390 U	460 U
Butylbenzylphthalate	330	390 U	460 U
Carbazole	330	390 U	460 U
Chrysene	330	390 U	460 U
Di-n-butylphthalate	330	390 U	460 U

LOCATION NAME:		SD-17	SD-18
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-17-0.0-0.3-NX-D-721-5	SE-18-0.0-0.3-NX-D-719-5
DATE SAMPLED:		06/01/92	06/01/92
REMARKS:			
Di-n-octylphthalate	330	390 U	460 U
Dibenz(a,h)anthracene	330	390 U	460 U
Dibenzofuran	330	390 U	460 U
Diethylphthalate	330	390 U	460 U
Dimethylphthalate	330	390 U	460 U
Fluoranthene	330	390 U	460 U
Fluorene	330	390 U	460 U
Hexachlorobenzene	330	390 U	460 U
Hexachlorobutadiene	330	390 U	460 U
Hexachlorocyclopentadiene	330	390 U	460 U
Hexachloroethane	330	390 U	460 U
Indeno(1,2,3-cd)pyrene	330	390 U	460 U
Isophorone	330	390 U	460 U
N-Nitroso-di-n-propylamine	330	390 U	460 U
N-Nitrosodiphenylamine	330	390 U	460 U
Naphthalene	330	390 U	460 U
Nitrobenzene	330	390 U	460 U
Pentachlorophenol	800	940 U	1100 U
Phenanthrene	330	390 U	460 U
Phenol	330	390 U	460 U
Pyrene	330	390 U	460 U
bis(2-Chloroethoxy)methane	330	390 U	460 U
bis(2-Chloroethyl) ether	330	390 U	460 U
bis(2-Ethylhexyl)phthalate	330	390 U	460 U
PESTICIDES/PCBs	CRQL(ug/kg)		
4,4'-DDD	3.3	4.0 U	4.7 U
4,4'-DDE	3.3	4.0 U	1.2 J
4,4'-DDT	3.3	4.0 U	4.7 U
Aldrin	1.7	2.1 U	2.4 U
Aroclor-1016	33.0	40 U	47 U
Aroclor-1221	67.0	82 U	95 U
Aroclor-1232	33.0	40 U	47 U
Aroclor-1242	33.0	40 U	47 U
Aroclor-1248	33.0	40 U	47 U
Aroclor-1254	33.0	40 U	47 U
Aroclor-1260	33.0	40 U	47 U
Dieldrin	3.3	4.0 U	4.7 U

LOCATION NAME:		SD-17	SD-18
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-17-0.0-0.3-NX-D-721-5	SE-18-0.0-0.3-NX-D-719-5
DATE SAMPLED:		06/01/92	06/01/92
REMARKS:			
Endosulfan I	1.7	2.1 U	2.4 U
Endosulfan II	3.3	4.0 U	4.7 U
Endosulfan Sulfate	3.3	4.0 U	4.7 U
Endrin	3.3	4.0 U	4.7 U
Endrin Aldehyde	3.3	4.0 U	4.7 U
Endrin Ketone	3.3	4.0 U	4.7 U
Heptachlor	1.7	2.1 U	2.4 U
Heptachlor Epoxide	1.7	2.1 U	2.4 U
Methoxychlor	17.0	21 U	24 U
Toxaphene	170.0	210 U	240 U
alpha-BHC	1.7	2.1 U	2.4 U
alpha-Chlordane	1.7	2.1 U	2.4 U
beta-BHC	1.7	2.1 U	2.4 U
delta-BHC	1.7	0.75 J	0.68 J
gamma-BHC(Lindane)	1.7	2.1 U	2.4 U
gamma-Chlordane	1.7	2.1 U	2.4 U
METALS	CRDL(mg/kg)		
Aluminum	200	1320	1420
Antimony	60	5.0 UJ	6.3 UJ
Arsenic	10	0.25 U	0.28 U
Barium	200	3.5	4.0
Beryllium	5	0.12 U	0.16 U
Cadmium	5	0.37 U	0.47 U
Calcium	5000	144 U	399
Chromium	10	1.1	2.5
Cobalt	50	1.0	0.47 U
Copper	25	0.56 U	0.93 U
Iron	100	3100	3720
Lead	3	3.7	13.5
Magnesium	5000	489	154
Manganese	15	87.1	128
Mercury	0.2	0.05 UJ	0.07 UJ
Nickel	40	2.5 U	3.2 U
Potassium	5000	272 U	422 U
Selenium	5	0.25 U	0.58
Silver	10	0.37 U	0.47 U
Sodium	5000	120 U	199 U

LOCATION NAME:		SD-17	SD-18
STREAM:		SAUGATUCKET RIVER	SAUGATUCKET RIVER
SAMPLE DEPTH (FT):		0.0-0.3	0.0-0.3
M&E SAMPLE ID:		SE-17-0.0-0.3-NX-D-721-5	SE-18-0.0-0.3-NX-D-719-5
DATE SAMPLED:		06/01/92	06/01/92
REMARKS:			
Thallium	10	0.25 U	0.28 U
Vanadium	50	2.5 U	3.1 U
Zinc	20	8.0 U	6.4 U

SOIL QUALITY PARAMETERS

CYANIDE	CRDL(mg/kg)		
Cyanide	20	2.58 U	3.35 U
AMMONIA	QL(mg/kg)		
Ammonia	0.75	2.17	1.07 U
TOTAL COMBUSTIBLE ORGANICS			
Moisture Content	(%)	29.5	53.4
Organic Content	(%)	1.5	2.2
Solids Content	(%)	77.2	65.2
GRAIN SIZE			
Clay	(%)	0	0
Gravel	(%)	8.4	25.4
Sand	(%)	89.8	69.4
Silt	(%)	1.8	5.2

D-13 SUMMA CANISTER DATA, SOIL GAS

Volatile Analysis of SUMMA Canisters
(ppbv)

SITE: ROSE HILL REGIONAL LANDFILL
SAS NO.: 7165A SDG NO.: SA1401

TRAFFIC REPORT NUMBER:			SA1401		SA1402		SA1403		SA1404		SA1405		SA1406	
M&E SAMPLE ID:			SG-SS(08+000)-12		SG-BW(04+100)-06		SG-BW(05+500)-12		SG-SW(13+300)-12		SG-SW(11+500)-05		SG-SWD(13+300)-12	
COMPOUND	CRQL	MW		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3
Dichlorodifluromethane	5	120.9	8 U	0.04	282 J	1.39	5200	26	12000 J	59	9200	45	22000 J	100
Freon 114	5	170.9	8 U	0.06	360 U	2.5	330 U	2.3	40000 U	300	280 J	2.0	140000 U	980
Chloromethane	5	50.5	8 U	0.02	360 U	0.74	330 U	0.68	40000 U	80	1400 J	2.9	140000 UJ	290
Vinyl Chloride	5	62.5	8 U	0.02	5500 D	14	470	1.2	490000 A	1300	400000 D	1000	1200000	3100
Bromomethane	5	95	8 U	0.03	360 U	1.4	330 U	1.3	40000 U	200	1800 U	7.0	140000 U	540
Chloroethane	5	64.5	8 U	0.02	740 J	1.9	670	1.8	6600 J	17	1800 U	4.7	140000 U	370
Trichlorofluoromethane	5	137.4	8 U	0.05	230 J	1.3	28 J	0.16	40000 U	200	250 J	1.4	140000 U	790
1,1-Dichloroethene	5	97	8 U	0.03	78 J	0.31	23 J	0.091	5600 J	22	3800	15	8100 J	32
Carbon Disulfide	5	76.1	8 U	0.03	360 U	1.1	330 U	1.0	40000 U	100	280 J	0.87	140000 U	430
Freon 113	5	187.4	8 U	0.06	14 J	0.11	330 U	2.5	40000 U	300	31 J	0.24	140000 U	1100
Acetone	5	58.1	34	0.08	560 J	1.3	330 U	0.78	40000 U	90	1800 U	4.3	140000 U	330
Methylene Chloride	5	84.9	0.6 J	0.002	260 J	0.90	680	2.4	8000 J	30	2400	8.3	19000 J	66
trans-1,2-Dichloroethene	5	97	8 U	0.03	75 J	0.30	28 J	0.11	3600 J	14	1000 J	4	6700 J	27
1,1-Dichloroethane	5	99	8 U	0.03	1700 J	6.9	510	2.1	22000 J	89	3900	16	34000 J	140
cis-1,2-Dichloroethene	5	97	8 U	0.03	4400 A	17	1200	4.8	2300000 A	9100	1800000 D	7100	5900000 J	23000
2-Butanone	5	72.1	8 U	0.02	740 J	2.2	590 A	1.7	40000 U	100	1800 U	5.3	140000 U	410
Chloroform	5	119.4	8 U	0.04	360 U	1.8	330 U	1.6	40000 U	200	1800 U	8.8	140000 U	680
1,1,1-Trichloroethane	5	133.4	8 U	0.04	310 J	1.7	330 U	1.8	1900 J	10	230 J	1.3	140000 U	760
Carbon Tetrachloride	5	153.8	8 U	0.05	360 U	2.3	330 U	2.1	40000 U	300	45 J	0.28	140000 U	880
Benzene	5	78.1	8 U	0.03	920 J	2.9	95 AJ	0.30	2500 J	8.0	620 J	2.0	140000 U	450
1,2-Dichloroethane	5	99	8 U	0.03	360 U	1.5	330 U	1.3	40000 U	160	1800 U	7.3	140000 U	570
Trichloroethene	5	131.4	8 U	0.04	570 J	3.1	700 A	3.8	2700 J	14	5700	31	140000 U	750
1,2-Dichloropropane	5	113	8 U	0.04	360 U	1.7	330 U	1.5	40000 U	200	1800 U	8.3	140000 U	650
Bromodichloromethane	5	163.9	8 U	0.05	360 U	2.4	330 U	2.2	40000 U	300	1800 U	12	140000 U	940
2-Chloroethyl Vinyl Ether	5	106.6	8 U	0.04	360 U	1.6	330 U	1.4	40000 U	200	1800 U	7.8	140000 U	610
cis-1,3-Dichloropropene	5	111	8 U	0.04	360 U	1.6	330 U	1.5	40000 U	200	1800 U	8.2	140000 U	630
4-Methyl-2-pentanone	5	100.2	8 U	0.03	360 U	1.5	330 U	1.3	1600 J	6.5	1800 U	7.4	140000 U	570
Toluene	5	92.1	8 U	0.03	9100 A	34	5700	21	22000 J	83	19000	71	62000 J	230
trans-1,3-Dichloropropene	5	111	8 U	0.04	360 U	1.6	330 U	1.5	40000 U	200	1800 U	8.2	140000 U	630
1,1,2-Trichloroethane	5	133.4	8 U	0.04	360 U	2.0	330 U	1.8	40000 U	200	1800 U	9.8	140000 U	760
Tetrachloroethene	5	165.8	8 U	0.06	130 J	0.88	200 J	1	40000 U	300	1200 J	8.1	140000 U	950
Dibromochloromethane	5	208.3	8 U	0.07	360 U	3.1	330 U	2.8	40000 U	300	1800 U	15	140000 U	1200
1,2-Dibromomethane	5	173.9	8 U	0.06	360 U	2.6	330 U	2.3	40000 U	300	1800 U	13	140000 U	990
2-Hexanone	5	100.2	8 U	0.03	360 U	1.5	330 U	1.3	40000 U	200	1800 U	7.4	140000 U	570
Chlorobenzene	5	112.6	8 U	0.04	360 U	1.7	330 U	1.5	40000 U	200	1800 U	8.3	140000 U	640
Ethylbenzene	5	106.2	2 J	0.01	2800 J	12	1300	5.6	40000 U	200	3000	10	140000 U	610
m,p-Xylene	5	106.2	4 J	0.02	5600 J	24	750	3.3	40000 U	200	5600	24	140000 U	610
o-Xylene	5	106.2	2 J	0.01	1500 J	6.5	160 J	0.69	40000 U	200	1000 J	4	140000 U	610
Styrene	5	104.2	8 U	0.03	1100 J	4.7	250 J	1.1	40000 U	200	1800 U	7.7	140000 U	600
Bromoform	5	252.8	8 U	0.08	360 U	3.7	330 U	3.4	40000 U	400	230 J	2.4	140000 U	1400
1,1,2,2-Tetrachloroethane	5	167.9	8 U	0.06	360 U	2.5	330 U	2.3	40000 U	300	1800 U	12	140000 U	960
1,3,5-Trimethylbenzene	5	120.2	0.6 J	0.003	310 J	1.5	61 AJ	0.30	870 J	4.3	150 J	0.74	140000 U	690
1,2,4-Trimethylbenzene	5	120.2	1 J	0.005	470 J	2.3	160 J	0.78	40000 U	200	220 J	1.1	140000 U	690
1,3-Dichlorobenzene	5	147	8 U	0.05	360 U	2.2	330 U	2.0	40000 U	200	1800 U	11	140000 U	840

Volatile Analysis of SUMMA Canisters
(ppbv)

SITE: ROSE HILL REGIONAL LANDFILL
SAS NO.: 7165A SDG NO.: SA1401

TRAFFIC REPORT NUMBER:			SA1401		SA1402		SA1403		SA1404		SA1405		SA1406	
M&E SAMPLE ID:			SG-SS(08+000)-12		SG-BW(04+100)-06		SG-BW(05+500)-12		SG-SW(13+300)-12		SG-SW(11+500)-05		SG-SWD(13+300)-12	
COMPOUND	CRQL	MW		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3
1,4-Dichlorobenzene	5	147	8 U	0.05	360 U	2.2	330 U	2.0	40000 U	200	1800 U	11	140000 U	840
Benzyl Chloride	5	126.6	8 U	0.04	360 U	1.9	330 U	1.7	40000 U	200	1800 U	9.3	140000 U	720
1,2-Dichlorobenzene	5	147	8 U	0.05	360 U	2.2	330 U	2.0	40000 U	200	1800 U	11	140000 U	840
1,2,4-Trichlorobenzene	5	181.5	8 U	0.06	360 U	2.7	37 J	0.27	40000 U	300	1800 U	13	140000 U	1000
Hexachlorbutadiene	5	260.8	8 U	0.09	360 U	3.8	29 J	0.31	40000 U	400	1800 U	19	140000 U	1500

DILUTION FACTOR:	1.642110	73.12241	66	7887.555	357.7192	28219.79
RECEIPT PRESSURE (in Hg):	5.5	2.5	2	4.5	7.5	1.5
FINAL PRESSURE (psi):	5	5	5	5	5	5
SAMPLE VOLUME:	1000	20	25	0.2	5	0.05
DATE SAMPLED:	05/07/92	05/08/92	05/11/92	05/12/92	05/12/92	05/12/92
DATE ANALYZED:	05/20/92	05/20/92	05/21/92	05/20/92	05/21/92	05/22/92
REMARKS:						

Footnotes:

CRQL - Contract Required Quantitation Limits.
J - Quantitation is approximate due to limitations identified in the quality control review .
U - Value reported is the sample detection limit.
R - Value is rejected.
UJ - Sample detection limit is approximate due to limitations identified in the quality control review.
D - Quantitation is from a diluted sample result.
DJ - Quantitation is from a diluted sample result, but should be considered estimated due to limitations identified in the quality control review.
A - Quantitation is the average of two diluted analysis results.
AJ - Quantitation is the average of two diluted analysis results, but should be considered estimated due to limitations identified in the quality control review.

SITE: ROSE HILL REGIONAL LANDFILL
SAS NO.: 7165A SDG NO.: SA1

TRAFFIC REPORT NUMBER:			SA1407			SA1408		
M&E SAMPLE ID:			SG-SW(03+300)-06			SG-EB(05-011)-0		
COMPOUND	CRQL	MW			mg/m3			mg/m3
Dichlorodifluromethane	5	120.9	210		1.0	0.3	J	0.001
Freon 114	5	170.9	160	U	1.1	6	U	0.04
Chloromethane	5	50.5	160	UJ	0.33	6	U	0.01
Vinyl Chloride	5	62.5	1200		3.1	6	U	0.02
Bromomethane	5	95	160	U	0.62	6	U	0.02
Chloroethane	5	64.5	450		1.2	6	U	0.02
Trichlorofluoromethane	5	137.4	32	J	0.18	0.1	J	0.0006
1,1-Dichloroethene	5	97	10	J	0.04	6	U	0.02
Carbon Disulfide	5	76.1	38	J	0.12	6	U	0.02
Freon 113	5	187.4	160	U	1.2	0.3	J	0.002
Acetone	5	58.1	160	U	0.38	6	U	0.01
Methylene Chloride	5	84.9	200		0.7	6	U	0.02
trans-1,2-Dichloroethene	5	97	22	J	0.087	6	U	0.02
1,1-Dichloroethane	5	99	53	J	0.21	6	U	0.02
cis-1,2-Dichloroethene	5	97	380		1.5	0.4	J	0.002
2-Butanone	5	72.1	160	U	0.47	6	U	0.02
Chloroform	5	119.4	160	U	0.78	6	U	0.03
1,1,1-Trichloroethane	5	133.4	160	U	0.87	0.2	J	0.001
Carbon Tetrachloride	5	153.8	160	U	1.0	6	U	0.04
Benzene	5	78.1	820		2.6	6	U	0.02
1,2-Dichloroethane	5	99	160	U	0.65	6	U	0.02
Trichloroethene	5	131.4	84	J	0.45	6	U	0.03
1,2-Dichloropropane	5	113	160	U	0.74	6	U	0.03
Bromodichloromethane	5	163.9	160	U	1.1	6	U	0.04
2-Chloroethyl Vinyl Ether	5	106.6	160	U	0.70	6	U	0.03
cis-1,3-Dichloropropene	5	111	160	U	0.72	6	U	0.03
4-Methyl-2-pentanone	5	100.2	160	U	0.65	6	U	0.02
Toluene	5	92.1	5500	A	21	0.6	J	0.002
trans-1,3-Dichloropropene	5	111	160	U	0.72	6	U	0.03
1,1,2-Trichloroethane	5	133.4	160	U	0.87	6	U	0.03
Tetrachloroethene	5	165.8	84	J	0.57	0.1	J	0.0007
Dibromochloromethane	5	208.3	160	U	1.4	6	U	0.05
1,2-Dibromomethane	5	173.9	160	U	1.1	6	U	0.04
2-Hexanone	5	100.2	160	U	0.65	6	U	0.02
Chlorobenzene	5	112.6	160	U	0.74	6	U	0.03
Ethylbenzene	5	106.2	5800	A	25	6	U	0.03
m,p-Xylene	5	106.2	9400	A	41	6	U	0.03
o-Xylene	5	106.2	2500	A	11	6	U	0.03
Styrene	5	104.2	160	U	0.68	6	U	0.03
Bromoform	5	252.8	160	U	1.7	6	U	0.06
1,1,2,2-Tetrachloroethane	5	167.9	160	U	1.1	6	U	0.04
1,3,5-Trimethylbenzene	5	120.2	210		1.0	6	U	0.03
1,2,4-Trimethylbenzene	5	120.2	500		2	6	U	0.03
1,3-Dichlorobenzene	5	147	160	U	0.96	6	U	0.04

SITE: ROSE HILL REGIONAL LANDFILL
SAS NO.: 7165A SDG NO.: SA1

TRAFFIC REPORT NUMBER:			SA1407			SA1408	
M&E SAMPLE ID:			SG-SW(03+300)-06			SG-EB(05-011)-0	
COMPOUND	CRQL	MW			mg/m3		mg/m3
1,4-Dichlorobenzene	5	147	72	J	0.43	6 U	0.04
Benzyl Chloride	5	126.6	160	U	0.83	6 U	0.03
1,2-Dichlorobenzene	5	147	160	U	0.96	6 U	0.04
1,2,4-Trichlorobenzene	5	181.5	160	U	1.2	6 U	0.04
Hexachlorbutadiene	5	260.8	160	U	1.7	6 U	0.06

DILUTION FACTOR:	32.18325	1.304736
RECEIPT PRESSURE (in Hg):	5	-0.81442
FINAL PRESSURE (psi):	5	5
SAMPLE VOLUME:	50	1000
DATE SAMPLED:	05/13/92	05/11/92
DATE ANALYZED:	05/22/92	05/20/92
REMARKS:		

Footnotes:

CRQL - Contract Required Quantitation Limits.
J - Quantitation is approximate due to limitations identified in the quality control review
U - Value reported is the sample detection limit.
R - Value is rejected.
UJ - Sample detection limit is approximate due to limitations identified in the quality control review.
D - Quantitation is from a diluted result.
DJ - Quantitation is from a diluted result, but should be consider estimated due to limitations identified in the quality control review.
A - Quantitation is the average of diluted analysis results.
AJ - Quantitation is the average of diluted analysis results, but considered estimated due to li identified in the quality cont

D-14 STATISTICAL ANALYSIS OF ANALYTICAL DATA

- RESULTS OF STATISTICAL ANALYSES
- DATA USED FOR STATISTICAL ANALYSES

RESULTS OF STATISTICAL ANALYSES

TABLE D-1. RESULTS OF STATISTICAL EVALUATIONS (1)

	BACKGROUND								NON-BACKGROUND		
					SURFACE WATER		SEDIMENT				
	SHALLOW OVER-BURDEN	BEDROCK	SURFACE SOIL	SUBSURFACE SOIL	SAUGATUCKET	MITCHELL BROOK	SAUGATUCKET	MITCHELL BROOK	SHALLOW OVERBURDEN v. BEDROCK	LEACHATE v. OVERBURDEN	LEACHATE v. SURFACE WATER
Aluminum	B	SWA(87%)	B	B		N	SD-05,SD-04(93%)	B	SHALLOB	B	
Antimony				N							
Arsenic			B								
Barium	N	SWA(94%)	N				SD-(04,05,06,08,11)	B	SHALLOB	LE(84%)	N
Beryllium				N	B						
Calcium	N	SWA			SW-08(91%)	SW-12		B	SHALLOB	LE(94%)	N
Chromium			B	B				B			
Cobalt	B		N	B						N	
Copper	B		SSA-S	#							
Iron	N	N	N	B		SW-12;SW-07(93%)	SD-(03,04,05,06,08,11)	N	SHALLOB	LE	LE
Lead	B		N	N			N(NP;04,05,06,11)	N			
Magnesium	N	SWA	N	B	SW-05,SW-08	SW-07,SW-12	N(NP;04,05,06,11)	B	SHALLOB	LE(89%)	N
Manganese	N	SWA	N	B	SW-(05,06,08,11)	SW-07,SW-12	SD-(03,04,05,06,08,11)	N	SHALLOB	LE	LE
Nickel								B			
Potassium		SWA(87%)	N	N				B			
Sodium	N	SWA			SW-(05,06,11)	SW-12(94%)			SHALLOB	LE(90%)	B
Spec. Cond.	SWA	SWA			SW-(04,05,06,08,11)	SW-07,SW-12			SHALLOB	LE	LE
Vanadium	SWA(93%)		B	B				B			
Zinc	N		N	N				B			

NOTES:
1. Where information is not presented, statistical evaluations were not conducted.
SHALLOB - Shallow Overburden Flow Zone
SWA - Solid Waste Area
SSA-S - Sewage Sludge Area (samples where sludge material was visually observed)
SSA-N - Sewage Sludge Area (samples where sludge material was not visually observed)
LE - Leachate
B - Indicates background sample average exceeds all other sample group averages.
N - Parameteric testing indicates that no samples showed average concentrations significantly (95%) above background.
NP - Indicates results of non-parametric testing for data which do not demonstrably require such testing, should be considered valid.
- Differences may be present not resolvable due to insufficient no. of data.
Quantity limitations particularly severe for Saugatucket sediment and leachate v. surface water.
( ) - Designates the confidence level if different than 95%.

DATA USED FOR STATISTICAL ANALYSES

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS IN BOREHOLES BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX	SAMPLING ROUND
BKGD	Aluminum	11800		BH-05	BH	2
BKGD	Aluminum	3955		BH-05	BH	2
SSA-N	Aluminum	4910		BH-03	BH	2
SSA-N	Aluminum	4950		BH-04	BH	2
SSA-N	Aluminum	6000		BH-04	BH	2
SSA-N	Aluminum	3705		BH-02	BH	2
SSA-N	Aluminum	3750		BH-02	BH	2
SSA-S	Aluminum	5360		BH-01	BH	2
SSA-S	Aluminum	845	U	BH-03	BH	2
SSA-S	Aluminum	5490		BH-01	BH	2
SWA	Aluminum	5250		BH-07	BH	2
SWA	Aluminum	3620		MW-14-01	BH	2
BKGD	Antimony	1.95	UJ	BH-05	BH	2
BKGD	Antimony	1.75	UJ	BH-05	BH	2
SSA-N	Antimony	1.85	UJ	BH-03	BH	2
SSA-N	Antimony	1.75	UJ	BH-02	BH	2
SSA-N	Antimony	8.3	J	BH-02	BH	2
SSA-N	Antimony	9.1	J	BH-04	BH	2
SSA-N	Antimony	1.75	UJ	BH-04	BH	2
SSA-S	Antimony	16.8	J	BH-01	BH	2
SSA-S	Antimony	1.8	UJ	BH-01	BH	2
SSA-S	Antimony	5.4	J	BH-03	BH	2
SWA	Antimony	6	J	MW-14-01	BH	2
SWA	Antimony	1.9	UJ	MW-14-01	BH	2
BKGD	Beryllium	0.47		BH-05	BH	2
BKGD	Beryllium	0.585		BH-05	BH	2
SSA-N	Beryllium	0.39		BH-04	BH	2
SSA-N	Beryllium	0.53		BH-02	BH	2
SSA-N	Beryllium	0.38		BH-03	BH	2
SSA-N	Beryllium	0.65		BH-02	BH	2
SSA-N	Beryllium	0.71		BH-04	BH	2
SSA-S	Beryllium	0.35		BH-03	BH	2
SSA-S	Beryllium	0.58		BH-01	BH	2
SSA-S	Beryllium	0.61		BH-01	BH	2
SWA	Beryllium	0.39		MW-14-01	BH	2
SWA	Beryllium	0.7		MW-14-01	BH	2
BKGD	Chromium	3.75		BH-05	BH	2
BKGD	Chromium	9.2		BH-05	BH	2
SSA-N	Chromium	4.1		BH-02	BH	2
SSA-N	Chromium	3.7		BH-03	BH	2
SSA-N	Chromium	5.9		BH-04	BH	2
SSA-N	Chromium	4.1		BH-04	BH	2
SSA-N	Chromium	3.8		BH-02	BH	2
SSA-S	Chromium	1.6		BH-03	BH	2
SSA-S	Chromium	5.9		BH-01	BH	2
SSA-S	Chromium	8.9		BH-01	BH	2
SWA	Chromium	5.5		MW-14-01	BH	2
SWA	Chromium	5.5		MW-14-01	BH	2
BKGD	Cobalt	3.05		BH-05	BH	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS IN BOREHOLES BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX	SAMPLING ROUND
BKGD	Cobalt	5.4		BH-05	BH	2
SSA-N	Cobalt	4.1		BH-04	BH	2
SSA-N	Cobalt	6.3		BH-04	BH	2
SSA-N	Cobalt	2.6		BH-03	BH	2
SSA-N	Cobalt	2.4		BH-02	BH	2
SSA-N	Cobalt	4.2		BH-02	BH	2
SSA-S	Cobalt	4.2		BH-01	BH	2
SSA-S	Cobalt	3		BH-01	BH	2
SSA-S	Cobalt	1		BH-03	BH	2
SWA	Cobalt	1.8		MW-14-01	BH	2
SWA	Cobalt	3.3		MW-14-01	BH	2
BKGD	Copper	3.4		BH-05	BH	2
BKGD	Copper	3.5		BH-05	BH	2
SSA-N	Copper	4.2		BH-04	BH	2
SSA-N	Copper	6.6		BH-02	BH	2
SSA-N	Copper	6.15		BH-02	BH	2
SSA-N	Copper	10.8		BH-04	BH	2
SSA-N	Copper	7.1		BH-03	BH	2
SSA-S	Copper	15.6		BH-01	BH	2
SSA-S	Copper	79.2		BH-01	BH	2
SSA-S	Copper	1.105	U	BH-03	BH	2
SWA	Copper	18.9		MW-14-01	BH	2
SWA	Copper	7.4		MW-14-01	BH	2
BKGD	Iron	6415		BH-05	BH	2
BKGD	Iron	12800		BH-05	BH	2
SSA-N	Iron	7390		BH-04	BH	2
SSA-N	Iron	6940		BH-04	BH	2
SSA-N	Iron	5770		BH-03	BH	2
SSA-N	Iron	5890		BH-02	BH	2
SSA-N	Iron	8635		BH-02	BH	2
SSA-S	Iron	8330		BH-01	BH	2
SSA-S	Iron	3400		BH-03	BH	2
SSA-S	Iron	7230		BH-01	BH	2
SWA	Iron	4800		MW-14-01	BH	2
SWA	Iron	7540		MW-14-01	BH	2
BKGD	Lead	12.6		BH-05	BH	2
BKGD	Lead	2.55		BH-05	BH	2
SSA-N	Lead	2.3		BH-04	BH	2
SSA-N	Lead	3		BH-02	BH	2
SSA-N	Lead	4.7		BH-04	BH	2
SSA-N	Lead	4.1		BH-03	BH	2
SSA-N	Lead	3.3		BH-02	BH	2
SSA-S	Lead	8.8		BH-01	BH	2
SSA-S	Lead	5.2		BH-01	BH	2
SSA-S	Lead	0.95	U	BH-03	BH	2
SWA	Lead	19.4		MW-14-01	BH	2
SWA	Lead	20.2		MW-14-01	BH	2
BKGD	Magnesium	966		BH-05	BH	2
BKGD	Magnesium	1350		BH-05	BH	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS IN BOREHOLES BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX	SAMPLING ROUND
SSA-N	Magnesium	896		BH-02	BH	2
SSA-N	Magnesium	810		BH-03	BH	2
SSA-N	Magnesium	1350		BH-04	BH	2
SSA-N	Magnesium	1250		BH-04	BH	2
SSA-N	Magnesium	1245		BH-02	BH	2
SSA-S	Magnesium	419		BH-03	BH	2
SSA-S	Magnesium	1120		BH-01	BH	2
SSA-S	Magnesium	1700		BH-01	BH	2
SWA	Magnesium	1090		MW-14-01	BH	2
SWA	Magnesium	738		MW-14-01	BH	2
BKGD	Manganese	147.5		BH-05	BH	2
BKGD	Manganese	125		BH-05	BH	2
SSA-N	Manganese	109		BH-04	BH	2
SSA-N	Manganese	106		BH-04	BH	2
SSA-N	Manganese	141		BH-02	BH	2
SSA-N	Manganese	32.75	U	BH-03	BH	2
SSA-N	Manganese	213		BH-02	BH	2
BKGD	Potassium	887.5		BH-05	BH	2
BKGD	Potassium	415		BH-05	BH	2
SSA-N	Potassium	394		BH-04	BH	2
SSA-N	Potassium	1060		BH-04	BH	2
SSA-N	Potassium	823		BH-02	BH	2
SSA-N	Potassium	844.5		BH-02	BH	2
SSA-N	Potassium	475		BH-03	BH	2
SSA-S	Potassium	1450		BH-01	BH	2
SSA-S	Potassium	686		BH-01	BH	2
SSA-S	Potassium	367		BH-03	BH	2
SWA	Potassium	780		MW-14-01	BH	2
SWA	Potassium	618		MW-14-01	BH	2
BKGD	Vanadium	19.3		BH-05	BH	2
BKGD	Vanadium	6.2		BH-05	BH	2
SSA-N	Vanadium	7.8		BH-02	BH	2
SSA-N	Vanadium	5.7		BH-02	BH	2
SSA-N	Vanadium	7.1		BH-04	BH	2
SSA-N	Vanadium	10.1		BH-04	BH	2
SSA-N	Vanadium	7.5		BH-03	BH	2
SSA-S	Vanadium	7.9		BH-01	BH	2
SSA-S	Vanadium	11.4		BH-01	BH	2
SSA-S	Vanadium	1.45	U	BH-03	BH	2
SWA	Vanadium	5.5		MW-14-01	BH	2
SWA	Vanadium	9.3		MW-14-01	BH	2
BKGD	Zinc	12.05	J	BH-05	BH	2
BKGD	Zinc	20		BH-05	BH	2
SSA-N	Zinc	16.7		BH-02	BH	2
SSA-N	Zinc	20.8		BH-02	BH	2
SSA-N	Zinc	16.5		BH-03	BH	2
SSA-N	Zinc	29		BH-04	BH	2
SSA-N	Zinc	18		BH-04	BH	2
SSA-S	Zinc	1.4	UJ	BH-03	BH	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS IN BOREHOLES BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX	SAMPLING ROUND
SSA-S	Zinc	188		BH-01	BH	2
SSA-S	Zinc	36.4		BH-01	BH	2
SWA	Zinc	68.2		MW-14-01	BH	2
SWA	Zinc	45.5		MW-14-01	BH	2

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SSA-S - Sewage Sludge Area - Sludge material observed in sample in the field.

SSA-N - Sewage Sludge Area - No sludge material observed in sample in the field.

SWA - Solid Waste Area

BKGD - Background

BH - Borehole

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN BEDROCK WELLS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	FLOW ZONE	SAMPLING ROUND
BKGD	Aluminum	201	J	MW-01-02	GWBR	2
BKGD	Aluminum	433		MW-01-02	GWBR	3
BKGD	Aluminum	77.5	U	MW-01-02	GWBR	4
SWA	Aluminum	43.4	U	MW-04-03	GWBR	2
SWA	Aluminum	228		MW-04-03	GWBR	3
SWA	Aluminum	96.5	U	MW-07-02	GWBR	2
SWA	Aluminum	906		MW-07-02	GWBR	3
SWA	Aluminum	278	J	MW-07-02	GWBR	4
SWA	Aluminum	1410		MW-08-02	GWBR	2
SWA	Aluminum	445	J	MW-08-02	GWBR	4
SWA	Aluminum	1570		MW-11-03	GWBR	2
SWA	Aluminum	865		MW-11-03	GWBR	3
BKGD	Barium	3.5	U	MW-01-02	GWBR	2
BKGD	Barium	12.8		MW-01-02	GWBR	3
BKGD	Barium	18.6	J	MW-01-02	GWBR	4
SWA	Barium	118		MW-08-02	GWBR	4
SWA	Barium	108		MW-11-03	GWBR	2
SWA	Barium	7		MW-04-03	GWBR	3
SWA	Barium	87.7		MW-11-03	GWBR	3
SWA	Barium	38.4		MW-07-02	GWBR	3
SWA	Barium	133		MW-08-02	GWBR	2
SWA	Barium	1	U	MW-04-03	GWBR	2
SWA	Barium	42.6		MW-07-02	GWBR	2
SWA	Barium	25.8		MW-07-02	GWBR	4
BKGD	Calcium	17200		MW-01-02	GWBR	2
BKGD	Calcium	20600		MW-01-02	GWBR	3
BKGD	Calcium	14100		MW-01-02	GWBR	4
BWA	Calcium	8460	J	MW-03-03	GWBR	2
BWA	Calcium	9670		MW-03-03	GWBR	3
SWA	Calcium	46100		MW-04-03	GWBR	2
SWA	Calcium	34200		MW-11-03	GWBR	2
SWA	Calcium	27400		MW-11-03	GWBR	3
SWA	Calcium	88300		MW-07-02	GWBR	2
SWA	Calcium	40500		MW-07-02	GWBR	4
SWA	Calcium	27800		MW-08-02	GWBR	2
SWA	Calcium	25500		MW-08-02	GWBR	4
SWA	Calcium	42000		MW-04-03	GWBR	3
SWA	Calcium	82500		MW-07-02	GWBR	3
BKGD	Iron	3815	UJ	MW-01-02	GWBR	2
BKGD	Iron	13700		MW-01-02	GWBR	3
BKGD	Iron	30900		MW-01-02	GWBR	4
BWA	Iron	5080	J	MW-03-03	GWBR	2
BWA	Iron	37100		MW-03-03	GWBR	3
SWA	Iron	2490		MW-04-03	GWBR	2
SWA	Iron	16200		MW-04-03	GWBR	3
SWA	Iron	1160		MW-11-03	GWBR	3
SWA	Iron	858		MW-07-02	GWBR	3
SWA	Iron	120.5	UJ	MW-07-02	GWBR	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN BEDROCK WELLS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	FLOW ZONE	SAMPLING ROUND
SWA	Iron	4830		MW-08-02	GWBR	2
SWA	Iron	9430	J	MW-08-02	GWBR	4
SWA	Iron	1270		MW-11-03	GWBR	2
SWA	Iron	106.5	U	MW-07-02	GWBR	2
BKGD	Magnesium	1670		MW-01-02	GWBR	2
BKGD	Magnesium	1900		MW-01-02	GWBR	3
BKGD	Magnesium	1500		MW-01-02	GWBR	4
BWA	Magnesium	1140	J	MW-03-03	GWBR	2
BWA	Magnesium	1650		MW-03-03	GWBR	3
SWA	Magnesium	4290		MW-04-03	GWBR	2
SWA	Magnesium	4080		MW-04-03	GWBR	3
SWA	Magnesium	1360		MW-07-02	GWBR	2
SWA	Magnesium	2980		MW-07-02	GWBR	3
SWA	Magnesium	1300		MW-07-02	GWBR	4
SWA	Magnesium	2100		MW-08-02	GWBR	2
SWA	Magnesium	4140		MW-08-02	GWBR	4
SWA	Magnesium	4020		MW-11-03	GWBR	2
SWA	Magnesium	3380		MW-11-03	GWBR	3
BKGD	Manganese	54.5	J	MW-01-02	GWBR	2
BKGD	Manganese	113		MW-01-02	GWBR	3
BKGD	Manganese	330		MW-01-02	GWBR	4
BWA	Manganese	43.25	J	MW-03-03	GWBR	2
BWA	Manganese	103		MW-03-03	GWBR	3
SWA	Manganese	658		MW-04-03	GWBR	2
SWA	Manganese	651		MW-04-03	GWBR	3
SWA	Manganese	6	U	MW-07-02	GWBR	2
SWA	Manganese	22.8		MW-07-02	GWBR	3
SWA	Manganese	3.05	U	MW-07-02	GWBR	4
SWA	Manganese	1350		MW-08-02	GWBR	2
SWA	Manganese	3380		MW-08-02	GWBR	4
SWA	Manganese	338		MW-11-03	GWBR	2
SWA	Manganese	206		MW-11-03	GWBR	3
BKGD	Potassium	1570		MW-01-02	GWBR	2
BKGD	Potassium	2250		MW-01-02	GWBR	3
BKGD	Potassium	2590		MW-01-02	GWBR	4
SWA	Potassium	780	U	MW-04-03	GWBR	2
SWA	Potassium	1650		MW-04-03	GWBR	3
SWA	Potassium	102000		MW-07-02	GWBR	2
SWA	Potassium	76500		MW-07-02	GWBR	3
SWA	Potassium	67700		MW-07-02	GWBR	4
SWA	Potassium	5360		MW-08-02	GWBR	2
SWA	Potassium	4420		MW-08-02	GWBR	4
SWA	Potassium	1635	U	MW-11-03	GWBR	2
SWA	Potassium	4750		MW-11-03	GWBR	3
BKGD	Sodium	8190		MW-01-02	GWBR	2
BKGD	Sodium	10700		MW-01-02	GWBR	3
BKGD	Sodium	13600		MW-01-02	GWBR	4
BWA	Sodium	12700		MW-03-03	GWBR	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN BEDROCK WELLS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	FLOW ZONE	SAMPLING ROUND
BWA	Sodium	10900		MW-03-03	GWBR	3
SWA	Sodium	16300		MW-04-03	GWBR	2
SWA	Sodium	17200		MW-04-03	GWBR	3
SWA	Sodium	53700		MW-07-02	GWBR	2
SWA	Sodium	58800		MW-07-02	GWBR	3
SWA	Sodium	52500		MW-07-02	GWBR	4
SWA	Sodium	10500		MW-08-02	GWBR	2
SWA	Sodium	10600		MW-08-02	GWBR	4
SWA	Sodium	59500		MW-11-03	GWBR	2
SWA	Sodium	56500		MW-11-03	GWBR	3
BKGD	Specific Conductance	110		MW-01-02	GWBR	2
BKGD	Specific Conductance	150		MW-01-02	GWBR	3
BKGD	Specific Conductance	150		MW-01-02	GWBR	4
BWA	Specific Conductance	140		MW-03-03	GWBR	2
BWA	Specific Conductance	130		MW-03-03	GWBR	3
SWA	Specific Conductance	340		MW-04-03	GWBR	2
SWA	Specific Conductance	225		MW-04-03	GWBR	3
SWA	Specific Conductance	1200		MW-07-02	GWBR	2
SWA	Specific Conductance	1500		MW-07-02	GWBR	3
SWA	Specific Conductance	1050		MW-07-02	GWBR	4
SWA	Specific Conductance	210		MW-08-02	GWBR	2
SWA	Specific Conductance	200		MW-08-02	GWBR	4
SWA	Specific Conductance	295		MW-11-03	GWBR	2
SWA	Specific Conductance	550		MW-11-03	GWBR	3

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SWA - Solid Waste Area

BKGD - Background

BWA - Bulky Waste Area

GWBR - Groundwater in the bedrock flow zone

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN LEACHATE AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
LE	Aluminum	9220	J	LE-02	LESR	1
LE	Aluminum	184	J	LE-03	LESR	1
LE	Aluminum	683.9	J	LE-04	LESR	1
LE	Aluminum	383	J	LE-05	LESR	1
LE	Aluminum	13.5	U	LE-06	LESR	1
LE	Barium	2120		LE-02	LESR	1
LE	Barium	58.3		LE-03	LESR	1
LE	Barium	132.8		LE-04	LESR	1
LE	Barium	392		LE-05	LESR	1
LE	Barium	22.2		LE-06	LESR	1
LE	Calcium	59000		LE-02	LESR	1
LE	Calcium	10000		LE-03	LESR	1
LE	Calcium	11070		LE-04	LESR	1
LE	Calcium	41000		LE-05	LESR	1
LE	Calcium	15200		LE-06	LESR	1
LE	Cobalt	295		LE-02	LESR	1
LE	Cobalt	1.65	U	LE-03	LESR	1
LE	Cobalt	6.975	J	LE-04	LESR	1
LE	Cobalt	7.4		LE-05	LESR	1
LE	Cobalt	5.6		LE-06	LESR	1
LE	Iron	1370000	J	LE-02	LESR	1
LE	Iron	75600	J	LE-03	LESR	1
LE	Iron	116100	J	LE-04	LESR	1
LE	Iron	287000	J	LE-05	LESR	1
LE	Iron	15200	J	LE-06	LESR	1
LE	Magnesium	16100		LE-02	LESR	1
LE	Magnesium	2420		LE-03	LESR	1
LE	Magnesium	2510		LE-04	LESR	1
LE	Magnesium	11000		LE-05	LESR	1
LE	Magnesium	5620		LE-06	LESR	1
LE	Manganese	14700	J	LE-02	LESR	1
LE	Manganese	9420		LE-03	LESR	1
LE	Manganese	10105		LE-04	LESR	1
LE	Manganese	2490	J	LE-05	LESR	1
LE	Manganese	4930	J	LE-06	LESR	1
LE	Potassium	44800		LE-02	LESR	1
LE	Potassium	2840		LE-03	LESR	1
LE	Potassium	2955		LE-04	LESR	1
LE	Potassium	25400		LE-05	LESR	1
LE	Potassium	2000		LE-06	LESR	1
LE	Sodium	55400		LE-02	LESR	1
LE	Sodium	5560		LE-03	LESR	1
LE	Sodium	5695	J	LE-04	LESR	1
LE	Sodium	39100		LE-05	LESR	1
LE	Sodium	9910		LE-06	LESR	1
LE	Specific Conductance	1000		LE-02	LESR	1
LE	Specific Conductance	380		LE-03	LESR	1
LE	Specific Conductance	320		LE-04	LESR	1

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN LEACHATE AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
LE	Specific Conductance	1800		LE-05	LESR	1
LE	Specific Conductance	250		LE-06	LESR	1
BKGD	Aluminum	19700	J	MW-01-01	GWSOB	2
BKGD	Aluminum	43300		MW-01-01	GWSOB	3
BKGD	Aluminum	10800		MW-01-01	GWSOB	4
SOB	Aluminum	12700		MW-03-01	GWSOB	2
SOB	Aluminum	50900		MW-03-01	GWSOB	3
SOB	Aluminum	18600		MW-05-01	GWSOB	2
SOB	Aluminum	18400	J	MW-05-01	GWSOB	4
SOB	Aluminum	2880		MW-12-01	GWSOB	2
SOB	Aluminum	13900	J	MW-12-01	GWSOB	4
SOB	Aluminum	2570	J	MW-V	GWSOB	1
SOB	Aluminum	3830	J	MW-V	GWSOB	2
BKGD	Barium	113		MW-01-01	GWSOB	2
BKGD	Barium	213		MW-01-01	GWSOB	3
BKGD	Barium	79.8	J	MW-01-01	GWSOB	4
SOB	Barium	26.6		MW-12-01	GWSOB	2
SOB	Barium	370		MW-03-01	GWSOB	3
SOB	Barium	67.5		MW-05-01	GWSOB	2
SOB	Barium	61.2		MW-05-01	GWSOB	4
SOB	Barium	234		MW-03-01	GWSOB	2
SOB	Barium	146		MW-12-01	GWSOB	4
SOB	Barium	20.5		MW-V	GWSOB	1
SOB	Barium	29.6		MW-V	GWSOB	2
BKGD	Calcium	15600		MW-01-01	GWSOB	2
BKGD	Calcium	18700		MW-01-01	GWSOB	3
BKGD	Calcium	11500		MW-01-01	GWSOB	4
SOB	Calcium	35100		MW-03-01	GWSOB	2
SOB	Calcium	30700		MW-03-01	GWSOB	3
SOB	Calcium	6080		MW-05-01	GWSOB	2
SOB	Calcium	6230		MW-05-01	GWSOB	4
SOB	Calcium	6610		MW-12-01	GWSOB	2
SOB	Calcium	14300		MW-12-01	GWSOB	4
SOB	Calcium	3340		MW-V	GWSOB	1
SOB	Calcium	3300		MW-V	GWSOB	2
BKGD	Cobalt	27.7		MW-01-01	GWSOB	2
BKGD	Cobalt	101		MW-01-01	GWSOB	3
BKGD	Cobalt	31.6		MW-01-01	GWSOB	4
SOB	Cobalt	20.7		MW-03-01	GWSOB	2
SOB	Cobalt	27.2		MW-03-01	GWSOB	3
SOB	Cobalt	5.1	U	MW-05-01	GWSOB	2
SOB	Cobalt	10.1		MW-05-01	GWSOB	4
SOB	Cobalt	6.8	U	MW-12-01	GWSOB	2
SOB	Cobalt	8.3		MW-12-01	GWSOB	4
SOB	Cobalt	2	U	MW-V	GWSOB	1
SOB	Cobalt	3	U	MW-V	GWSOB	2
BKGD	Copper	25.5	U	MW-01-01	GWSOB	2
BKGD	Copper	115		MW-01-01	GWSOB	3

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN LEACHATE AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Copper	24.4		MW-01-01	GWSOB	4
SOB	Copper	8.15	U	MW-03-01	GWSOB	2
SOB	Copper	36.9		MW-03-01	GWSOB	3
SOB	Copper	104		MW-05-01	GWSOB	2
SOB	Copper	55.9		MW-05-01	GWSOB	4
SOB	Copper	43.4		MW-12-01	GWSOB	2
SOB	Copper	10.8	U	MW-12-01	GWSOB	4
SOB	Copper	5.5	U	MW-V	GWSOB	1
SOB	Copper	12.4		MW-V	GWSOB	2
BKGD	Iron	31500		MW-01-01	GWSOB	2
BKGD	Iron	71200		MW-01-01	GWSOB	3
BKGD	Iron	12100		MW-01-01	GWSOB	4
SOB	Iron	15400		MW-12-01	GWSOB	2
SOB	Iron	75600		MW-03-01	GWSOB	3
SOB	Iron	29700		MW-05-01	GWSOB	2
SOB	Iron	28000	J	MW-05-01	GWSOB	4
SOB	Iron	24000		MW-03-01	GWSOB	2
SOB	Iron	92000	J	MW-12-01	GWSOB	4
SOB	Iron	4050	J	MW-V	GWSOB	1
SOB	Iron	5320		MW-V	GWSOB	2
BKGD	Lead	23.6		MW-01-01	GWSOB	2
BKGD	Lead	64.4		MW-01-01	GWSOB	3
BKGD	Lead	22.1		MW-01-01	GWSOB	4
SOB	Lead	5.4	U	MW-03-01	GWSOB	2
SOB	Lead	36.2		MW-03-01	GWSOB	3
SOB	Lead	32.8		MW-05-01	GWSOB	2
SOB	Lead	24	J	MW-05-01	GWSOB	4
SOB	Lead	2.65	U	MW-12-01	GWSOB	2
SOB	Lead	24.7	J	MW-12-01	GWSOB	4
SOB	Lead	2.95	U	MW-V	GWSOB	1
SOB	Lead	2.9	U	MW-V	GWSOB	2
BKGD	Magnesium	3770		MW-01-01	GWSOB	2
BKGD	Magnesium	7540		MW-01-01	GWSOB	3
BKGD	Magnesium	2940		MW-01-01	GWSOB	4
SOB	Magnesium	8290		MW-03-01	GWSOB	2
SOB	Magnesium	10300		MW-03-01	GWSOB	3
SOB	Magnesium	5230		MW-05-01	GWSOB	2
SOB	Magnesium	4880		MW-05-01	GWSOB	4
SOB	Magnesium	1760		MW-12-01	GWSOB	2
SOB	Magnesium	4310		MW-12-01	GWSOB	4
SOB	Magnesium	1350		MW-V	GWSOB	1
SOB	Magnesium	1480		MW-V	GWSOB	2
BKGD	Manganese	4080		MW-01-01	GWSOB	2
BKGD	Manganese	1600		MW-01-01	GWSOB	3
BKGD	Manganese	444		MW-01-01	GWSOB	4
SOB	Manganese	1660		MW-12-01	GWSOB	2
SOB	Manganese	3240		MW-03-01	GWSOB	3
SOB	Manganese	756		MW-05-01	GWSOB	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN LEACHATE AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Manganese	636		MW-05-01	GWSOB	4
SOB	Manganese	3000		MW-03-01	GWSOB	2
SOB	Manganese	6960		MW-12-01	GWSOB	4
SOB	Manganese	132	J	MW-V	GWSOB	1
SOB	Manganese	201		MW-V	GWSOB	2
BKGD	Sodium	15400		MW-01-01	GWSOB	2
BKGD	Sodium	16400		MW-01-01	GWSOB	3
BKGD	Sodium	13000		MW-01-01	GWSOB	4
SOB	Sodium	33000		MW-03-01	GWSOB	2
SOB	Sodium	21600		MW-03-01	GWSOB	3
SOB	Sodium	8600		MW-05-01	GWSOB	2
SOB	Sodium	8130		MW-05-01	GWSOB	4
SOB	Sodium	7470		MW-12-01	GWSOB	2
SOB	Sodium	7930		MW-12-01	GWSOB	4
SOB	Sodium	5450		MW-V	GWSOB	1
SOB	Sodium	3015	U	MW-V	GWSOB	2
BKGD	Specific Conductance	200		MW-01-01	GWSOB	2
BKGD	Specific Conductance	68		MW-01-01	GWSOB	3
BKGD	Specific Conductance	100		MW-01-01	GWSOB	4
SOB	Specific Conductance	440		MW-03-01	GWSOB	2
SOB	Specific Conductance	350		MW-03-01	GWSOB	3
SOB	Specific Conductance	72		MW-05-01	GWSOB	2
SOB	Specific Conductance	78		MW-05-01	GWSOB	4
SOB	Specific Conductance	120		MW-12-01	GWSOB	2
SOB	Specific Conductance	400		MW-12-01	GWSOB	4
SOB	Specific Conductance	140		MW-V	GWSOB	1
SOB	Specific Conductance	40		MW-V	GWSOB	2
BKGD	Vanadium	15.9		MW-01-01	GWSOB	2
BKGD	Vanadium	36.3		MW-01-01	GWSOB	3
BKGD	Vanadium	3.2	U	MW-01-01	GWSOB	4
SOB	Vanadium	13.7		MW-03-01	GWSOB	2
SOB	Vanadium	19.7		MW-12-01	GWSOB	4
SOB	Vanadium	29.7		MW-05-01	GWSOB	2
SOB	Vanadium	24		MW-05-01	GWSOB	4
SOB	Vanadium	6.5		MW-12-01	GWSOB	2
SOB	Vanadium	47.7		MW-03-01	GWSOB	3
SOB	Vanadium	2.1	U	MW-V	GWSOB	1
SOB	Vanadium	1.9	U	MW-V	GWSOB	2
BKGD	Zinc	38.65	U	MW-01-01	GWSOB	2
BKGD	Zinc	139		MW-01-01	GWSOB	3
BKGD	Zinc	28.2	J	MW-01-01	GWSOB	4
SOB	Zinc	32.7	U	MW-03-01	GWSOB	2
SOB	Zinc	171		MW-03-01	GWSOB	3
SOB	Zinc	32.75	U	MW-05-01	GWSOB	2
SOB	Zinc	75.1	J	MW-05-01	GWSOB	4
SOB	Zinc	215		MW-12-01	GWSOB	2
SOB	Zinc	52.6	J	MW-12-01	GWSOB	4
SOB	Zinc	19.05	U	MW-V	GWSOB	1

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN LEACHATE AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Zinc	9.8	U	MW-V	GWSOB	2

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

LE - Leachate

BKGD - Background

SOB - Shallow Overburden

LESR - Leachate entering the Saugatucket River

GWSOB - Groundwater in shallow overburden flow zone

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN LEACHATE AND SURFACE WATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
LE	Aluminum	9220	J	LE-02	LESR	1
LE	Aluminum	184	J	LE-03	LESR	1
LE	Aluminum	683.9	J	LE-04	LESR	1
LE	Aluminum	383	J	LE-05	LESR	1
LE	Aluminum	13.5	U	LE-06	LESR	1
LE	Barium	2120		LE-02	LESR	1
LE	Barium	58.3		LE-03	LESR	1
LE	Barium	132.8		LE-04	LESR	1
LE	Barium	392		LE-05	LESR	1
LE	Barium	22.2		LE-06	LESR	1
LE	Calcium	59000		LE-02	LESR	1
LE	Calcium	10000		LE-03	LESR	1
LE	Calcium	11070		LE-04	LESR	1
LE	Calcium	41000		LE-05	LESR	1
LE	Calcium	15200		LE-06	LESR	1
LE	Cobalt	295		LE-02	LESR	1
LE	Cobalt	1.65	U	LE-03	LESR	1
LE	Cobalt	6.975	J	LE-04	LESR	1
LE	Cobalt	7.4		LE-05	LESR	1
LE	Cobalt	5.6		LE-06	LESR	1
LE	Iron	1370000	J	LE-02	LESR	1
LE	Iron	75600	J	LE-03	LESR	1
LE	Iron	116100	J	LE-04	LESR	1
LE	Iron	287000	J	LE-05	LESR	1
LE	Iron	15200	J	LE-06	LESR	1
LE	Magnesium	16100		LE-02	LESR	1
LE	Magnesium	2420		LE-03	LESR	1
LE	Magnesium	2510		LE-04	LESR	1
LE	Magnesium	11000		LE-05	LESR	1
LE	Magnesium	5620		LE-06	LESR	1
LE	Manganese	14700	J	LE-02	LESR	1
LE	Manganese	9420		LE-03	LESR	1
LE	Manganese	10105		LE-04	LESR	1
LE	Manganese	2490	J	LE-05	LESR	1
LE	Manganese	4930	J	LE-06	LESR	1
LE	Potassium	44800		LE-02	LESR	1
LE	Potassium	2840		LE-03	LESR	1
LE	Potassium	2955		LE-04	LESR	1
LE	Potassium	25400		LE-05	LESR	1
LE	Potassium	2000		LE-06	LESR	1
LE	Sodium	55400		LE-02	LESR	1
LE	Sodium	5560		LE-03	LESR	1
LE	Sodium	5695	J	LE-04	LESR	1
LE	Sodium	39100		LE-05	LESR	1
LE	Sodium	9910		LE-06	LESR	1
LE	Specific Conductance	1000		LE-02	LESR	1
LE	Specific Conductance	380		LE-03	LESR	1
LE	Specific Conductance	320		LE-04	LESR	1

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN LEACHATE AND SURFACE WATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
LE	Specific Conductance	1800		LE-05	LESR	1
LE	Specific Conductance	250		LE-06	LESR	1
SW	Calcium	4130		SW-04	SWSR	1
SW	Calcium	27100		SW-05	SWSR	1
SW	Magnesium	1410		SW-04	SWSR	1
SW	Magnesium	12900		SW-05	SWSR	1
SW	Manganese	201	J	SW-04	SWSR	1
SW	Manganese	2030		SW-05	SWSR	1
SW	Sodium	8020		SW-04	SWSR	1
SW	Sodium	59900		SW-05	SWSR	1
SW	Specific Conductance	80		SW-04	SWSR	1
SW	Specific Conductance	83		SW-05	SWSR	1
SW-04	Barium	5.8		SW-04	SWSR	1
SW-05	Barium	279		SW-05	SWSR	1
SW-04	Iron	467	J	SW-04	SWSR	1
SW-05	Iron	34600		SW-05	SWSR	1

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

LE - Leachate

SW - Surface Water

LESR - Leachate entering the Saugatucket River

SWSR - Surface water in the Saugatucket River

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Aluminum	19700	J	MW-01-01	GWSOB	2
SOB	Aluminum	43300		MW-01-01	GWSOB	3
SOB	Aluminum	10800		MW-01-01	GWSOB	4
SOB	Aluminum	12700		MW-03-01	GWSOB	2
SOB	Aluminum	50900		MW-03-01	GWSOB	3
SOB	Aluminum	18600		MW-05-01	GWSOB	2
SOB	Aluminum	18400	J	MW-05-01	GWSOB	4
SOB	Aluminum	2880		MW-12-01	GWSOB	2
SOB	Aluminum	13900	J	MW-12-01	GWSOB	4
SOB	Aluminum	2570	J	MW-V	GWSOB	1
SOB	Aluminum	3830	J	MW-V	GWSOB	2
SOB	Aluminum	55600		MW-02-01	GWSOB	2
SOB	Aluminum	21000		MW-02-01	GWSOB	3
SOB	Aluminum	663	J	MW-I	GWSOB	1
SOB	Aluminum	41400	J	MW-I	GWSOB	2
SOB	Aluminum	627	J	MW-II	GWSOB	1
SOB	Aluminum	23500	J	MW-II	GWSOB	2
SOB	Aluminum	24200	J	MW-II	GWSOB	4
SOB	Aluminum	20650	J	MW-III	GWSOB	1
SOB	Aluminum	11300	J	MW-III	GWSOB	2
SOB	Aluminum	2400	J	MW-IV	GWSOB	1
SOB	Aluminum	1010	J	MW-IV	GWSOB	2
SOB	Aluminum	24300		MW-04-01	GWSOB	2
SOB	Aluminum	55100		MW-04-01	GWSOB	3
SOB	Aluminum	1390	J	MW-06-01	GWSOB	2
SOB	Aluminum	2780		MW-06-01	GWSOB	4
SOB	Aluminum	6630		MW-11-01	GWSOB	2
SOB	Aluminum	20400		MW-11-01	GWSOB	3
SOB	Aluminum	6600		MW-13-01	GWSOB	2
SOB	Barium	113		MW-01-01	GWSOB	2
SOB	Barium	213		MW-01-01	GWSOB	3
SOB	Barium	79.8	J	MW-01-01	GWSOB	4
SOB	Barium	26.6		MW-12-01	GWSOB	2
SOB	Barium	370		MW-03-01	GWSOB	3
SOB	Barium	67.5		MW-05-01	GWSOB	2
SOB	Barium	61.2		MW-05-01	GWSOB	4
SOB	Barium	234		MW-03-01	GWSOB	2
SOB	Barium	146		MW-12-01	GWSOB	4
SOB	Barium	20.5		MW-V	GWSOB	1
SOB	Barium	29.6		MW-V	GWSOB	2
SOB	Barium	265.5		MW-02-01	GWSOB	2
SOB	Barium	94.4		MW-02-01	GWSOB	3
SOB	Barium	3.85	U	MW-I	GWSOB	1
SOB	Barium	105.65		MW-III	GWSOB	1
SOB	Barium	26		MW-II	GWSOB	1
SOB	Barium	149		MW-II	GWSOB	2
SOB	Barium	125		MW-II	GWSOB	4
SOB	Barium	284		MW-I	GWSOB	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Barium	107		MW-III	GWSOB	2
SOB	Barium	19.5		MW-IV	GWSOB	1
SOB	Barium	19.3		MW-IV	GWSOB	2
SOB	Barium	244		MW-04-01	GWSOB	2
SOB	Barium	292		MW-04-01	GWSOB	3
SOB	Barium	56.5		MW-06-01	GWSOB	2
SOB	Barium	60.8	J	MW-06-01	GWSOB	4
SOB	Barium	290		MW-11-01	GWSOB	2
SOB	Barium	323		MW-11-01	GWSOB	3
SOB	Barium	76.4		MW-13-01	GWSOB	2
SOB	Calcium	15600		MW-01-01	GWSOB	2
SOB	Calcium	18700		MW-01-01	GWSOB	3
SOB	Calcium	11500		MW-01-01	GWSOB	4
SOB	Calcium	35100		MW-03-01	GWSOB	2
SOB	Calcium	30700		MW-03-01	GWSOB	3
SOB	Calcium	6080		MW-05-01	GWSOB	2
SOB	Calcium	6230		MW-05-01	GWSOB	4
SOB	Calcium	6610		MW-12-01	GWSOB	2
SOB	Calcium	14300		MW-12-01	GWSOB	4
SOB	Calcium	3340		MW-V	GWSOB	1
SOB	Calcium	3300		MW-V	GWSOB	2
SOB	Calcium	12300		MW-02-01	GWSOB	2
SOB	Calcium	10190		MW-02-01	GWSOB	3
SOB	Calcium	1020		MW-I	GWSOB	1
SOB	Calcium	7830		MW-I	GWSOB	2
SOB	Calcium	8460		MW-II	GWSOB	1
SOB	Calcium	12200		MW-II	GWSOB	2
SOB	Calcium	13300		MW-II	GWSOB	4
SOB	Calcium	8350		MW-III	GWSOB	1
SOB	Calcium	4120		MW-III	GWSOB	2
SOB	Calcium	3430		MW-IV	GWSOB	1
SOB	Calcium	5170		MW-IV	GWSOB	2
SOB	Calcium	20600	J	MW-04-01	GWSOB	2
SOB	Calcium	15300		MW-04-01	GWSOB	3
SOB	Calcium	6260		MW-06-01	GWSOB	2
SOB	Calcium	6350		MW-06-01	GWSOB	4
SOB	Calcium	63100		MW-11-01	GWSOB	2
SOB	Calcium	64300		MW-11-01	GWSOB	3
SOB	Calcium	9100		MW-13-01	GWSOB	2
SOB	Cobalt	27.7		MW-01-01	GWSOB	2
SOB	Cobalt	101		MW-01-01	GWSOB	3
SOB	Cobalt	31.6		MW-01-01	GWSOB	4
SOB	Cobalt	20.7		MW-03-01	GWSOB	2
SOB	Cobalt	27.2		MW-03-01	GWSOB	3
SOB	Cobalt	5.1	U	MW-05-01	GWSOB	2
SOB	Cobalt	10.1		MW-05-01	GWSOB	4
SOB	Cobalt	6.8	U	MW-12-01	GWSOB	2
SOB	Cobalt	8.3		MW-12-01	GWSOB	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Cobalt	2	U	MW-V	GWSOB	1
SOB	Cobalt	3	U	MW-V	GWSOB	2
SOB	Cobalt	28.95	U	MW-02-01	GWSOB	2
SOB	Cobalt	10		MW-02-01	GWSOB	3
SOB	Cobalt	1.95	U	MW-I	GWSOB	1
SOB	Cobalt	45		MW-I	GWSOB	2
SOB	Cobalt	3.9	U	MW-II	GWSOB	1
SOB	Cobalt	37.2		MW-II	GWSOB	2
SOB	Cobalt	26.2		MW-II	GWSOB	4
SOB	Cobalt	16.1		MW-III	GWSOB	1
SOB	Cobalt	10.2		MW-III	GWSOB	2
SOB	Cobalt	21		MW-IV	GWSOB	1
SOB	Cobalt	20.3		MW-IV	GWSOB	2
SOB	Copper	25.5	U	MW-01-01	GWSOB	2
SOB	Copper	115		MW-01-01	GWSOB	3
SOB	Copper	24.4		MW-01-01	GWSOB	4
SOB	Copper	8.15	U	MW-03-01	GWSOB	2
SOB	Copper	36.9		MW-03-01	GWSOB	3
SOB	Copper	104		MW-05-01	GWSOB	2
SOB	Copper	55.9		MW-05-01	GWSOB	4
SOB	Copper	43.4		MW-12-01	GWSOB	2
SOB	Copper	10.8	U	MW-12-01	GWSOB	4
SOB	Copper	5.5	U	MW-V	GWSOB	1
SOB	Copper	12.4		MW-V	GWSOB	2
SOB	Copper	33.05	UJ	MW-04-01	GWSOB	2
SOB	Copper	73.3	J	MW-04-01	GWSOB	3
SOB	Copper	4.9	U	MW-06-01	GWSOB	2
SOB	Copper	3.7	U	MW-06-01	GWSOB	4
SOB	Copper	11.25	U	MW-11-01	GWSOB	2
SOB	Copper	9.3	U	MW-11-01	GWSOB	3
SOB	Copper	13.8	U	MW-13-01	GWSOB	2
SOB	Iron	31500		MW-01-01	GWSOB	2
SOB	Iron	71200		MW-01-01	GWSOB	3
SOB	Iron	12100		MW-01-01	GWSOB	4
SOB	Iron	15400		MW-12-01	GWSOB	2
SOB	Iron	75600		MW-03-01	GWSOB	3
SOB	Iron	29700		MW-05-01	GWSOB	2
SOB	Iron	28000	J	MW-05-01	GWSOB	4
SOB	Iron	24000		MW-03-01	GWSOB	2
SOB	Iron	92000	J	MW-12-01	GWSOB	4
SOB	Iron	4050	J	MW-V	GWSOB	1
SOB	Iron	5320		MW-V	GWSOB	2
SOB	Iron	118000		MW-02-01	GWSOB	2
SOB	Iron	38450		MW-02-01	GWSOB	3
SOB	Iron	794	J	MW-I	GWSOB	1
SOB	Iron	34000	J	MW-III	GWSOB	1
SOB	Iron	73600	J	MW-II	GWSOB	1
SOB	Iron	84700		MW-II	GWSOB	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Iron	114000	J	MW-II	GWSOB	4
SOB	Iron	41400		MW-I	GWSOB	2
SOB	Iron	12600		MW-III	GWSOB	2
SOB	Iron	50800	J	MW-IV	GWSOB	1
SOB	Iron	54700		MW-IV	GWSOB	2
SOB	Iron	51400		MW-04-01	GWSOB	2
SOB	Iron	114000		MW-04-01	GWSOB	3
SOB	Iron	3640		MW-06-01	GWSOB	2
SOB	Iron	10900		MW-06-01	GWSOB	4
SOB	Iron	65600		MW-11-01	GWSOB	2
SOB	Iron	88000		MW-11-01	GWSOB	3
SOB	Iron	28700		MW-13-01	GWSOB	2
SOB	Lead	23.6		MW-01-01	GWSOB	2
SOB	Lead	64.4		MW-01-01	GWSOB	3
SOB	Lead	22.1		MW-01-01	GWSOB	4
SOB	Lead	5.4	U	MW-03-01	GWSOB	2
SOB	Lead	36.2		MW-03-01	GWSOB	3
SOB	Lead	32.8		MW-05-01	GWSOB	2
SOB	Lead	24	J	MW-05-01	GWSOB	4
SOB	Lead	2.65	U	MW-12-01	GWSOB	2
SOB	Lead	24.7	J	MW-12-01	GWSOB	4
SOB	Lead	2.95	U	MW-V	GWSOB	1
SOB	Lead	2.9	U	MW-V	GWSOB	2
SOB	Lead	82.4		MW-02-01	GWSOB	2
SOB	Lead	19.25	J	MW-02-01	GWSOB	3
SOB	Lead	1.6	U	MW-I	GWSOB	1
SOB	Lead	42.7		MW-I	GWSOB	2
SOB	Lead	2.6	U	MW-II	GWSOB	1
SOB	Lead	72.8		MW-II	GWSOB	2
SOB	Lead	39.9	J	MW-II	GWSOB	4
SOB	Lead	71.85	J	MW-III	GWSOB	1
SOB	Lead	25.7		MW-III	GWSOB	2
SOB	Lead	5.45	U	MW-IV	GWSOB	1
SOB	Lead	3.2	U	MW-IV	GWSOB	2
SOB	Lead	13.9	U	MW-04-01	GWSOB	2
SOB	Lead	53		MW-04-01	GWSOB	3
SOB	Lead	1.35	U	MW-06-01	GWSOB	2
SOB	Lead	2.4	U	MW-06-01	GWSOB	4
SOB	Lead	2.7	U	MW-11-01	GWSOB	2
SOB	Lead	7.5	U	MW-11-01	GWSOB	3
SOB	Lead	6.5	U	MW-13-01	GWSOB	2
SOB	Magnesium	3770		MW-01-01	GWSOB	2
SOB	Magnesium	7540		MW-01-01	GWSOB	3
SOB	Magnesium	2940		MW-01-01	GWSOB	4
SOB	Magnesium	8290		MW-03-01	GWSOB	2
SOB	Magnesium	10300		MW-03-01	GWSOB	3
SOB	Magnesium	5230		MW-05-01	GWSOB	2
SOB	Magnesium	4880		MW-05-01	GWSOB	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Magnesium	1760		MW-12-01	GWSOB	2
SOB	Magnesium	4310		MW-12-01	GWSOB	4
SOB	Magnesium	1350		MW-V	GWSOB	1
SOB	Magnesium	1480		MW-V	GWSOB	2
SOB	Magnesium	13750		MW-02-01	GWSOB	2
SOB	Magnesium	6145		MW-02-01	GWSOB	3
SOB	Magnesium	887		MW-I	GWSOB	1
SOB	Magnesium	7280		MW-I	GWSOB	2
SOB	Magnesium	4030		MW-II	GWSOB	1
SOB	Magnesium	5680		MW-II	GWSOB	2
SOB	Magnesium	7100		MW-II	GWSOB	4
SOB	Magnesium	6620		MW-III	GWSOB	1
SOB	Magnesium	2200		MW-III	GWSOB	2
SOB	Magnesium	1660		MW-IV	GWSOB	1
SOB	Magnesium	2080		MW-IV	GWSOB	2
SOB	Magnesium	4000	J	MW-04-01	GWSOB	2
SOB	Magnesium	9700		MW-04-01	GWSOB	3
SOB	Magnesium	2140		MW-06-01	GWSOB	2
SOB	Magnesium	2400		MW-06-01	GWSOB	4
SOB	Magnesium	19300		MW-11-01	GWSOB	2
SOB	Magnesium	21500		MW-11-01	GWSOB	3
SOB	Magnesium	2180		MW-13-01	GWSOB	2
SOB	Manganese	4080		MW-01-01	GWSOB	2
SOB	Manganese	1600		MW-01-01	GWSOB	3
SOB	Manganese	444		MW-01-01	GWSOB	4
SOB	Manganese	1660		MW-12-01	GWSOB	2
SOB	Manganese	3240		MW-03-01	GWSOB	3
SOB	Manganese	756		MW-05-01	GWSOB	2
SOB	Manganese	636		MW-05-01	GWSOB	4
SOB	Manganese	3000		MW-03-01	GWSOB	2
SOB	Manganese	6960		MW-12-01	GWSOB	4
SOB	Manganese	132	J	MW-V	GWSOB	1
SOB	Manganese	201		MW-V	GWSOB	2
SOB	Manganese	5505		MW-02-01	GWSOB	2
SOB	Manganese	2510		MW-02-01	GWSOB	3
SOB	Manganese	44		MW-I	GWSOB	1
SOB	Manganese	1400	J	MW-III	GWSOB	1
SOB	Manganese	3850		MW-II	GWSOB	1
SOB	Manganese	4230		MW-II	GWSOB	2
SOB	Manganese	4290		MW-II	GWSOB	4
SOB	Manganese	1450		MW-I	GWSOB	2
SOB	Manganese	636		MW-III	GWSOB	2
SOB	Manganese	4340	J	MW-IV	GWSOB	1
SOB	Manganese	6230		MW-IV	GWSOB	2
SOB	Manganese	9790		MW-04-01	GWSOB	2
SOB	Manganese	9130		MW-04-01	GWSOB	3
SOB	Manganese	261		MW-06-01	GWSOB	2
SOB	Manganese	220		MW-06-01	GWSOB	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Manganese	3250		MW-11-01	GWSOB	2
SOB	Manganese	3420		MW-11-01	GWSOB	3
SOB	Manganese	1540		MW-13-01	GWSOB	2
SOB	Sodium	15400		MW-01-01	GWSOB	2
SOB	Sodium	16400		MW-01-01	GWSOB	3
SOB	Sodium	13000		MW-01-01	GWSOB	4
SOB	Sodium	33000		MW-03-01	GWSOB	2
SOB	Sodium	21600		MW-03-01	GWSOB	3
SOB	Sodium	8600		MW-05-01	GWSOB	2
SOB	Sodium	8130		MW-05-01	GWSOB	4
SOB	Sodium	7470		MW-12-01	GWSOB	2
SOB	Sodium	7930		MW-12-01	GWSOB	4
SOB	Sodium	5450		MW-V	GWSOB	1
SOB	Sodium	3015	U	MW-V	GWSOB	2
SOB	Sodium	7290		MW-02-01	GWSOB	2
SOB	Sodium	6460		MW-02-01	GWSOB	3
SOB	Sodium	3040		MW-I	GWSOB	1
SOB	Sodium	3950	U	MW-I	GWSOB	2
SOB	Sodium	4740		MW-II	GWSOB	1
SOB	Sodium	3615	U	MW-II	GWSOB	2
SOB	Sodium	7130	J	MW-II	GWSOB	4
SOB	Sodium	6440		MW-III	GWSOB	1
SOB	Sodium	4570		MW-III	GWSOB	2
SOB	Sodium	6790		MW-IV	GWSOB	1
SOB	Sodium	4510	U	MW-IV	GWSOB	2
SOB	Sodium	12800		MW-04-01	GWSOB	2
SOB	Sodium	14000		MW-04-01	GWSOB	3
SOB	Sodium	19900		MW-06-01	GWSOB	2
SOB	Sodium	15000		MW-06-01	GWSOB	4
SOB	Sodium	75100		MW-11-01	GWSOB	2
SOB	Sodium	69700		MW-11-01	GWSOB	3
SOB	Sodium	11700		MW-13-01	GWSOB	2
SOB	Specific Conductance	200		MW-01-01	GWSOB	2
SOB	Specific Conductance	68		MW-01-01	GWSOB	3
SOB	Specific Conductance	100		MW-01-01	GWSOB	4
SOB	Specific Conductance	440		MW-03-01	GWSOB	2
SOB	Specific Conductance	350		MW-03-01	GWSOB	3
SOB	Specific Conductance	72		MW-05-01	GWSOB	2
SOB	Specific Conductance	78		MW-05-01	GWSOB	4
SOB	Specific Conductance	120		MW-12-01	GWSOB	2
SOB	Specific Conductance	400		MW-12-01	GWSOB	4
SOB	Specific Conductance	140		MW-V	GWSOB	1
SOB	Specific Conductance	40		MW-V	GWSOB	2
SOB	Specific Conductance	260		MW-IV	GWSOB	2
SOB	Specific Conductance	50		MW-02-01	GWSOB	2
SOB	Specific Conductance	21		MW-I	GWSOB	1
SOB	Specific Conductance	120		MW-I	GWSOB	2
SOB	Specific Conductance	260		MW-II	GWSOB	1

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Specific Conductance	230		MW-II	GWSOB	2
SOB	Specific Conductance	460		MW-II	GWSOB	4
SOB	Specific Conductance	51		MW-III	GWSOB	1
SOB	Specific Conductance	26		MW-III	GWSOB	2
SOB	Specific Conductance	195		MW-IV	GWSOB	1
SOB	Specific Conductance	280		MW-02-01	GWSOB	3
SOB	Specific Conductance	290		MW-04-01	GWSOB	2
SOB	Specific Conductance	780		MW-04-01	GWSOB	3
SOB	Specific Conductance	210		MW-06-01	GWSOB	2
SOB	Specific Conductance	2500		MW-06-01	GWSOB	4
SOB	Specific Conductance	100		MW-11-01	GWSOB	2
SOB	Specific Conductance	1300		MW-11-01	GWSOB	3
SOB	Specific Conductance	175		MW-13-01	GWSOB	2
SOB	Vanadium	15.9		MW-01-01	GWSOB	2
SOB	Vanadium	36.3		MW-01-01	GWSOB	3
SOB	Vanadium	3.2	U	MW-01-01	GWSOB	4
SOB	Vanadium	13.7		MW-03-01	GWSOB	2
SOB	Vanadium	19.7		MW-12-01	GWSOB	4
SOB	Vanadium	29.7		MW-05-01	GWSOB	2
SOB	Vanadium	24		MW-05-01	GWSOB	4
SOB	Vanadium	6.5		MW-12-01	GWSOB	2
SOB	Vanadium	47.7		MW-03-01	GWSOB	3
SOB	Vanadium	2.1	U	MW-V	GWSOB	1
SOB	Vanadium	1.9	U	MW-V	GWSOB	2
SOB	Vanadium	100.95		MW-02-01	GWSOB	2
SOB	Vanadium	27.15		MW-02-01	GWSOB	3
SOB	Vanadium	1.8	U	MW-I	GWSOB	1
SOB	Vanadium	44.3		MW-I	GWSOB	2
SOB	Vanadium	5.55	U	MW-III	GWSOB	2
SOB	Vanadium	33.9		MW-II	GWSOB	2
SOB	Vanadium	35.2		MW-II	GWSOB	4
SOB	Vanadium	27.85		MW-III	GWSOB	1
SOB	Vanadium	1.25	U	MW-II	GWSOB	1
SOB	Vanadium	3.8	U	MW-IV	GWSOB	1
SOB	Vanadium	1.5	U	MW-IV	GWSOB	2
SOB	Vanadium	30.2		MW-04-01	GWSOB	2
SOB	Vanadium	67.2	J	MW-04-01	GWSOB	3
SOB	Vanadium	1.5	U	MW-06-01	GWSOB	2
SOB	Vanadium	2.85	U	MW-06-01	GWSOB	4
SOB	Vanadium	4.6	U	MW-11-01	GWSOB	2
SOB	Vanadium	27.6		MW-11-01	GWSOB	3
SOB	Vanadium	11		MW-13-01	GWSOB	2
SOB	Zinc	38.65	U	MW-01-01	GWSOB	2
SOB	Zinc	139		MW-01-01	GWSOB	3
SOB	Zinc	28.2	J	MW-01-01	GWSOB	4
SOB	Zinc	32.7	U	MW-03-01	GWSOB	2
SOB	Zinc	171		MW-03-01	GWSOB	3
SOB	Zinc	32.75	U	MW-05-01	GWSOB	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SOB	Zinc	75.1	J	MW-05-01	GWSOB	4
SOB	Zinc	215		MW-12-01	GWSOB	2
SOB	Zinc	52.6	J	MW-12-01	GWSOB	4
SOB	Zinc	19.05	U	MW-V	GWSOB	1
SOB	Zinc	9.8	U	MW-V	GWSOB	2
SOB	Zinc	133	J	MW-04-01	GWSOB	2
SOB	Zinc	210	J	MW-04-01	GWSOB	3
SOB	Zinc	13.75	UJ	MW-06-01	GWSOB	2
SOB	Zinc	5.5	UJ	MW-06-01	GWSOB	4
SOB	Zinc	15.45	U	MW-11-01	GWSOB	2
SOB	Zinc	73.5		MW-11-01	GWSOB	3
SOB	Zinc	28	UJ	MW-13-01	GWSOB	2
BR	Aluminum	201	J	MW-01-02	GWBR	2
BR	Aluminum	433		MW-01-02	GWBR	3
BR	Aluminum	77.5	U	MW-01-02	GWBR	4
BR	Aluminum	43.4	U	MW-04-03	GWBR	2
BR	Aluminum	228		MW-04-03	GWBR	3
BR	Aluminum	96.5	U	MW-07-02	GWBR	2
BR	Aluminum	906		MW-07-02	GWBR	3
BR	Aluminum	278	J	MW-07-02	GWBR	4
BR	Aluminum	1410		MW-08-02	GWBR	2
BR	Aluminum	445	J	MW-08-02	GWBR	4
BR	Aluminum	1570		MW-11-03	GWBR	2
BR	Aluminum	865		MW-11-03	GWBR	3
BR	Barium	3.5	U	MW-01-02	GWBR	2
BR	Barium	12.8		MW-01-02	GWBR	3
BR	Barium	18.6	J	MW-01-02	GWBR	4
BR	Barium	118		MW-08-02	GWBR	4
BR	Barium	108		MW-11-03	GWBR	2
BR	Barium	7		MW-04-03	GWBR	3
BR	Barium	87.7		MW-11-03	GWBR	3
BR	Barium	38.4		MW-07-02	GWBR	3
BR	Barium	133		MW-08-02	GWBR	2
BR	Barium	1	U	MW-04-03	GWBR	2
BR	Barium	42.6		MW-07-02	GWBR	2
BR	Barium	25.8		MW-07-02	GWBR	4
BR	Calcium	17200		MW-01-02	GWBR	2
BR	Calcium	20600		MW-01-02	GWBR	3
BR	Calcium	14100		MW-01-02	GWBR	4
BR	Calcium	8460	J	MW-03-03	GWBR	2
BR	Calcium	9670		MW-03-03	GWBR	3
BR	Calcium	46100		MW-04-03	GWBR	2
BR	Calcium	34200		MW-11-03	GWBR	2
BR	Calcium	27400		MW-11-03	GWBR	3
BR	Calcium	88300		MW-07-02	GWBR	2
BR	Calcium	40500		MW-07-02	GWBR	4
BR	Calcium	27800		MW-08-02	GWBR	2
BR	Calcium	25500		MW-08-02	GWBR	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BR	Calcium	42000		MW-04-03	GWBR	3
BR	Calcium	82500		MW-07-02	GWBR	3
BR	Iron	3815	UJ	MW-01-02	GWBR	2
BR	Iron	13700		MW-01-02	GWBR	3
BR	Iron	30900		MW-01-02	GWBR	4
BR	Iron	5080	J	MW-03-03	GWBR	2
BR	Iron	37100		MW-03-03	GWBR	3
BR	Iron	2490		MW-04-03	GWBR	2
BR	Iron	16200		MW-04-03	GWBR	3
BR	Iron	1160		MW-11-03	GWBR	3
BR	Iron	858		MW-07-02	GWBR	3
BR	Iron	120.5	UJ	MW-07-02	GWBR	4
BR	Iron	4830		MW-08-02	GWBR	2
BR	Iron	9430	J	MW-08-02	GWBR	4
BR	Iron	1270		MW-11-03	GWBR	2
BR	Iron	106.5	U	MW-07-02	GWBR	2
BR	Magnesium	1670		MW-01-02	GWBR	2
BR	Magnesium	1900		MW-01-02	GWBR	3
BR	Magnesium	1500		MW-01-02	GWBR	4
BR	Magnesium	1140	J	MW-03-03	GWBR	2
BR	Magnesium	1650		MW-03-03	GWBR	3
BR	Magnesium	4290		MW-04-03	GWBR	2
BR	Magnesium	4080		MW-04-03	GWBR	3
BR	Magnesium	1360		MW-07-02	GWBR	2
BR	Magnesium	2980		MW-07-02	GWBR	3
BR	Magnesium	1300		MW-07-02	GWBR	4
BR	Magnesium	2100		MW-08-02	GWBR	2
BR	Magnesium	4140		MW-08-02	GWBR	4
BR	Magnesium	4020		MW-11-03	GWBR	2
BR	Magnesium	3380		MW-11-03	GWBR	3
BR	Manganese	54.5	J	MW-01-02	GWBR	2
BR	Manganese	113		MW-01-02	GWBR	3
BR	Manganese	330		MW-01-02	GWBR	4
BR	Manganese	43.25	J	MW-03-03	GWBR	2
BR	Manganese	103		MW-03-03	GWBR	3
BR	Manganese	658		MW-04-03	GWBR	2
BR	Manganese	651		MW-04-03	GWBR	3
BR	Manganese	6	U	MW-07-02	GWBR	2
BR	Manganese	22.8		MW-07-02	GWBR	3
BR	Manganese	3.05	U	MW-07-02	GWBR	4
BR	Manganese	1350		MW-08-02	GWBR	2
BR	Manganese	3380		MW-08-02	GWBR	4
BR	Manganese	338		MW-11-03	GWBR	2
BR	Manganese	206		MW-11-03	GWBR	3
BR	Potassium	1570		MW-01-02	GWBR	2
BR	Potassium	2250		MW-01-02	GWBR	3
BR	Potassium	2590		MW-01-02	GWBR	4
BR	Potassium	780	U	MW-04-03	GWBR	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY BETWEEN BEDROCK AND SHALLOW OVERBURDEN GROUNDWATER

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BR	Potassium	1650		MW-04-03	GWBR	3
BR	Potassium	102000		MW-07-02	GWBR	2
BR	Potassium	76500		MW-07-02	GWBR	3
BR	Potassium	67700		MW-07-02	GWBR	4
BR	Potassium	5360		MW-08-02	GWBR	2
BR	Potassium	4420		MW-08-02	GWBR	4
BR	Potassium	1635	U	MW-11-03	GWBR	2
BR	Potassium	4750		MW-11-03	GWBR	3
BR	Sodium	8190		MW-01-02	GWBR	2
BR	Sodium	10700		MW-01-02	GWBR	3
BR	Sodium	13600		MW-01-02	GWBR	4
BR	Sodium	12700		MW-03-03	GWBR	2
BR	Sodium	10900		MW-03-03	GWBR	3
BR	Sodium	16300		MW-04-03	GWBR	2
BR	Sodium	17200		MW-04-03	GWBR	3
BR	Sodium	53700		MW-07-02	GWBR	2
BR	Sodium	58800		MW-07-02	GWBR	3
BR	Sodium	52500		MW-07-02	GWBR	4
BR	Sodium	10500		MW-08-02	GWBR	2
BR	Sodium	10600		MW-08-02	GWBR	4
BR	Sodium	59500		MW-11-03	GWBR	2
BR	Sodium	56500		MW-11-03	GWBR	3
BR	Specific Conductance	110		MW-01-02	GWBR	2
BR	Specific Conductance	150		MW-01-02	GWBR	3
BR	Specific Conductance	150		MW-01-02	GWBR	4
BR	Specific Conductance	140		MW-03-03	GWBR	2
BR	Specific Conductance	130		MW-03-03	GWBR	3
BR	Specific Conductance	340		MW-04-03	GWBR	2
BR	Specific Conductance	225		MW-04-03	GWBR	3
BR	Specific Conductance	1200		MW-07-02	GWBR	2
BR	Specific Conductance	1500		MW-07-02	GWBR	3
BR	Specific Conductance	1050		MW-07-02	GWBR	4
BR	Specific Conductance	210		MW-08-02	GWBR	2
BR	Specific Conductance	200		MW-08-02	GWBR	4
BR	Specific Conductance	295		MW-11-03	GWBR	2
BR	Specific Conductance	550		MW-11-03	GWBR	3

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SOB - Shallow Overburden

BR - Bedrock

GWSOB - Groundwater in shallow overburden flow zone

GWBR - Groundwater in bedrock flow zone

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN MITCHELL BROOK SEDIMENT SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Aluminum	6050		SD-01	SD	1
BKGD	Aluminum	8650		SD-01	SD	2
SD-07	Aluminum	1820		SD-07	SD	1
SD-07	Aluminum	5970		SD-07	SD	2
SD-07	Aluminum	2640		SD-07	SD	5
SD-09	Aluminum	3290		SD-09	SD	1
SD-09	Aluminum	4780		SD-09	SD	2
SD-09	Aluminum	1890		SD-09	SD	5
SD-12	Aluminum	1360		SD-12	SD	1
SD-12	Aluminum	1660		SD-12	SD	2
SD-12	Aluminum	1860		SD-12	SD	5
SD-14	Aluminum	5640		SD-14	SD	1
SD-14	Aluminum	3670		SD-14	SD	2
SD-15	Aluminum	2740		SD-15	SD	1
SD-15	Aluminum	4530		SD-15	SD	2
BKGD	Barium	13.6		SD-01	SD	1
BKGD	Barium	21.5		SD-01	SD	2
SD-07	Barium	7		SD-07	SD	1
SD-07	Barium	21.5		SD-07	SD	2
SD-07	Barium	11.5		SD-07	SD	5
SD-09	Barium	13.95		SD-09	SD	1
SD-09	Barium	19.2		SD-09	SD	2
SD-09	Barium	6.2		SD-09	SD	5
SD-12	Barium	7.3		SD-12	SD	1
SD-12	Barium	10.5		SD-12	SD	2
SD-12	Barium	10.8		SD-12	SD	5
SD-14	Barium	15.7		SD-14	SD	1
SD-14	Barium	9.3		SD-14	SD	2
SD-15	Barium	8.2		SD-15	SD	1
SD-15	Barium	13.3		SD-15	SD	2
BKGD	Calcium	378		SD-01	SD	1
BKGD	Calcium	751	J	SD-01	SD	2
SD-07	Calcium	116.5	U	SD-07	SD	1
SD-07	Calcium	949		SD-07	SD	2
SD-07	Calcium	208		SD-07	SD	5
SD-09	Calcium	339		SD-09	SD	1
SD-09	Calcium	543		SD-09	SD	2
SD-09	Calcium	176.5		SD-09	SD	5
SD-12	Calcium	125.5	U	SD-12	SD	1
SD-12	Calcium	290		SD-12	SD	2
SD-12	Calcium	232		SD-12	SD	5
SD-14	Calcium	486		SD-14	SD	1
SD-14	Calcium	339		SD-14	SD	2
BKGD	Chromium	4.4		SD-01	SD	1
BKGD	Chromium	11.1		SD-01	SD	2
SD-09	Chromium	2.45		SD-09	SD	1
SD-09	Chromium	2.75	U	SD-09	SD	2
SD-09	Chromium	1.35		SD-09	SD	5

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN MITCHELL BROOK SEDIMENT SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Iron	7530		SD-01	SD	1
BKGD	Iron	10500		SD-01	SD	2
SD-07	Iron	6490		SD-07	SD	1
SD-07	Iron	14600		SD-07	SD	2
SD-07	Iron	12400		SD-07	SD	5
SD-09	Iron	2930		SD-09	SD	1
SD-09	Iron	5010		SD-09	SD	2
SD-09	Iron	3985		SD-09	SD	5
SD-12	Iron	5670		SD-12	SD	1
SD-12	Iron	6500		SD-12	SD	2
SD-12	Iron	9630		SD-12	SD	5
SD-14	Iron	4800		SD-14	SD	1
SD-14	Iron	5130		SD-14	SD	2
SD-15	Iron	2750		SD-15	SD	1
SD-15	Iron	7040		SD-15	SD	2
BKGD	Lead	10.8		SD-01	SD	1
BKGD	Lead	12.2	J	SD-01	SD	2
SD-07	Lead	1.8	U	SD-07	SD	1
SD-07	Lead	8.9	J	SD-07	SD	2
SD-07	Lead	2.4		SD-07	SD	5
SD-09	Lead	5.15		SD-09	SD	1
SD-09	Lead	15.8	J	SD-09	SD	2
SD-09	Lead	3.6		SD-09	SD	5
SD-12	Lead	1.4	U	SD-12	SD	1
SD-12	Lead	3.5	J	SD-12	SD	2
SD-12	Lead	2.3		SD-12	SD	5
SD-14	Lead	21.7		SD-14	SD	1
SD-14	Lead	8.9	J	SD-14	SD	2
BKGD	Magnesium	1100		SD-01	SD	1
BKGD	Magnesium	1550		SD-01	SD	2
SD-09	Magnesium	531		SD-09	SD	1
SD-09	Magnesium	708		SD-09	SD	2
SD-09	Magnesium	433.5		SD-09	SD	5
SD-12	Magnesium	128.5	U	SD-12	SD	1
SD-12	Magnesium	350		SD-12	SD	2
SD-12	Magnesium	388		SD-12	SD	5
SD-14	Magnesium	764		SD-14	SD	1
SD-14	Magnesium	635		SD-14	SD	2
SD-15	Magnesium	506		SD-15	SD	1
SD-15	Magnesium	752		SD-15	SD	2
BKGD	Manganese	74.4		SD-01	SD	1
BKGD	Manganese	113		SD-01	SD	2
SD-07	Manganese	56.6		SD-07	SD	1
SD-07	Manganese	222		SD-07	SD	2
SD-07	Manganese	241		SD-07	SD	5
SD-09	Manganese	41.95		SD-09	SD	1
SD-09	Manganese	70.9		SD-09	SD	2
SD-09	Manganese	58.15		SD-09	SD	5

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN MITCHELL BROOK SEDIMENT SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SD-12	Manganese	37.3		SD-12	SD	1
SD-12	Manganese	41.1		SD-12	SD	2
SD-12	Manganese	79.9		SD-12	SD	5
SD-14	Manganese	68.4		SD-14	SD	1
SD-14	Manganese	47.7		SD-14	SD	2
SD-15	Manganese	36.3		SD-15	SD	1
SD-15	Manganese	78.7		SD-15	SD	2
BKGD	Nickel	4.1		SD-01	SD	1
BKGD	Nickel	7.3		SD-01	SD	2
SD-12	Nickel	1.5		SD-12	SD	1
SD-12	Nickel	1.9	U	SD-12	SD	2
SD-12	Nickel	3.8		SD-12	SD	5
SD-14	Nickel	3		SD-14	SD	1
SD-14	Nickel	2.1	U	SD-14	SD	2
BKGD	Potassium	549		SD-01	SD	1
BKGD	Potassium	775		SD-01	SD	2
SD-09	Potassium	190.5		SD-09	SD	1
SD-09	Potassium	423		SD-09	SD	2
SD-09	Potassium	177.5	U	SD-09	SD	5
SD-14	Potassium	308		SD-14	SD	1
SD-14	Potassium	270		SD-14	SD	2
BKGD	Vanadium	10.8		SD-01	SD	1
BKGD	Vanadium	16.8		SD-01	SD	2
SD-07	Vanadium	3.5		SD-07	SD	1
SD-07	Vanadium	10.5		SD-07	SD	2
SD-07	Vanadium	6.4		SD-07	SD	5
SD-09	Vanadium	4.85		SD-09	SD	1
SD-09	Vanadium	8.4		SD-09	SD	2
SD-09	Vanadium	1.8	U	SD-09	SD	5
SD-14	Vanadium	7.2		SD-14	SD	1
SD-14	Vanadium	6		SD-14	SD	2
SD-15	Vanadium	3.8		SD-15	SD	1
SD-15	Vanadium	8		SD-15	SD	2
BKGD	Zinc	25.2		SD-01	SD	1
BKGD	Zinc	33.7		SD-01	SD	2
SD-09	Zinc	17.3		SD-09	SD	1
SD-09	Zinc	33.6	J	SD-09	SD	2
SD-09	Zinc	4.65	U	SD-09	SD	5

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SD - Sediments

BKGD - Background

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SAUGATUCKET RIVER SEDIMENT SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Aluminum	749		SD-02	SD	1
BKGD	Aluminum	1260		SD-02	SD	2
BKGD	Aluminum	836		SD-02	SD	5
SD-03	Aluminum	1780		SD-03	SD	1
SD-03	Aluminum	2300		SD-03	SD	2
SD-04	Aluminum	5710		SD-04	SD	1
SD-04	Aluminum	6780		SD-04	SD	2
SD-04	Aluminum	1440		SD-04	SD	5
SD-05	Aluminum	6280		SD-05	SD	1
SD-05	Aluminum	8420		SD-05	SD	2
SD-05	Aluminum	1540		SD-05	SD	5
SD-06	Aluminum	3310		SD-06	SD	1
SD-06	Aluminum	1870		SD-06	SD	2
SD-06	Aluminum	1800		SD-06	SD	5
SD-08	Aluminum	1890		SD-08	SD	1
SD-08	Aluminum	3255		SD-08	SD	2
SD-11	Aluminum	2820		SD-11	SD	2
SD-11	Aluminum	1860		SD-11	SD	5
BKGD	Barium	2.7		SD-02	SD	1
BKGD	Barium	3.1		SD-02	SD	2
BKGD	Barium	2.9		SD-02	SD	5
SD-03	Barium	7.8		SD-03	SD	1
SD-03	Barium	8.1		SD-03	SD	2
SD-04	Barium	26.2		SD-04	SD	1
SD-04	Barium	30.5		SD-04	SD	2
SD-04	Barium	8.6		SD-04	SD	5
SD-05	Barium	17		SD-05	SD	1
SD-05	Barium	20.6		SD-05	SD	2
SD-05	Barium	13.7	J	SD-05	SD	5
SD-06	Barium	10.35		SD-06	SD	1
SD-06	Barium	6.3		SD-06	SD	2
SD-06	Barium	6.9		SD-06	SD	5
SD-08	Barium	9.7		SD-08	SD	1
SD-08	Barium	9.4		SD-08	SD	2
SD-11	Barium	12.1		SD-11	SD	2
SD-11	Barium	10.5		SD-11	SD	5
BKGD	Iron	780		SD-02	SD	1
BKGD	Iron	1020		SD-02	SD	2
BKGD	Iron	885		SD-02	SD	5
SD-03	Iron	1380		SD-03	SD	1
SD-03	Iron	1570		SD-03	SD	2
SD-04	Iron	11600		SD-04	SD	1
SD-04	Iron	16400		SD-04	SD	2
SD-04	Iron	4240		SD-04	SD	5
SD-05	Iron	4320		SD-05	SD	1
SD-05	Iron	6170		SD-05	SD	2
SD-05	Iron	25900		SD-05	SD	5
SD-06	Iron	8000		SD-06	SD	1

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SAUGATUCKET RIVER SEDIMENT SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SD-06	Iron	8940		SD-06	SD	2
SD-06	Iron	12500		SD-06	SD	5
SD-08	Iron	4020		SD-08	SD	1
SD-08	Iron	2795		SD-08	SD	2
SD-11	Iron	2530		SD-11	SD	2
SD-11	Iron	3680		SD-11	SD	5
BKGD	Lead	1.35	U	SD-02	SD	1
BKGD	Lead	7.2	J	SD-02	SD	2
BKGD	Lead	5.1		SD-02	SD	5
SD-04	Lead	2.25	U	SD-04	SD	1
SD-04	Lead	6.4	J	SD-04	SD	2
SD-04	Lead	6.2		SD-04	SD	5
SD-05	Lead	2.35	U	SD-05	SD	1
SD-05	Lead	4.3	J	SD-05	SD	2
SD-05	Lead	5.2		SD-05	SD	5
SD-06	Lead	10.9		SD-06	SD	1
SD-06	Lead	5.6	J	SD-06	SD	2
SD-06	Lead	3.9		SD-06	SD	5
SD-11	Lead	16.5	J	SD-11	SD	2
SD-11	Lead	7.6		SD-11	SD	5
BKGD	Magnesium	88	U	SD-02	SD	1
BKGD	Magnesium	373		SD-02	SD	2
BKGD	Magnesium	114		SD-02	SD	5
SD-04	Magnesium	1030		SD-04	SD	1
SD-04	Magnesium	1250		SD-04	SD	2
SD-04	Magnesium	245		SD-04	SD	5
SD-05	Magnesium	1040		SD-05	SD	1
SD-05	Magnesium	1430		SD-05	SD	2
SD-05	Magnesium	140		SD-05	SD	5
SD-06	Magnesium	488		SD-06	SD	1
SD-06	Magnesium	2560		SD-06	SD	2
SD-06	Magnesium	333		SD-06	SD	5
SD-11	Magnesium	473		SD-11	SD	2
SD-11	Magnesium	329		SD-11	SD	5
BKGD	Manganese	13.5		SD-02	SD	1
BKGD	Manganese	20.4		SD-02	SD	2
BKGD	Manganese	22.6		SD-02	SD	5
SD-03	Manganese	97.3		SD-03	SD	1
SD-03	Manganese	106		SD-03	SD	2
SD-04	Manganese	87.4		SD-04	SD	1
SD-04	Manganese	193		SD-04	SD	2
SD-04	Manganese	200		SD-04	SD	5
SD-05	Manganese	171		SD-05	SD	1
SD-05	Manganese	207		SD-05	SD	2
SD-05	Manganese	177		SD-05	SD	5
SD-06	Manganese	193		SD-06	SD	1
SD-06	Manganese	53.3		SD-06	SD	2
SD-06	Manganese	74.6		SD-06	SD	5

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SAUGATUCKET RIVER SEDIMENT SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SD-08	Manganese	72		SD-08	SD	1
SD-08	Manganese	49.25		SD-08	SD	2
SD-11	Manganese	50.3		SD-11	SD	2
SD-11	Manganese	75.9		SD-11	SD	5
SD-05	Selenium	2.1	J	SD-05	SD	1
SD-05	Selenium	1.3	J	SD-05	SD	2
SD-05	Selenium	0.13	U	SD-05	SD	5

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SD - Sediments

BKGD - Background

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Aluminum	19700	J	MW-01-01	GWSOB	2
BKGD	Aluminum	43300		MW-01-01	GWSOB	3
BKGD	Aluminum	10800		MW-01-01	GWSOB	4
BWA	Aluminum	12700		MW-03-01	GWSOB	2
BWA	Aluminum	50900		MW-03-01	GWSOB	3
BWA	Aluminum	18600		MW-05-01	GWSOB	2
BWA	Aluminum	18400	J	MW-05-01	GWSOB	4
BWA	Aluminum	2880		MW-12-01	GWSOB	2
BWA	Aluminum	13900	J	MW-12-01	GWSOB	4
BWA	Aluminum	2570	J	MW-V	GWSOB	1
BWA	Aluminum	3830	J	MW-V	GWSOB	2
SSA	Aluminum	55600		MW-02-01	GWSOB	2
SSA	Aluminum	21000		MW-02-01	GWSOB	3
SSA	Aluminum	663	J	MW-I	GWSOB	1
SSA	Aluminum	41400	J	MW-I	GWSOB	2
SSA	Aluminum	627	J	MW-II	GWSOB	1
SSA	Aluminum	23500	J	MW-II	GWSOB	2
SSA	Aluminum	24200	J	MW-II	GWSOB	4
SSA	Aluminum	20650	J	MW-III	GWSOB	1
SSA	Aluminum	11300	J	MW-III	GWSOB	2
SSA	Aluminum	2400	J	MW-IV	GWSOB	1
SSA	Aluminum	1010	J	MW-IV	GWSOB	2
SWA	Aluminum	24300		MW-04-01	GWSOB	2
SWA	Aluminum	55100		MW-04-01	GWSOB	3
SWA	Aluminum	1390	J	MW-06-01	GWSOB	2
SWA	Aluminum	2780		MW-06-01	GWSOB	4
SWA	Aluminum	6630		MW-11-01	GWSOB	2
SWA	Aluminum	20400		MW-11-01	GWSOB	3
SWA	Aluminum	6600		MW-13-01	GWSOB	2
BKGD	Barium	113		MW-01-01	GWSOB	2
BKGD	Barium	213		MW-01-01	GWSOB	3
BKGD	Barium	79.8	J	MW-01-01	GWSOB	4
BWA	Barium	26.6		MW-12-01	GWSOB	2
BWA	Barium	370		MW-03-01	GWSOB	3
BWA	Barium	67.5		MW-05-01	GWSOB	2
BWA	Barium	61.2		MW-05-01	GWSOB	4
BWA	Barium	234		MW-03-01	GWSOB	2
BWA	Barium	146		MW-12-01	GWSOB	4
BWA	Barium	20.5		MW-V	GWSOB	1
BWA	Barium	29.6		MW-V	GWSOB	2
SSA	Barium	265.5		MW-02-01	GWSOB	2
SSA	Barium	94.4		MW-02-01	GWSOB	3
SSA	Barium	3.85	U	MW-I	GWSOB	1
SSA	Barium	105.65		MW-III	GWSOB	1
SSA	Barium	26		MW-II	GWSOB	1
SSA	Barium	149		MW-II	GWSOB	2
SSA	Barium	125		MW-II	GWSOB	4
SSA	Barium	284		MW-I	GWSOB	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SSA	Barium	107		MW-III	GWSOB	2
SSA	Barium	19.5		MW-IV	GWSOB	1
SSA	Barium	19.3		MW-IV	GWSOB	2
SWA	Barium	244		MW-04-01	GWSOB	2
SWA	Barium	292		MW-04-01	GWSOB	3
SWA	Barium	56.5		MW-06-01	GWSOB	2
SWA	Barium	60.8	J	MW-06-01	GWSOB	4
SWA	Barium	290		MW-11-01	GWSOB	2
SWA	Barium	323		MW-11-01	GWSOB	3
SWA	Barium	76.4		MW-13-01	GWSOB	2
BKGD	Calcium	15600		MW-01-01	GWSOB	2
BKGD	Calcium	18700		MW-01-01	GWSOB	3
BKGD	Calcium	11500		MW-01-01	GWSOB	4
BWA	Calcium	35100		MW-03-01	GWSOB	2
BWA	Calcium	30700		MW-03-01	GWSOB	3
BWA	Calcium	6080		MW-05-01	GWSOB	2
BWA	Calcium	6230		MW-05-01	GWSOB	4
BWA	Calcium	6610		MW-12-01	GWSOB	2
BWA	Calcium	14300		MW-12-01	GWSOB	4
BWA	Calcium	3340		MW-V	GWSOB	1
BWA	Calcium	3300		MW-V	GWSOB	2
SSA	Calcium	12300		MW-02-01	GWSOB	2
SSA	Calcium	10190		MW-02-01	GWSOB	3
SSA	Calcium	1020		MW-I	GWSOB	1
SSA	Calcium	7830		MW-I	GWSOB	2
SSA	Calcium	8460		MW-II	GWSOB	1
SSA	Calcium	12200		MW-II	GWSOB	2
SSA	Calcium	13300		MW-II	GWSOB	4
SSA	Calcium	8350		MW-III	GWSOB	1
SSA	Calcium	4120		MW-III	GWSOB	2
SSA	Calcium	3430		MW-IV	GWSOB	1
SSA	Calcium	5170		MW-IV	GWSOB	2
SWA	Calcium	20600	J	MW-04-01	GWSOB	2
SWA	Calcium	15300		MW-04-01	GWSOB	3
SWA	Calcium	6260		MW-06-01	GWSOB	2
SWA	Calcium	6350		MW-06-01	GWSOB	4
SWA	Calcium	63100		MW-11-01	GWSOB	2
SWA	Calcium	64300		MW-11-01	GWSOB	3
SWA	Calcium	9100		MW-13-01	GWSOB	2
BKGD	Cobalt	27.7		MW-01-01	GWSOB	2
BKGD	Cobalt	101		MW-01-01	GWSOB	3
BKGD	Cobalt	31.6		MW-01-01	GWSOB	4
BWA	Cobalt	20.7		MW-03-01	GWSOB	2
BWA	Cobalt	27.2		MW-03-01	GWSOB	3
BWA	Cobalt	5.1	U	MW-05-01	GWSOB	2
BWA	Cobalt	10.1		MW-05-01	GWSOB	4
BWA	Cobalt	6.8	U	MW-12-01	GWSOB	2
BWA	Cobalt	8.3		MW-12-01	GWSOB	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BWA	Cobalt	2	U	MW-V	GWSOB	1
BWA	Cobalt	3	U	MW-V	GWSOB	2
SSA	Cobalt	28.95	U	MW-02-01	GWSOB	2
SSA	Cobalt	10		MW-02-01	GWSOB	3
SSA	Cobalt	1.95	U	MW-I	GWSOB	1
SSA	Cobalt	45		MW-I	GWSOB	2
SSA	Cobalt	3.9	U	MW-II	GWSOB	1
SSA	Cobalt	37.2		MW-II	GWSOB	2
SSA	Cobalt	26.2		MW-II	GWSOB	4
SSA	Cobalt	16.1		MW-III	GWSOB	1
SSA	Cobalt	10.2		MW-III	GWSOB	2
SSA	Cobalt	21		MW-IV	GWSOB	1
SSA	Cobalt	20.3		MW-IV	GWSOB	2
BKGD	Copper	25.5	U	MW-01-01	GWSOB	2
BKGD	Copper	115		MW-01-01	GWSOB	3
BKGD	Copper	24.4		MW-01-01	GWSOB	4
BWA	Copper	8.15	U	MW-03-01	GWSOB	2
BWA	Copper	36.9		MW-03-01	GWSOB	3
BWA	Copper	104		MW-05-01	GWSOB	2
BWA	Copper	55.9		MW-05-01	GWSOB	4
BWA	Copper	43.4		MW-12-01	GWSOB	2
BWA	Copper	10.8	U	MW-12-01	GWSOB	4
BWA	Copper	5.5	U	MW-V	GWSOB	1
BWA	Copper	12.4		MW-V	GWSOB	2
SWA	Copper	33.05	UJ	MW-04-01	GWSOB	2
SWA	Copper	73.3	J	MW-04-01	GWSOB	3
SWA	Copper	4.9	U	MW-06-01	GWSOB	2
SWA	Copper	3.7	U	MW-06-01	GWSOB	4
SWA	Copper	11.25	U	MW-11-01	GWSOB	2
SWA	Copper	9.3	U	MW-11-01	GWSOB	3
SWA	Copper	13.8	U	MW-13-01	GWSOB	2
BKGD	Iron	31500		MW-01-01	GWSOB	2
BKGD	Iron	71200		MW-01-01	GWSOB	3
BKGD	Iron	12100		MW-01-01	GWSOB	4
BWA	Iron	15400		MW-12-01	GWSOB	2
BWA	Iron	75600		MW-03-01	GWSOB	3
BWA	Iron	29700		MW-05-01	GWSOB	2
BWA	Iron	28000	J	MW-05-01	GWSOB	4
BWA	Iron	24000		MW-03-01	GWSOB	2
BWA	Iron	92000	J	MW-12-01	GWSOB	4
BWA	Iron	4050	J	MW-V	GWSOB	1
BWA	Iron	5320		MW-V	GWSOB	2
SSA	Iron	118000		MW-02-01	GWSOB	2
SSA	Iron	38450		MW-02-01	GWSOB	3
SSA	Iron	794	J	MW-I	GWSOB	1
SSA	Iron	34000	J	MW-III	GWSOB	1
SSA	Iron	73600	J	MW-II	GWSOB	1
SSA	Iron	84700		MW-II	GWSOB	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SSA	Iron	114000	J	MW-II	GWSOB	4
SSA	Iron	41400		MW-I	GWSOB	2
SSA	Iron	12600		MW-III	GWSOB	2
SSA	Iron	50800	J	MW-IV	GWSOB	1
SSA	Iron	54700		MW-IV	GWSOB	2
SWA	Iron	51400		MW-04-01	GWSOB	2
SWA	Iron	114000		MW-04-01	GWSOB	3
SWA	Iron	3640		MW-06-01	GWSOB	2
SWA	Iron	10900		MW-06-01	GWSOB	4
SWA	Iron	65600		MW-11-01	GWSOB	2
SWA	Iron	88000		MW-11-01	GWSOB	3
SWA	Iron	28700		MW-13-01	GWSOB	2
BKGD	Lead	23.6		MW-01-01	GWSOB	2
BKGD	Lead	64.4		MW-01-01	GWSOB	3
BKGD	Lead	22.1		MW-01-01	GWSOB	4
BWA	Lead	5.4	U	MW-03-01	GWSOB	2
BWA	Lead	36.2		MW-03-01	GWSOB	3
BWA	Lead	32.8		MW-05-01	GWSOB	2
BWA	Lead	24	J	MW-05-01	GWSOB	4
BWA	Lead	2.65	U	MW-12-01	GWSOB	2
BWA	Lead	24.7	J	MW-12-01	GWSOB	4
BWA	Lead	2.95	U	MW-V	GWSOB	1
BWA	Lead	2.9	U	MW-V	GWSOB	2
SSA	Lead	82.4		MW-02-01	GWSOB	2
SSA	Lead	19.25	J	MW-02-01	GWSOB	3
SSA	Lead	1.6	U	MW-I	GWSOB	1
SSA	Lead	42.7		MW-I	GWSOB	2
SSA	Lead	2.6	U	MW-II	GWSOB	1
SSA	Lead	72.8		MW-II	GWSOB	2
SSA	Lead	39.9	J	MW-II	GWSOB	4
SSA	Lead	71.85	J	MW-III	GWSOB	1
SSA	Lead	25.7		MW-III	GWSOB	2
SSA	Lead	5.45	U	MW-IV	GWSOB	1
SSA	Lead	3.2	U	MW-IV	GWSOB	2
SWA	Lead	13.9	U	MW-04-01	GWSOB	2
SWA	Lead	53		MW-04-01	GWSOB	3
SWA	Lead	1.35	U	MW-06-01	GWSOB	2
SWA	Lead	2.4	U	MW-06-01	GWSOB	4
SWA	Lead	2.7	U	MW-11-01	GWSOB	2
SWA	Lead	7.5	U	MW-11-01	GWSOB	3
SWA	Lead	6.5	U	MW-13-01	GWSOB	2
BKGD	Magnesium	3770		MW-01-01	GWSOB	2
BKGD	Magnesium	7540		MW-01-01	GWSOB	3
BKGD	Magnesium	2940		MW-01-01	GWSOB	4
BWA	Magnesium	8290		MW-03-01	GWSOB	2
BWA	Magnesium	10300		MW-03-01	GWSOB	3
BWA	Magnesium	5230		MW-05-01	GWSOB	2
BWA	Magnesium	4880		MW-05-01	GWSOB	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BWA	Magnesium	1760		MW-12-01	GWSOB	2
BWA	Magnesium	4310		MW-12-01	GWSOB	4
BWA	Magnesium	1350		MW-V	GWSOB	1
BWA	Magnesium	1480		MW-V	GWSOB	2
SSA	Magnesium	13750		MW-02-01	GWSOB	2
SSA	Magnesium	6145		MW-02-01	GWSOB	3
SSA	Magnesium	887		MW-I	GWSOB	1
SSA	Magnesium	7280		MW-I	GWSOB	2
SSA	Magnesium	4030		MW-II	GWSOB	1
SSA	Magnesium	5680		MW-II	GWSOB	2
SSA	Magnesium	7100		MW-II	GWSOB	4
SSA	Magnesium	6620		MW-III	GWSOB	1
SSA	Magnesium	2200		MW-III	GWSOB	2
SSA	Magnesium	1660		MW-IV	GWSOB	1
SSA	Magnesium	2080		MW-IV	GWSOB	2
SWA	Magnesium	4000	J	MW-04-01	GWSOB	2
SWA	Magnesium	9700		MW-04-01	GWSOB	3
SWA	Magnesium	2140		MW-06-01	GWSOB	2
SWA	Magnesium	2400		MW-06-01	GWSOB	4
SWA	Magnesium	19300		MW-11-01	GWSOB	2
SWA	Magnesium	21500		MW-11-01	GWSOB	3
SWA	Magnesium	2180		MW-13-01	GWSOB	2
BKGD	Manganese	4080		MW-01-01	GWSOB	2
BKGD	Manganese	1600		MW-01-01	GWSOB	3
BKGD	Manganese	444		MW-01-01	GWSOB	4
BWA	Manganese	1660		MW-12-01	GWSOB	2
BWA	Manganese	3240		MW-03-01	GWSOB	3
BWA	Manganese	756		MW-05-01	GWSOB	2
BWA	Manganese	636		MW-05-01	GWSOB	4
BWA	Manganese	3000		MW-03-01	GWSOB	2
BWA	Manganese	6960		MW-12-01	GWSOB	4
BWA	Manganese	132	J	MW-V	GWSOB	1
BWA	Manganese	201		MW-V	GWSOB	2
SSA	Manganese	5505		MW-02-01	GWSOB	2
SSA	Manganese	2510		MW-02-01	GWSOB	3
SSA	Manganese	44		MW-I	GWSOB	1
SSA	Manganese	1400	J	MW-III	GWSOB	1
SSA	Manganese	3850		MW-II	GWSOB	1
SSA	Manganese	4230		MW-II	GWSOB	2
SSA	Manganese	4290		MW-II	GWSOB	4
SSA	Manganese	1450		MW-I	GWSOB	2
SSA	Manganese	636		MW-III	GWSOB	2
SSA	Manganese	4340	J	MW-IV	GWSOB	1
SSA	Manganese	6230		MW-IV	GWSOB	2
SWA	Manganese	9790		MW-04-01	GWSOB	2
SWA	Manganese	9130		MW-04-01	GWSOB	3
SWA	Manganese	261		MW-06-01	GWSOB	2
SWA	Manganese	220		MW-06-01	GWSOB	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SWA	Manganese	3250		MW-11-01	GWSOB	2
SWA	Manganese	3420		MW-11-01	GWSOB	3
SWA	Manganese	1540		MW-13-01	GWSOB	2
BKGD	Sodium	15400		MW-01-01	GWSOB	2
BKGD	Sodium	16400		MW-01-01	GWSOB	3
BKGD	Sodium	13000		MW-01-01	GWSOB	4
BWA	Sodium	33000		MW-03-01	GWSOB	2
BWA	Sodium	21600		MW-03-01	GWSOB	3
BWA	Sodium	8600		MW-05-01	GWSOB	2
BWA	Sodium	8130		MW-05-01	GWSOB	4
BWA	Sodium	7470		MW-12-01	GWSOB	2
BWA	Sodium	7930		MW-12-01	GWSOB	4
BWA	Sodium	5450		MW-V	GWSOB	1
BWA	Sodium	3015	U	MW-V	GWSOB	2
SSA	Sodium	7290		MW-02-01	GWSOB	2
SSA	Sodium	6460		MW-02-01	GWSOB	3
SSA	Sodium	3040		MW-I	GWSOB	1
SSA	Sodium	3950	U	MW-I	GWSOB	2
SSA	Sodium	4740		MW-II	GWSOB	1
SSA	Sodium	3615	U	MW-II	GWSOB	2
SSA	Sodium	7130	J	MW-II	GWSOB	4
SSA	Sodium	6440		MW-III	GWSOB	1
SSA	Sodium	4570		MW-III	GWSOB	2
SSA	Sodium	6790		MW-IV	GWSOB	1
SSA	Sodium	4510	U	MW-IV	GWSOB	2
SWA	Sodium	12800		MW-04-01	GWSOB	2
SWA	Sodium	14000		MW-04-01	GWSOB	3
SWA	Sodium	19900		MW-06-01	GWSOB	2
SWA	Sodium	15000		MW-06-01	GWSOB	4
SWA	Sodium	75100		MW-11-01	GWSOB	2
SWA	Sodium	69700		MW-11-01	GWSOB	3
SWA	Sodium	11700		MW-13-01	GWSOB	2
BKGD	Specific Conductance	200		MW-01-01	GWSOB	2
BKGD	Specific Conductance	68		MW-01-01	GWSOB	3
BKGD	Specific Conductance	100		MW-01-01	GWSOB	4
BWA	Specific Conductance	440		MW-03-01	GWSOB	2
BWA	Specific Conductance	350		MW-03-01	GWSOB	3
BWA	Specific Conductance	72		MW-05-01	GWSOB	2
BWA	Specific Conductance	78		MW-05-01	GWSOB	4
BWA	Specific Conductance	120		MW-12-01	GWSOB	2
BWA	Specific Conductance	400		MW-12-01	GWSOB	4
BWA	Specific Conductance	140		MW-V	GWSOB	1
BWA	Specific Conductance	40		MW-V	GWSOB	2
SSA	Specific Conductance	260		MW-IV	GWSOB	2
SSA	Specific Conductance	50		MW-02-01	GWSOB	2
SSA	Specific Conductance	21		MW-I	GWSOB	1
SSA	Specific Conductance	120		MW-I	GWSOB	2
SSA	Specific Conductance	260		MW-II	GWSOB	1

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SSA	Specific Conductance	230		MW-II	GWSOB	2
SSA	Specific Conductance	460		MW-II	GWSOB	4
SSA	Specific Conductance	51		MW-III	GWSOB	1
SSA	Specific Conductance	26		MW-III	GWSOB	2
SSA	Specific Conductance	195		MW-IV	GWSOB	1
SSA	Specific Conductance	280		MW-02-01	GWSOB	3
SWA	Specific Conductance	290		MW-04-01	GWSOB	2
SWA	Specific Conductance	780		MW-04-01	GWSOB	3
SWA	Specific Conductance	210		MW-06-01	GWSOB	2
SWA	Specific Conductance	2500		MW-06-01	GWSOB	4
SWA	Specific Conductance	100		MW-11-01	GWSOB	2
SWA	Specific Conductance	1300		MW-11-01	GWSOB	3
SWA	Specific Conductance	175		MW-13-01	GWSOB	2
BKGD	Vanadium	15.9		MW-01-01	GWSOB	2
BKGD	Vanadium	36.3		MW-01-01	GWSOB	3
BKGD	Vanadium	3.2	U	MW-01-01	GWSOB	4
BWA	Vanadium	13.7		MW-03-01	GWSOB	2
BWA	Vanadium	19.7		MW-12-01	GWSOB	4
BWA	Vanadium	29.7		MW-05-01	GWSOB	2
BWA	Vanadium	24		MW-05-01	GWSOB	4
BWA	Vanadium	6.5		MW-12-01	GWSOB	2
BWA	Vanadium	47.7		MW-03-01	GWSOB	3
BWA	Vanadium	2.1	U	MW-V	GWSOB	1
BWA	Vanadium	1.9	U	MW-V	GWSOB	2
SSA	Vanadium	100.95		MW-02-01	GWSOB	2
SSA	Vanadium	27.15		MW-02-01	GWSOB	3
SSA	Vanadium	1.8	U	MW-I	GWSOB	1
SSA	Vanadium	44.3		MW-I	GWSOB	2
SSA	Vanadium	5.55	U	MW-III	GWSOB	2
SSA	Vanadium	33.9		MW-II	GWSOB	2
SSA	Vanadium	35.2		MW-II	GWSOB	4
SSA	Vanadium	27.85		MW-III	GWSOB	1
SSA	Vanadium	1.25	U	MW-II	GWSOB	1
SSA	Vanadium	3.8	U	MW-IV	GWSOB	1
SSA	Vanadium	1.5	U	MW-IV	GWSOB	2
SWA	Vanadium	30.2		MW-04-01	GWSOB	2
SWA	Vanadium	67.2	J	MW-04-01	GWSOB	3
SWA	Vanadium	1.5	U	MW-06-01	GWSOB	2
SWA	Vanadium	2.85	U	MW-06-01	GWSOB	4
SWA	Vanadium	4.6	U	MW-11-01	GWSOB	2
SWA	Vanadium	27.6		MW-11-01	GWSOB	3
SWA	Vanadium	11		MW-13-01	GWSOB	2
BKGD	Zinc	38.65	U	MW-01-01	GWSOB	2
BKGD	Zinc	139		MW-01-01	GWSOB	3
BKGD	Zinc	28.2	J	MW-01-01	GWSOB	4
BWA	Zinc	32.7	U	MW-03-01	GWSOB	2
BWA	Zinc	171		MW-03-01	GWSOB	3
BWA	Zinc	32.75	U	MW-05-01	GWSOB	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SHALLOW OVERBURDEN GROUNDWATER BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BWA	Zinc	75.1	J	MW-05-01	GWSOB	4
BWA	Zinc	215		MW-12-01	GWSOB	2
BWA	Zinc	52.6	J	MW-12-01	GWSOB	4
BWA	Zinc	19.05	U	MW-V	GWSOB	1
BWA	Zinc	9.8	U	MW-V	GWSOB	2
SWA	Zinc	133	J	MW-04-01	GWSOB	2
SWA	Zinc	210	J	MW-04-01	GWSOB	3
SWA	Zinc	13.75	UJ	MW-06-01	GWSOB	2
SWA	Zinc	5.5	UJ	MW-06-01	GWSOB	4
SWA	Zinc	15.45	U	MW-11-01	GWSOB	2
SWA	Zinc	73.5		MW-11-01	GWSOB	3
SWA	Zinc	28	UJ	MW-13-01	GWSOB	2

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SSA - Sewage Sludge Area

SWA - Solid Waste Area

BKGD - Background

BWA - Bulky Waste Area

GWSOB - Groundwater in shallow overburden flow zone

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SURFACE SOILS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Aluminum	10700		SS-14	SS	4
BKGD	Aluminum	12200		SS-01	SS	2
BKGD	Aluminum	16600		SS-02	SS	2
BWA	Aluminum	3065		SS-22	SS	4
BWA	Aluminum	6500		SS-24	SS	4
BWA	Aluminum	4760		SS-23	SS	4
BWA	Aluminum	8940		SS-09	SS	2
BWA	Aluminum	8630		SS-10	SS	2
NDA	Aluminum	6790		SS-20	SS	4
NDA	Aluminum	13000		SS-07	SS	2
NDA	Aluminum	2520		SS-21	SS	4
NDA	Aluminum	1740		SS-06	SS	2
NDA	Aluminum	11400		SS-08	SS	2
NDA	Aluminum	6800		SS-19	SS	4
SSA	Aluminum	6360		SS-11	SS	2
SSA	Aluminum	6740		SS-15	SS	4
SSA	Aluminum	3450		SS-12	SS	2
SWA	Aluminum	14400		SS-18	SS	4
SWA	Aluminum	4590		SS-17	SS	4
SWA	Aluminum	5650		SS-16	SS	4
SWA	Aluminum	7650		SS-05	SS	2
SWA	Aluminum	7880		SS-04	SS	2
SWA	Aluminum	11000		SS-03	SS	2
SWA	Aluminum	11000		SS-13	SS	2
BKGD	Arsenic	2.8	J	SS-01	SS	2
BKGD	Arsenic	2.1	J	SS-02	SS	2
BKGD	Arsenic	0.465	U	SS-14	SS	4
SWA	Arsenic	0.55	U	SS-16	SS	4
SWA	Arsenic	0.81		SS-05	SS	2
SWA	Arsenic	1.6	J	SS-13	SS	2
SWA	Arsenic	1.4		SS-03	SS	2
SWA	Arsenic	0.38	U	SS-17	SS	4
SWA	Arsenic	3.5		SS-18	SS	4
SWA	Arsenic	1.2	J	SS-04	SS	2
BKGD	Barium	11		SS-14	SS	4
BKGD	Barium	15.4		SS-01	SS	2
BKGD	Barium	37.8		SS-02	SS	2
BWA	Barium	16.5		SS-10	SS	2
BWA	Barium	86.2	J	SS-23	SS	4
BWA	Barium	37.3		SS-22	SS	4
BWA	Barium	14.4		SS-24	SS	4
BWA	Barium	16.4		SS-09	SS	2
NDA	Barium	16.8		SS-07	SS	2
NDA	Barium	20.5	J	SS-21	SS	4
NDA	Barium	5.2		SS-06	SS	2
NDA	Barium	16.9		SS-08	SS	2
NDA	Barium	9.2		SS-20	SS	4
NDA	Barium	17.1		SS-19	SS	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SURFACE SOILS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SSA	Barium	58.9		SS-11	SS	2
SSA	Barium	8.5		SS-12	SS	2
SSA	Barium	15.8		SS-15	SS	4
SWA	Barium	14.2		SS-18	SS	4
SWA	Barium	15.5		SS-17	SS	4
SWA	Barium	17.2		SS-05	SS	2
SWA	Barium	17		SS-04	SS	2
SWA	Barium	20.3		SS-13	SS	2
SWA	Barium	17.7		SS-03	SS	2
SWA	Barium	16.9		SS-16	SS	4
BKGD	Chromium	11.2		SS-01	SS	2
BKGD	Chromium	17.5		SS-02	SS	2
BKGD	Chromium	4.9	UJ	SS-14	SS	4
SSA	Chromium	5.3	J	SS-12	SS	2
SSA	Chromium	4.05	UJ	SS-15	SS	4
SSA	Chromium	9.8		SS-11	SS	2
SWA	Chromium	3	UJ	SS-16	SS	4
SWA	Chromium	12.8		SS-13	SS	2
SWA	Chromium	10		SS-04	SS	2
SWA	Chromium	9.7		SS-05	SS	2
SWA	Chromium	2.6	UJ	SS-17	SS	4
SWA	Chromium	12.1	J	SS-18	SS	4
SWA	Chromium	11.2		SS-03	SS	2
BKGD	Cobalt	2.4	U	SS-14	SS	4
BKGD	Cobalt	3		SS-01	SS	2
BKGD	Cobalt	3.6		SS-02	SS	2
BWA	Cobalt	3.25		SS-09	SS	2
BWA	Cobalt	12.8		SS-23	SS	4
BWA	Cobalt	7.1		SS-22	SS	4
BWA	Cobalt	4.8		SS-10	SS	2
BWA	Cobalt	2.25	U	SS-24	SS	4
SSA	Cobalt	3.6		SS-11	SS	2
SSA	Cobalt	3		SS-12	SS	2
SSA	Cobalt	2.2	U	SS-15	SS	4
SWA	Cobalt	4.8		SS-04	SS	2
SWA	Cobalt	4		SS-05	SS	2
SWA	Cobalt	1.55	U	SS-17	SS	4
SWA	Cobalt	1.8	U	SS-18	SS	4
SWA	Cobalt	5.7		SS-13	SS	2
SWA	Cobalt	4.1		SS-03	SS	2
SWA	Cobalt	2.1	U	SS-16	SS	4
BKGD	Copper	3.5		SS-01	SS	2
BKGD	Copper	5.3		SS-02	SS	2
BKGD	Copper	4.3		SS-14	SS	4
SSA	Copper	2	U	SS-12	SS	2
SSA	Copper	9.9		SS-15	SS	4
SSA	Copper	99.3		SS-11	SS	2
SWA	Copper	5.4		SS-04	SS	2

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SURFACE SOILS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SWA	Copper	8.7		SS-13	SS	2
SWA	Copper	253		SS-03	SS	2
SWA	Copper	7.6		SS-16	SS	4
SWA	Copper	5.5		SS-17	SS	4
SWA	Copper	1.35	U	SS-18	SS	4
SWA	Copper	7.2		SS-05	SS	2
BKGD	Iron	12700		SS-14	SS	4
BKGD	Iron	12300		SS-01	SS	2
BKGD	Iron	18100		SS-02	SS	2
BWA	Iron	11650		SS-09	SS	2
BWA	Iron	149000		SS-23	SS	4
BWA	Iron	19700		SS-22	SS	4
BWA	Iron	9240		SS-24	SS	4
BWA	Iron	10600		SS-10	SS	2
NDA	Iron	14700		SS-07	SS	2
NDA	Iron	40500		SS-21	SS	4
NDA	Iron	4090		SS-06	SS	2
NDA	Iron	13300		SS-08	SS	2
NDA	Iron	7030		SS-20	SS	4
NDA	Iron	6020		SS-19	SS	4
SSA	Iron	10400		SS-11	SS	2
SSA	Iron	7190		SS-12	SS	2
SSA	Iron	9240		SS-15	SS	4
SWA	Iron	15100		SS-18	SS	4
SWA	Iron	6840		SS-17	SS	4
SWA	Iron	10200		SS-05	SS	2
SWA	Iron	12100		SS-04	SS	2
SWA	Iron	9970		SS-13	SS	2
SWA	Iron	12100		SS-03	SS	2
SWA	Iron	12000		SS-16	SS	4
BKGD	Lead	30.1	J	SS-01	SS	2
BKGD	Lead	14.3	J	SS-02	SS	2
BKGD	Lead	11.1		SS-14	SS	4
BWA	Lead	5.6		SS-09	SS	2
BWA	Lead	7.2		SS-22	SS	4
BWA	Lead	124		SS-23	SS	4
BWA	Lead	4.3		SS-24	SS	4
BWA	Lead	5.6	J	SS-10	SS	2
NDA	Lead	10.3	J	SS-08	SS	2
NDA	Lead	3.1		SS-06	SS	2
NDA	Lead	27.4	J	SS-07	SS	2
NDA	Lead	4.4		SS-21	SS	4
NDA	Lead	8.5		SS-20	SS	4
NDA	Lead	23.5		SS-19	SS	4
SSA	Lead	4.4		SS-15	SS	4
SSA	Lead	2.6	J	SS-12	SS	2
SSA	Lead	11.8	J	SS-11	SS	2
SWA	Lead	31.1		SS-18	SS	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SURFACE SOILS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SWA	Lead	8.1		SS-05	SS	2
SWA	Lead	10.3		SS-03	SS	2
SWA	Lead	11.5	J	SS-13	SS	2
SWA	Lead	4.1		SS-16	SS	4
SWA	Lead	3.9		SS-17	SS	4
SWA	Lead	7.3	J	SS-04	SS	2
BKGD	Magnesium	1110		SS-01	SS	2
BKGD	Magnesium	1360		SS-14	SS	4
BKGD	Magnesium	1220		SS-02	SS	2
BWA	Magnesium	493		SS-23	SS	4
BWA	Magnesium	638		SS-22	SS	4
BWA	Magnesium	946		SS-09	SS	2
BWA	Magnesium	1270		SS-10	SS	2
BWA	Magnesium	1150		SS-24	SS	4
NDA	Magnesium	185		SS-19	SS	4
NDA	Magnesium	1710		SS-08	SS	2
NDA	Magnesium	381		SS-06	SS	2
NDA	Magnesium	975.5		SS-07	SS	2
NDA	Magnesium	238		SS-20	SS	4
NDA	Magnesium	639		SS-21	SS	4
SSA	Magnesium	773		SS-12	SS	2
SSA	Magnesium	1100		SS-11	SS	2
SSA	Magnesium	1300		SS-15	SS	4
SWA	Magnesium	1310		SS-05	SS	2
SWA	Magnesium	1030		SS-17	SS	4
SWA	Magnesium	1060		SS-16	SS	4
SWA	Magnesium	1990		SS-13	SS	2
SWA	Magnesium	1750		SS-04	SS	2
SWA	Magnesium	1600		SS-03	SS	2
SWA	Magnesium	732		SS-18	SS	4
BKGD	Manganese	82		SS-14	SS	4
BKGD	Manganese	104		SS-01	SS	2
BKGD	Manganese	267		SS-02	SS	2
BWA	Manganese	153.5		SS-09	SS	2
BWA	Manganese	108		SS-10	SS	2
BWA	Manganese	105		SS-24	SS	4
BWA	Manganese	6120		SS-23	SS	4
BWA	Manganese	318.5		SS-22	SS	4
NDA	Manganese	116.5		SS-07	SS	2
NDA	Manganese	167		SS-08	SS	2
NDA	Manganese	12.9		SS-19	SS	4
NDA	Manganese	86.6		SS-06	SS	2
NDA	Manganese	257		SS-21	SS	4
NDA	Manganese	18.4		SS-20	SS	4
SSA	Manganese	135		SS-12	SS	2
SSA	Manganese	96.4		SS-11	SS	2
SSA	Manganese	97.3		SS-15	SS	4
SWA	Manganese	60.8		SS-18	SS	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SURFACE SOILS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SWA	Manganese	114		SS-17	SS	4
SWA	Manganese	138		SS-16	SS	4
SWA	Manganese	123		SS-05	SS	2
SWA	Manganese	92.1		SS-03	SS	2
SWA	Manganese	109		SS-13	SS	2
SWA	Manganese	131		SS-04	SS	2
BKGD	Potassium	673		SS-01	SS	2
BKGD	Potassium	909		SS-02	SS	2
BKGD	Potassium	443		SS-14	SS	4
BWA	Potassium	566		SS-09	SS	2
BWA	Potassium	766		SS-10	SS	2
BWA	Potassium	504		SS-24	SS	4
BWA	Potassium	290		SS-22	SS	4
BWA	Potassium	278		SS-23	SS	4
NDA	Potassium	669.5		SS-07	SS	2
NDA	Potassium	717		SS-08	SS	2
NDA	Potassium	106		SS-19	SS	4
NDA	Potassium	308		SS-06	SS	2
NDA	Potassium	147		SS-20	SS	4
NDA	Potassium	472		SS-21	SS	4
SSA	Potassium	518		SS-15	SS	4
SSA	Potassium	847		SS-11	SS	2
SSA	Potassium	653		SS-12	SS	2
SWA	Potassium	179		SS-18	SS	4
SWA	Potassium	766		SS-17	SS	4
SWA	Potassium	630		SS-16	SS	4
SWA	Potassium	697		SS-05	SS	2
SWA	Potassium	472.5	UJ	SS-04	SS	2
SWA	Potassium	612		SS-03	SS	2
SWA	Potassium	944		SS-13	SS	2
BKGD	Vanadium	21		SS-01	SS	2
BKGD	Vanadium	16.5		SS-14	SS	4
BKGD	Vanadium	25.7		SS-02	SS	2
BWA	Vanadium	5.7		SS-22	SS	4
BWA	Vanadium	13.15		SS-09	SS	2
BWA	Vanadium	15		SS-10	SS	2
BWA	Vanadium	18.1	J	SS-23	SS	4
BWA	Vanadium	10.2		SS-24	SS	4
NDA	Vanadium	27.2		SS-07	SS	2
NDA	Vanadium	20.5		SS-08	SS	2
NDA	Vanadium	8.8		SS-19	SS	4
NDA	Vanadium	3.2		SS-06	SS	2
NDA	Vanadium	8.1		SS-20	SS	4
NDA	Vanadium	5.8	J	SS-21	SS	4
SSA	Vanadium	12.1		SS-15	SS	4
SSA	Vanadium	12		SS-11	SS	2
SSA	Vanadium	3.45	U	SS-12	SS	2
SWA	Vanadium	21.3		SS-18	SS	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS
IN SURFACE SOILS BY DISPOSAL AREA

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SWA	Vanadium	6.9		SS-17	SS	4
SWA	Vanadium	10.2		SS-16	SS	4
SWA	Vanadium	13.7		SS-05	SS	2
SWA	Vanadium	16.9		SS-04	SS	2
SWA	Vanadium	18.2		SS-03	SS	2
SWA	Vanadium	22.9		SS-13	SS	2
BKGD	Zinc	30.1		SS-02	SS	2
BKGD	Zinc	22.3		SS-01	SS	2
BKGD	Zinc	21	J	SS-14	SS	4
BWA	Zinc	22.7		SS-10	SS	2
BWA	Zinc	0	R	SS-23	SS	4
BWA	Zinc	13.3	J	SS-22	SS	4
BWA	Zinc	19.3	J	SS-24	SS	4
BWA	Zinc	35.95		SS-09	SS	2
NDA	Zinc	31.7		SS-07	SS	2
NDA	Zinc	0	R	SS-21	SS	4
NDA	Zinc	20.8		SS-06	SS	2
NDA	Zinc	37.4		SS-08	SS	2
NDA	Zinc	18.5	J	SS-20	SS	4
NDA	Zinc	10.3	J	SS-19	SS	4
SSA	Zinc	56.5		SS-11	SS	2
SSA	Zinc	22.1	J	SS-15	SS	4
SSA	Zinc	19.9		SS-12	SS	2
SWA	Zinc	16.3	J	SS-18	SS	4
SWA	Zinc	19.8	J	SS-17	SS	4
SWA	Zinc	25.7	J	SS-16	SS	4
SWA	Zinc	38.3		SS-13	SS	2
SWA	Zinc	39.9		SS-05	SS	2
SWA	Zinc	24.4		SS-04	SS	2
SWA	Zinc	40.5		SS-03	SS	2

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SSA - Sewage Sludge Area

SWA - Solid Waste Area

BKGD - Background

BWA - Bulky Waste Area

SS - Surface Soil

NDA - Non-disposal area

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN MITCHELL BROOK SURFACE WATER SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Aluminum	272	J	SW-01	SW	1
BKGD	Aluminum	573	J	SW-01	SW	2
SW-07	Aluminum	177	J	SW-07	SW	1
SW-07	Aluminum	89	U	SW-07	SW	2
SW-07	Aluminum	109		SW-07	SW	3
SW-07	Aluminum	59.5	U	SW-07	SW	4
SW-07	Aluminum	320		SW-07	SW	5
SW-12	Aluminum	968	J	SW-12	SW	1
SW-12	Aluminum	48.45	U	SW-12	SW	2
SW-12	Aluminum	123.5		SW-12	SW	3
SW-12	Aluminum	58.5	U	SW-12	SW	4
SW-12	Aluminum	132		SW-12	SW	5
SW-14	Aluminum	369	J	SW-14	SW	1
SW-14	Aluminum	47.8	U	SW-14	SW	2
SW-15	Aluminum	951	J	SW-15	SW	1
SW-15	Aluminum	86	U	SW-15	SW	2
BKGD	Calcium	2980		SW-01	SW	1
BKGD	Calcium	2500		SW-01	SW	2
SW-07	Calcium	8620		SW-07	SW	1
SW-07	Calcium	6760		SW-07	SW	2
SW-07	Calcium	3210		SW-07	SW	3
SW-07	Calcium	3480		SW-07	SW	4
SW-07	Calcium	4560		SW-07	SW	5
SW-09	Calcium	2845		SW-09	SW	1
SW-09	Calcium	3720		SW-09	SW	2
SW-09	Calcium	2810		SW-09	SW	3
SW-09	Calcium	2870		SW-09	SW	4
SW-09	Calcium	2990		SW-09	SW	5
SW-12	Calcium	23200		SW-12	SW	1
SW-12	Calcium	10000		SW-12	SW	2
SW-12	Calcium	3660		SW-12	SW	3
SW-12	Calcium	4260		SW-12	SW	4
SW-12	Calcium	6330		SW-12	SW	5
SW-14	Calcium	2440		SW-14	SW	1
SW-14	Calcium	3650	J	SW-14	SW	2
SW-15	Calcium	2710		SW-15	SW	1
SW-15	Calcium	3690		SW-15	SW	2
BKGD	Iron	3250	J	SW-01	SW	1
BKGD	Iron	1360	J	SW-01	SW	2
SW-07	Iron	14800	J	SW-07	SW	1
SW-07	Iron	5000	J	SW-07	SW	2
SW-07	Iron	820		SW-07	SW	3
SW-07	Iron	1310		SW-07	SW	4
SW-07	Iron	6760		SW-07	SW	5
SW-09	Iron	795	J	SW-09	SW	1
SW-09	Iron	292	J	SW-09	SW	2
SW-09	Iron	280		SW-09	SW	3
SW-09	Iron	152	UJ	SW-09	SW	4

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN MITCHELL BROOK SURFACE WATER SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SW-09	Iron	403		SW-09	SW	5
SW-12	Iron	65000	J	SW-12	SW	1
SW-12	Iron	4200	J	SW-12	SW	2
SW-12	Iron	1105		SW-12	SW	3
SW-12	Iron	1300		SW-12	SW	4
SW-12	Iron	2510		SW-12	SW	5
SW-14	Iron	920	J	SW-14	SW	1
SW-14	Iron	102	UJ	SW-14	SW	2
SW-15	Iron	3360	J	SW-15	SW	1
SW-15	Iron	91.5	U	SW-15	SW	2
BKGD	Magnesium	1070		SW-01	SW	1
BKGD	Magnesium	975		SW-01	SW	2
SW-07	Magnesium	2590		SW-07	SW	1
SW-07	Magnesium	2090		SW-07	SW	2
SW-07	Magnesium	1180		SW-07	SW	3
SW-07	Magnesium	1220		SW-07	SW	4
SW-07	Magnesium	1550		SW-07	SW	5
SW-09	Magnesium	984.5		SW-09	SW	1
SW-09	Magnesium	1270		SW-09	SW	2
SW-09	Magnesium	1070		SW-09	SW	3
SW-09	Magnesium	1050		SW-09	SW	4
SW-09	Magnesium	1100		SW-09	SW	5
SW-12	Magnesium	7380		SW-12	SW	1
SW-12	Magnesium	3260		SW-12	SW	2
SW-12	Magnesium	1335		SW-12	SW	3
SW-12	Magnesium	1500		SW-12	SW	4
SW-12	Magnesium	2170		SW-12	SW	5
SW-14	Magnesium	960		SW-14	SW	1
SW-14	Magnesium	1210	J	SW-14	SW	2
SW-15	Magnesium	994		SW-15	SW	1
SW-15	Magnesium	1270		SW-15	SW	2
BKGD	Manganese	161		SW-01	SW	1
BKGD	Manganese	155		SW-01	SW	2
SW-07	Manganese	1330	J	SW-07	SW	1
SW-07	Manganese	577		SW-07	SW	2
SW-07	Manganese	132		SW-07	SW	3
SW-07	Manganese	163		SW-07	SW	4
SW-07	Manganese	443		SW-07	SW	5
SW-09	Manganese	102.75		SW-09	SW	1
SW-09	Manganese	9.1	U	SW-09	SW	2
SW-09	Manganese	53.4	J	SW-09	SW	3
SW-09	Manganese	51.1		SW-09	SW	4
SW-09	Manganese	58.65		SW-09	SW	5
SW-12	Manganese	1610	J	SW-12	SW	1
SW-12	Manganese	708		SW-12	SW	2
SW-12	Manganese	173		SW-12	SW	3
SW-12	Manganese	212		SW-12	SW	4
SW-12	Manganese	434		SW-12	SW	5

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN MITCHELL BROOK SURFACE WATER SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SW-14	Manganese	87.8		SW-14	SW	1
SW-14	Manganese	24.3		SW-14	SW	2
SW-15	Manganese	276	J	SW-15	SW	1
SW-15	Manganese	6.15	U	SW-15	SW	2
BKGD	Sodium	6840		SW-01	SW	1
BKGD	Sodium	4620		SW-01	SW	2
SW-09	Sodium	6950		SW-09	SW	1
SW-09	Sodium	11000		SW-09	SW	2
SW-09	Sodium	8080		SW-09	SW	3
SW-09	Sodium	8150		SW-09	SW	4
SW-09	Sodium	7905		SW-09	SW	5
SW-12	Sodium	35300		SW-12	SW	1
SW-12	Sodium	18800		SW-12	SW	2
SW-12	Sodium	9330		SW-12	SW	3
SW-12	Sodium	10400		SW-12	SW	4
SW-12	Sodium	12500		SW-12	SW	5
SW-14	Sodium	6550		SW-14	SW	1
SW-14	Sodium	10900		SW-14	SW	2
SW-15	Sodium	6780		SW-15	SW	1
SW-15	Sodium	10800		SW-15	SW	2
BKGD	Specific Conductance	73		SW-01	SW	1
BKGD	Specific Conductance	50		SW-01	SW	2
SW-07	Specific Conductance	160		SW-07	SW	1
SW-07	Specific Conductance	136		SW-07	SW	2
SW-07	Specific Conductance	80		SW-07	SW	3
SW-07	Specific Conductance	85		SW-07	SW	4
SW-07	Specific Conductance	94		SW-07	SW	5
SW-09	Specific Conductance	72		SW-09	SW	1
SW-09	Specific Conductance	73		SW-09	SW	2
SW-09	Specific Conductance	80		SW-09	SW	3
SW-09	Specific Conductance	74		SW-09	SW	4
SW-09	Specific Conductance	68		SW-09	SW	5
SW-12	Specific Conductance	1200		SW-12	SW	1
SW-12	Specific Conductance	222		SW-12	SW	2
SW-12	Specific Conductance	90		SW-12	SW	3
SW-12	Specific Conductance	125		SW-12	SW	4
SW-12	Specific Conductance	141		SW-12	SW	5
SW-14	Specific Conductance	58		SW-14	SW	1
SW-14	Specific Conductance	29		SW-14	SW	2
SW-15	Specific Conductance	59		SW-15	SW	1
SW-15	Specific Conductance	83		SW-15	SW	2

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

SW - Surface Water

BKGD - Background

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SAUGATUCKET RIVER SURFACE WATER SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
BKGD	Barium	5.3		SW-02	SW	1
BKGD	Barium	3.7	U	SW-02	SW	2
BKGD	Barium	8.6	J	SW-02	SW	4
BKGD	Barium	5.4		SW-02	SW	5
SW-04	Barium	5.8		SW-04	SW	1
SW-04	Barium	4	U	SW-04	SW	2
SW-04	Barium	3.75	U	SW-04	SW	3
SW-04	Barium	8.85	J	SW-04	SW	4
SW-04	Barium	4.9		SW-04	SW	5
BKGD	Calcium	3950		SW-02	SW	1
BKGD	Calcium	4070		SW-02	SW	2
BKGD	Calcium	3240		SW-02	SW	4
BKGD	Calcium	3900		SW-02	SW	5
SW-03	Calcium	4030		SW-03	SW	1
SW-03	Calcium	4010		SW-03	SW	2
SW-04	Calcium	4130		SW-04	SW	1
SW-04	Calcium	4220		SW-04	SW	2
SW-04	Calcium	3030		SW-04	SW	3
SW-04	Calcium	3295		SW-04	SW	4
SW-04	Calcium	3880		SW-04	SW	5
SW-05	Calcium	27100		SW-05	SW	1
SW-05	Calcium	4800		SW-05	SW	2
SW-05	Calcium	3700		SW-05	SW	3
SW-05	Calcium	3530		SW-05	SW	4
SW-05	Calcium	4160		SW-05	SW	5
SW-08	Calcium	6550		SW-08	SW	1
SW-08	Calcium	6740		SW-08	SW	2
SW-11	Calcium	6570	J	SW-11	SW	2
SW-11	Calcium	4060		SW-11	SW	3
SW-11	Calcium	4690		SW-11	SW	4
SW-11	Calcium	5950		SW-11	SW	5
BKGD	Magnesium	1270		SW-02	SW	1
BKGD	Magnesium	1460		SW-02	SW	2
BKGD	Magnesium	1210		SW-02	SW	4
BKGD	Magnesium	1350		SW-02	SW	5
SW-03	Magnesium	1360		SW-03	SW	1
SW-03	Magnesium	1460		SW-03	SW	2
SW-04	Magnesium	1410		SW-04	SW	1
SW-04	Magnesium	1490		SW-04	SW	2
SW-04	Magnesium	1250		SW-04	SW	3
SW-04	Magnesium	1210		SW-04	SW	4
SW-04	Magnesium	1350		SW-04	SW	5
SW-05	Magnesium	12900		SW-05	SW	1
SW-05	Magnesium	1610		SW-05	SW	2
SW-05	Magnesium	1370		SW-05	SW	3
SW-05	Magnesium	1290		SW-05	SW	4
SW-05	Magnesium	1410		SW-05	SW	5
SW-06	Magnesium	1770		SW-06	SW	1

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SAUGATUCKET RIVER SURFACE WATER SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SW-06	Magnesium	1970		SW-06	SW	2
SW-06	Magnesium	1360		SW-06	SW	3
SW-06	Magnesium	1430		SW-06	SW	4
SW-06	Magnesium	1660		SW-06	SW	5
SW-08	Magnesium	2070		SW-08	SW	1
SW-08	Magnesium	2075		SW-08	SW	2
SW-11	Magnesium	2070	J	SW-11	SW	2
SW-11	Magnesium	1510		SW-11	SW	3
SW-11	Magnesium	1590		SW-11	SW	4
SW-11	Magnesium	1920		SW-11	SW	5
BKGD	Manganese	22.2	J	SW-02	SW	1
BKGD	Manganese	68.2		SW-02	SW	2
BKGD	Manganese	20.6		SW-02	SW	4
BKGD	Manganese	21.2		SW-02	SW	5
SW-03	Manganese	43.1	J	SW-03	SW	1
SW-03	Manganese	42.3		SW-03	SW	2
SW-04	Manganese	201	J	SW-04	SW	1
SW-04	Manganese	225		SW-04	SW	2
SW-04	Manganese	62.5	J	SW-04	SW	3
SW-04	Manganese	90.85		SW-04	SW	4
SW-04	Manganese	136		SW-04	SW	5
SW-05	Manganese	2030		SW-05	SW	1
SW-05	Manganese	248		SW-05	SW	2
SW-05	Manganese	195		SW-05	SW	3
SW-05	Manganese	144		SW-05	SW	4
SW-05	Manganese	176		SW-05	SW	5
SW-06	Manganese	379		SW-06	SW	1
SW-06	Manganese	377		SW-06	SW	2
SW-06	Manganese	150		SW-06	SW	3
SW-06	Manganese	184		SW-06	SW	4
SW-06	Manganese	303		SW-06	SW	5
SW-08	Manganese	524	J	SW-08	SW	1
SW-08	Manganese	469.5		SW-08	SW	2
SW-11	Manganese	458		SW-11	SW	2
SW-11	Manganese	182	J	SW-11	SW	3
SW-11	Manganese	237		SW-11	SW	4
SW-11	Manganese	373		SW-11	SW	5
BKGD	Sodium	7900		SW-02	SW	1
BKGD	Sodium	9720		SW-02	SW	2
BKGD	Sodium	8350		SW-02	SW	4
BKGD	Sodium	8390		SW-02	SW	5
SW-03	Sodium	7990		SW-03	SW	1
SW-03	Sodium	9710		SW-03	SW	2
SW-04	Sodium	8020		SW-04	SW	1
SW-04	Sodium	9640		SW-04	SW	2
SW-04	Sodium	9290		SW-04	SW	3
SW-04	Sodium	8285		SW-04	SW	4
SW-04	Sodium	8300		SW-04	SW	5

DATA USED TO EVALUATE STATISTICAL DIFFERENCES FOR METALS AND CONDUCTIVITY IN SAUGATUCKET RIVER SURFACE WATER SAMPLING LOCATIONS

GROUPING	ANALYTE	RESULT	FLAG	LOCATION	MATRIX/ FLOW ZONE	SAMPLING ROUND
SW-05	Sodium	59900		SW-05	SW	1
SW-05	Sodium	10000		SW-05	SW	2
SW-05	Sodium	9430		SW-05	SW	3
SW-05	Sodium	8460		SW-05	SW	4
SW-05	Sodium	8330		SW-05	SW	5
SW-06	Sodium	9510		SW-06	SW	1
SW-06	Sodium	11900		SW-06	SW	2
SW-06	Sodium	9370		SW-06	SW	3
SW-06	Sodium	9120		SW-06	SW	4
SW-06	Sodium	9460		SW-06	SW	5
SW-11	Sodium	12200		SW-11	SW	2
SW-11	Sodium	10100		SW-11	SW	3
SW-11	Sodium	9790		SW-11	SW	4
SW-11	Sodium	10800		SW-11	SW	5
BKGD	Specific Conductance	77		SW-02	SW	1
BKGD	Specific Conductance	91		SW-02	SW	2
BKGD	Specific Conductance	76		SW-02	SW	4
BKGD	Specific Conductance	75		SW-02	SW	5
SW-03	Specific Conductance	77		SW-03	SW	1
SW-03	Specific Conductance	92		SW-03	SW	2
SW-04	Specific Conductance	80		SW-04	SW	1
SW-04	Specific Conductance	100		SW-04	SW	2
SW-04	Specific Conductance	900		SW-04	SW	3
SW-04	Specific Conductance	75		SW-04	SW	4
SW-04	Specific Conductance	75		SW-04	SW	5
SW-05	Specific Conductance	83		SW-05	SW	1
SW-05	Specific Conductance	170		SW-05	SW	2
SW-05	Specific Conductance	100		SW-05	SW	3
SW-05	Specific Conductance	74		SW-05	SW	4
SW-05	Specific Conductance	78		SW-05	SW	5
SW-06	Specific Conductance	106		SW-06	SW	1
SW-06	Specific Conductance	130		SW-06	SW	2
SW-06	Specific Conductance	90		SW-06	SW	3
SW-06	Specific Conductance	90		SW-06	SW	4
SW-06	Specific Conductance	97		SW-06	SW	5
SW-08	Specific Conductance	133		SW-08	SW	1
SW-08	Specific Conductance	138		SW-08	SW	2
SW-11	Specific Conductance	126		SW-11	SW	2
SW-11	Specific Conductance	100		SW-11	SW	3
SW-11	Specific Conductance	98		SW-11	SW	4
SW-11	Specific Conductance	112		SW-11	SW	5

NOTES:

*: Refer to Appendix G-2 for description of statistical procedures used.

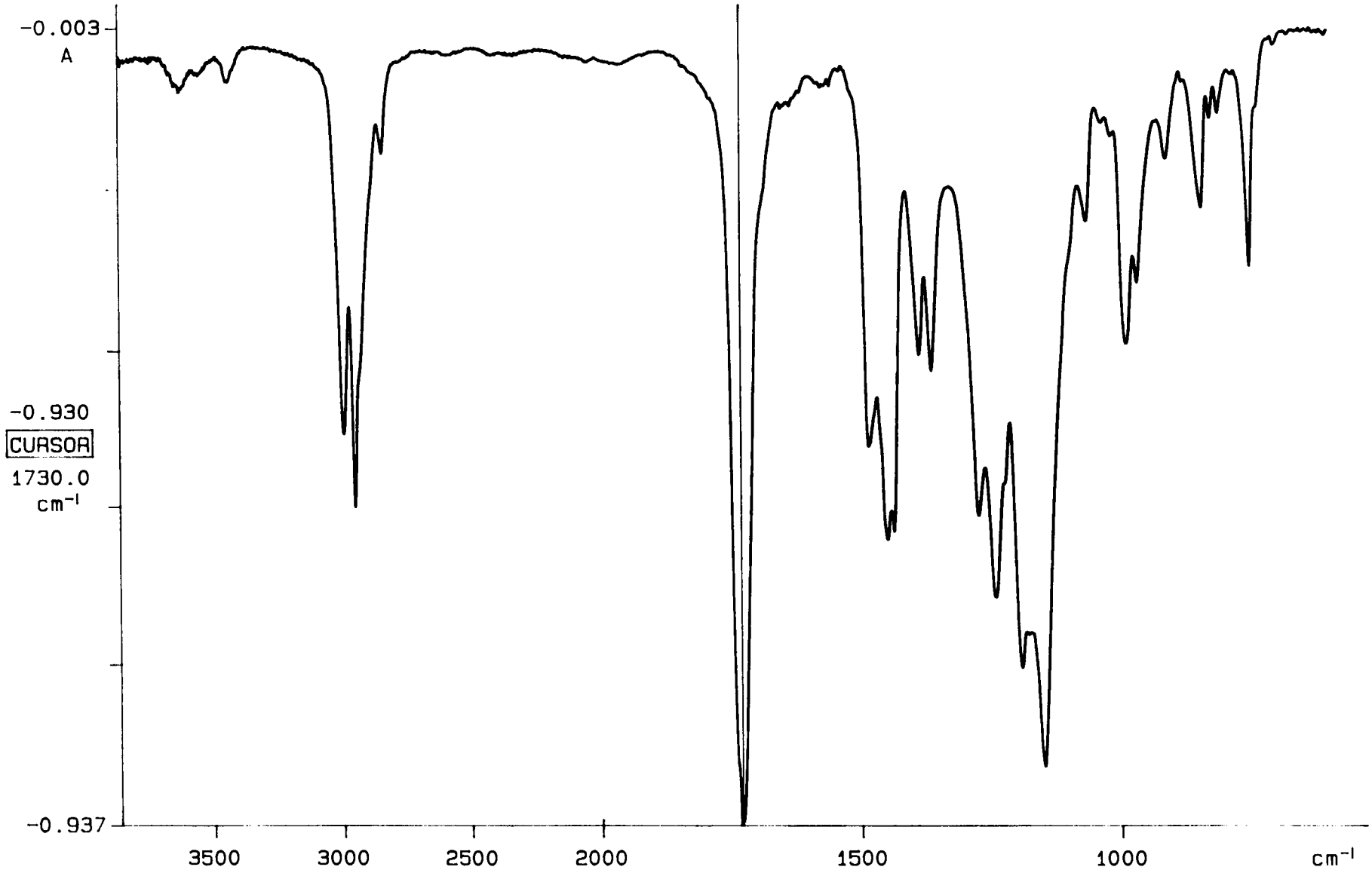
SW - Surface Water

BKGD - Background

D-15 GLUE-LIKE WASTE SPECTRUM

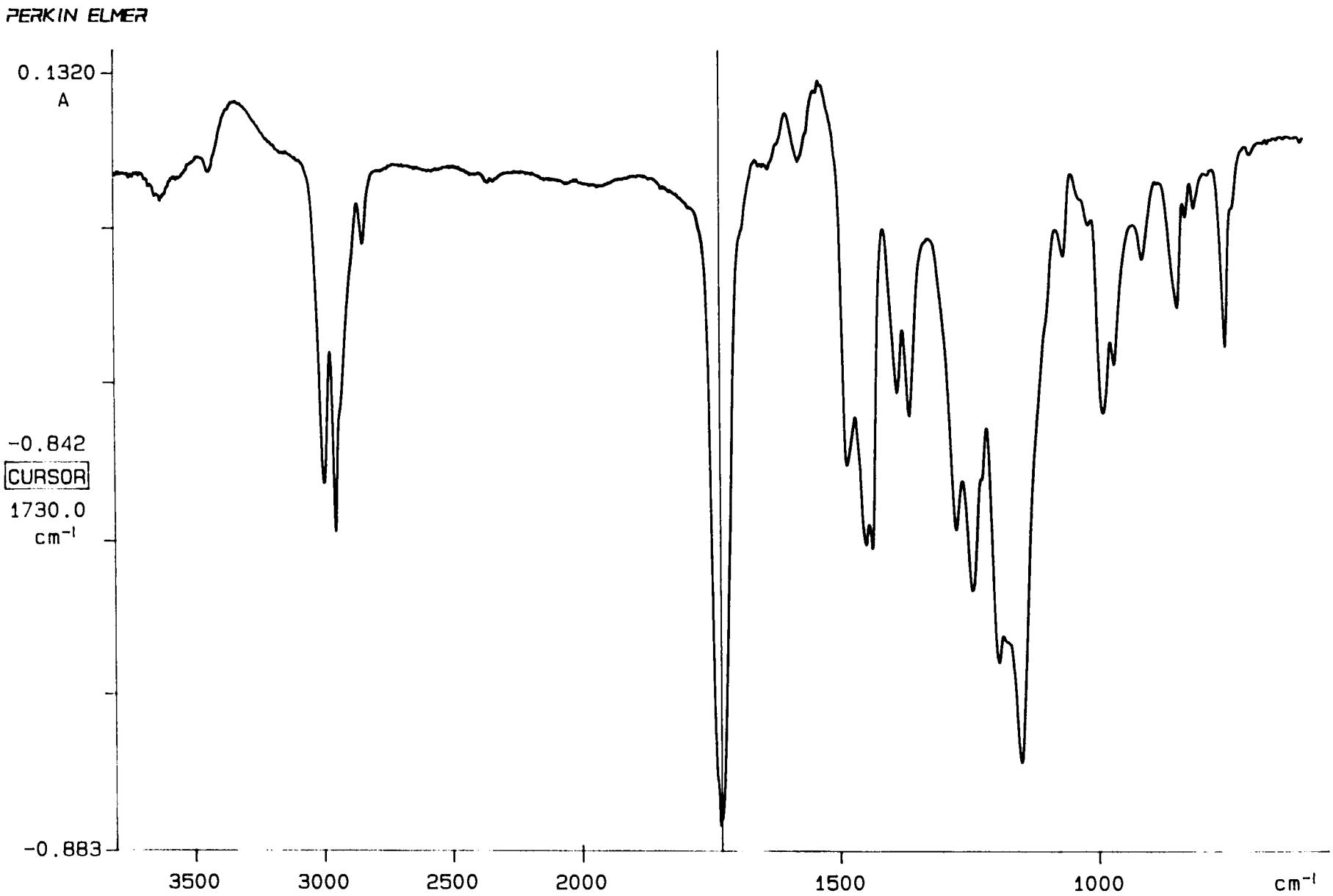
"GLUE-LIKE WASTE"

PERKIN ELMER

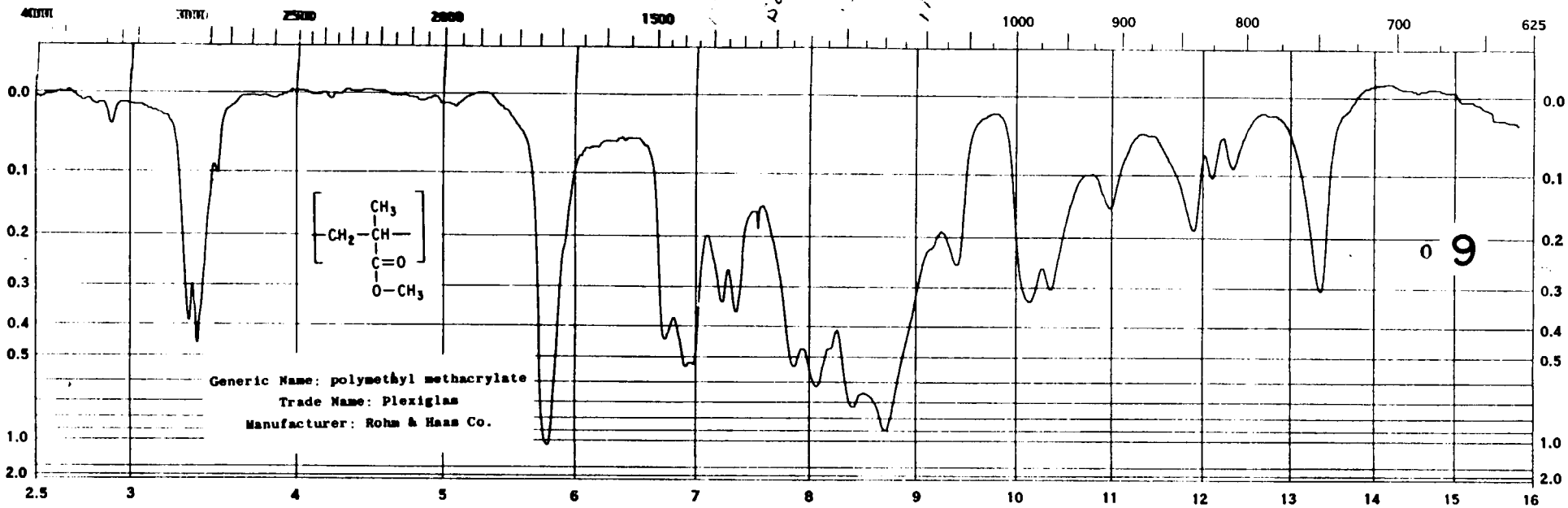


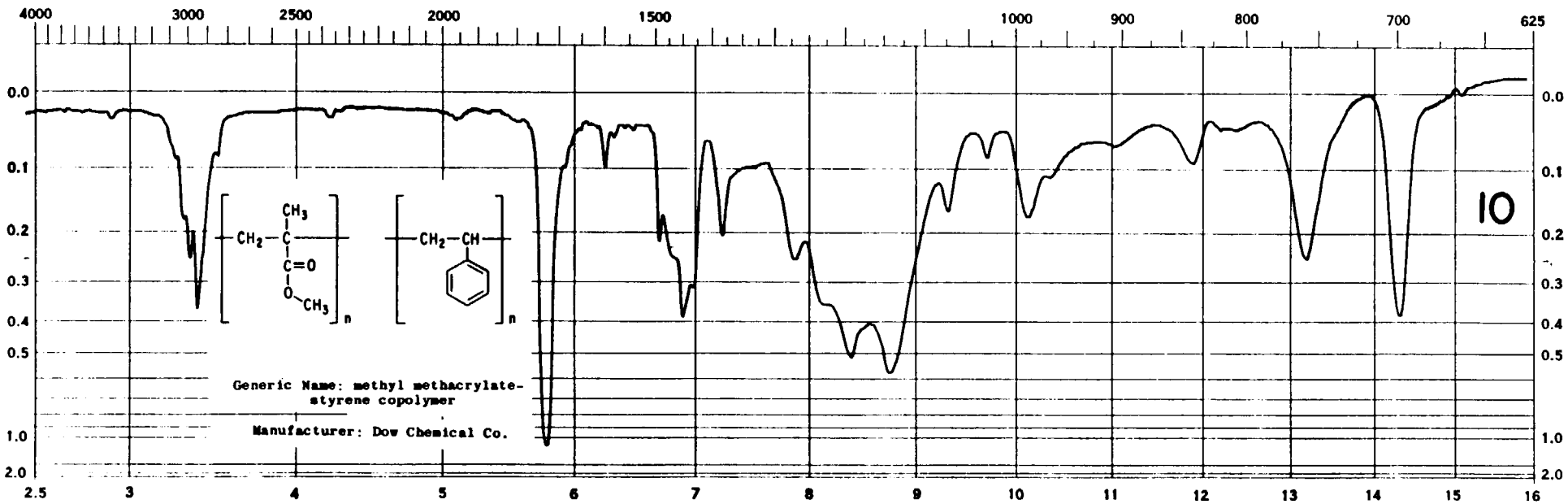
90/11/06 12:32
Y: 1 scan, 4.0cm-1
Rose Hill

"GLUE-LIKE WASTE"



90/11/06 12:48
Z: 4 scans, 4.0cm-1
Rose Hill Melt


9
Generic Name: polymethyl methacrylate
Trade Name: Plexiglas
Manufacturer: Rohm & Haas Co.


10
Generic Name: methyl methacrylate-
styrene copolymer
Manufacturer: Dow Chemical Co.

Appendix E

APPENDIX E
HUMAN HEALTH EVALUATION

E-1 Selection of Samples Used for Exposure Calculations

E-2 Determination of Chemicals of Concern

E-3 Toxicity Profiles

E-4 Evaluation of Risk from Fish Ingestion

E-5 Soil Vapor Emissions Calculations

E-6 Tables Referenced in Sections E-1 Through E-5

E-7 Figures Referenced in Sections E-1 Through E-5

E-1 SELECTION OF SAMPLES USED FOR EXPOSURE CALCULATIONS

APPENDIX E-1

SELECTION OF SAMPLES USED FOR EXPOSURE CALCULATIONS

Analytical laboratory data are available for the various areas investigated and media sampled during the RI field investigation at the Rose Hill site study area and also from air monitoring data collected separately from the RI field investigation by the USEPA Environmental Services Division (ESD). The media sampled include soil, groundwater from residential and monitoring wells, surface water, sediment, leachate, landfill gas and residential ambient and indoor air. Samples were collected from the different media at several times over the course of the investigation.

Several of these media are divided into specific areas of the site for consideration of exposures. The prominent features under investigation at the site study area are the three disposal areas: solid waste area, bulky waste area, and sewage sludge area. For evaluating several exposure pathways, the sample locations are grouped by disposal area which most directly affect them. This section identifies those samples selected to best represent site conditions at each of the disposal areas to which people might be exposed.

Selection and Grouping of Samples from the RI Field Investigation

Samples are included as representative of conditions at one of the disposal areas when the locations are within the boundaries of the disposal areas, are in close proximity to the disposal area, are in the predominant hydrogeological downgradient direction of the disposal area, or are closer to one disposal area than to another.

Areas considered are as follows:

- Sewage Sludge Area
- Bulky Waste Area
- Solid Waste Area

Media considered separately at each area include:

- surface soil
- leachate
- unfiltered groundwater (monitoring wells only)
- landfill gas

Surface water and sediment were considered separately for Mitchell Brook and the Saugatucket River, instead of by landfill area. In addition, residential wells are not divided by closest disposal area, but are considered as one group separately from the monitoring wells.

All portions of the site study area are readily accessible by recreational hunters as well as other people. Large areas of open grassy areas such as those that overlie the three disposal areas are accessible by foot or vehicle. Therefore, all soil and leachate sample locations which are likely to have any site-related contamination are included in one or another of the disposal areas. Some locations are not included in any of the landfill areas because these locations are either upgradient or are not considered to be impacted by the disposal areas.

Selection and Grouping of Samples from Ambient Air Sampling

Air monitoring data collected in February, March, and May 1993 by USEPA ESD are selected to evaluate exposures to contaminants in ambient air at nearby residences. Air monitoring data include three groups of data collected from residential areas and analyzed in a lab: indoor air measurements collected in February and March 1993; outdoor air measurements collected in February and March 1993; and outdoor air measurements collected in May 1993. Samples from the landfill surface were also collected in May, but not for 24-hour periods. The February and March samples were analyzed only for vinyl chloride; conversely, the vinyl chloride, chloromethane, and trichlorofluoromethane positive results from the May sampling have been rejected by EPA. The majority of volatile organics are accounted for in outdoor air if the two sets of data are combined. Locations included in the two sets of data overlap but are not identical.

The highest vinyl chloride concentrations were measured inside a home at 220 Rose Hill Road which has since been dismantled (February, March 1993). During February and March, indoor concentrations of vinyl chloride were generally lower than ambient samples taken outside the same houses, with the exception of 220 Rose Hill Road. In the summertime, residents would likely have windows open so indoor concentrations might be the same as outdoor concentrations, so using wintertime measured concentrations may not be sufficiently conservative. The conservative approach selected here is to use February and March outdoor vinyl chloride concentrations to represent all indoor and outdoor residential exposures. There are 11 outdoor vinyl chloride samples. In summary, VOCs measured in outdoor samples will be used to represent residential exposures.

The majority of the May 1993 ambient air sampling was conducted during fairly windy time periods and concentrations of organic compounds were low or not detected during these time periods. However, one set of 24-hour samples extended over a night with several hours of calm; these samples represent more conservative exposure conditions. This sample period, ending 5/27/93, is used to represent concentrations of chemicals other than vinyl chloride. Ambient air at four residential locations was sampled during this time period.

Future indoor air exposures are represented by the location at which the highest indoor air concentrations of vinyl chloride were measured. Exposure at this location can be evaluated only for vinyl chloride, since other VOC samples were not collected. This location, the prior residence at 220 Rose Hill Road, since demolished, consisted of an earth floor and fieldstone wall construction which may have had a high infiltration rate from soil or a low ventilation rate. Therefore, the predicted future exposures are expected to be conservative.

Sample Lists

Presented below are the sample locations that are considered in the evaluation of exposure routes for each for the three landfill areas and in the evaluation of surface water and sediment, residential wells, and residential ambient and indoor air. The rationale used to select the sample locations associated with or potentially affected by the different landfills is provided. Finally, sample locations which are not considered in the evaluation of exposure routes are listed.

SEWAGE SLUDGE AREA

Surface Soil:

SS-11 -	located within the sewage sludge area landfill boundaries
SS-12 -	located within the landfill boundaries
SS-15 -	located within the landfill boundaries

(See Figure E-1)

Groundwater:

MW-I -	located hydrogeologically upgradient from the landfill; potential for some groundwater movement to this location exists
MW-II -	hydrogeologically downgradient direction from landfill
MW-III -	hydrogeologically downgradient direction from landfill
MW-IV -	predominant hydrogeologic downgradient direction from landfill
MW-02 -	located within the landfill boundaries
MW-09 -	located southwest of landfill and east of Saugatucket River; hydrogeologic downgradient flow direction

(See Figure E-3)

Landfill Gas: Ambient air concentrations were modeled from soil gas sample:

SS(08+000) - located within the landfill boundaries

(See Figure E-3)

BULKY WASTE AREA

Surface Soil:

SS-09 -	located within the bulky waste area landfill boundaries
SS-10 -	located within the landfill boundaries
SS-22 -	east and downgradient of the landfill; near leachate seeps
SS-23 -	east and downgradient of the landfill; near leachate seeps
SS-24 -	located within the landfill boundaries

(See Figure E-1)

Leachate:

LE-02 -	located between the landfill and the Saugatucket River; indications that artesian conditions in overburden create groundwater seeps
LE-03 -	located between the landfill and the Saugatucket River; indications that artesian conditions in overburden create groundwater seeps
LE-04 -	located between the landfill and the Saugatucket River; indications that artesian conditions in overburden create groundwater seeps
LE-05 -	located between the landfill and the Saugatucket River; indications that artesian conditions in overburden create groundwater seeps
LE-06 -	located between the landfill and the Saugatucket River; indications that artesian conditions in overburden create groundwater seeps

(See Figure E-2)

Groundwater:

MW-03 -	predominant downgradient groundwater flow direction from landfill
MW-05 -	predominant downgradient groundwater flow direction from landfill
MW-10 -	predominant downgradient groundwater flow direction from landfill; located east of the Saugatucket River
MW-12 -	predominant downgradient groundwater flow direction from landfill
MW-V -	located within the landfill boundaries

(See Figure E-3)

Landfill Gas: Ambient air concentrations were modeled from soil gas samples:

BW(04+100) - located within the landfill boundaries
BW(05+500) - located within the landfill boundaries

(See Figure E-6)

SOLID WASTE AREA

Surface Soil:

SS-03 -	located within the boundaries of the solid waste area landfill
SS-04 -	located within the boundaries of the landfill
SS-05 -	located within the boundaries of the landfill
SS-06 -	located south of and in the vicinity of the landfill
SS-07 -	located east of the landfill and Rose Hill Road; closes to the landfill
SS-08 -	located west of the northern portion of the landfill and south of Mitchell Brook; potential for surface runoff to this location from the landfill
SS-13 -	located within the boundaries of the landfill
SS-16 -	located within the boundaries of the landfill
SS-17 -	located within the boundaries of the landfill
SS-18 -	located north of landfill and south of Mitchell Brook; potential for surface runoff to this location from the landfill
SS-19 -	located east of the landfill and west of Mitchell Brook; potential for surface runoff to this location from the landfill
SS-20 -	located east of the landfill and west of Mitchell Brook; potential for surface runoff to this location from the landfill
SS-21 -	located east of the landfill and west of Mitchell Brook; potential for surface runoff to this location from the landfill

(See Figure E-1)

Leachate:

LE-01 -	along the northern bank of the landfill

(See Figure E-2)

Groundwater:

OW-25 -	located within the boundaries of the landfill
OW-27 -	located within the boundaries of the landfill
OW-30 -	located east of the landfill, within the downgradient flow direction
MW-04 -	located each for the landfill, in a predominantly downgradient flow direction
MW-06 -	located east of the landfill, in a predominantly downgradient flow direction
MW-07 -	located west of the landfill and Rose Hill Road; potential groundwater flow in this direction because of water table mounding affects in the northern portion of landfill

MW-08 - located west of southern portion of landfill and Rose Hill Road; located closer to this landfill than others; small potential for groundwater movement in this direction

MW-11 - located east of the landfill, in a predominantly downgradient flow direction

MW-13 - located north of the landfill and Mitchell Brook; possibly past pumping of residential wells drew contaminated groundwater from the landfill into this area. Currently upgradient of the landfill; may be potentially affected by mounding effect in northern portion of the landfill.

MW-14 - located on the edge of the landfill, in garbage material

(See Figure E-3)

Landfill Gas: Ambient air concentrations were modeled from soil gas samples:

SW(11+500) - located within the landfill boundaries
SW(13+300) - located within the landfill boundaries
SW(03+300) - located within the landfill boundaries

(See Figure E-6)

SURFACE WATER/SEDIMENT

Saugatucket River

SW/SD-03
SW/SD-04
SW/SD-05
SW/SD-06
SW/SD-17
SW/SD-18

Mitchell Brook

SW/SD-07
SW/SD-09
SW/SD-12
SW/SD-14
SW/SD-15
SW/SD-16

(see Figure E-5)

RESIDENTIAL WELLS

The ten residential wells sampled during the first five sampling rounds of the study period are listed below:

RES #1
RES #2
RES #3
RES #4
RES #5
RES #6
RES #7
RES #8
RES #9
RES #10

(See Figure E-4)

RESIDENTIAL AMBIENT AND INDOOR AIR

Ambient air was sampled in February, March, and May 1993 at the six residences listed below:

121 Rose Hill Road (RES #8)
220 Rose Hill Road (RES #7)
278 Rose Hill Road (RES #6)
349 Rose Hill Road (RES #1)
339A Rose Hill Road (RES #9)
339B Rose Hill Road (RES #10)

(See Figure E-4)

Vinyl chloride measurements were sampled 11 times at 4 of the above 6 locations in February and March, and other VOC measurements were each sampled once at 4 of the above 6 locations in May. The 24-hour sample for the period ending 5/27/93 at 1800 hours which includes conservative, near-calm conditions, is used for other VOC measurements.

Vinyl chloride measurements in indoor air at the former dwelling at 220 Rose Hill Road were sampled 6 times in February and March.

BACKGROUND AND OTHER SAMPLE LOCATIONS NOT CONSIDERED

Several sample locations for different media that are located in the northern section of the site study area, are not considered representative of any of the landfill areas. In addition, three surface water and sediment locations are not considered to be impacted by the contaminants originating from any of the landfill areas. These locations are described below.

Surface Soil:

SS-01 - located north of the landfills
SS-02 - located north of the landfills
SS-14 - located north of the landfills

(See Figure E-1)

Groundwater:

MW-01 - north of and hydrogeologically upgradient of landfills, no known pathway for migration of contaminants from the landfill

(See Figure E-3)

A sixth round of groundwater sampling of residential wells (September, 1993) was not evaluated in the exposure and risk tables.

Surface Water/Sediment:

SW/SW-01 - located on the unnamed tributary; north of the solid waste and bulky waste areas; upgradient of the landfills

SW/SD-02 - located on the Saugatucket River, north of and upgradient of the landfills

SW/SD-08 - located on the Saugatucket River, south of Saugatucket Road; downstream of SW/SD-11, which did not have detectable organic contaminant levels. Preliminary evaluation of analytical data from SW/SD-08 indicates that organic contaminants, characteristic of road activities, are present in low concentrations. The nearby road appears to be the major impact at this location.

SW/SD-10 - located on the unnamed brook; located west of Rose Hill Road and southwest of the solid waste area; this location is not considered to be impacted by the landfill

SW/SD-11 - located on the Saugatucket River, south of the landfill areas and downstream of SW/SD-06; preliminary evaluation of analytical data indicates that organic contaminants are not present at this location

SW/SD-13 - west of Rose Hill Road and the northern edge of the solid waste area; is upstream of the solid waste area and is not considered to be impacted by the landfill

(See Figure E-5)

Soil Gas:

Other landfill gas monitoring points in the site study area were sampled during the course of the study, as shown in Figures E-6 and E-7. Samples from these points were analyzed in the field only. These additional samples are not considered for this evaluation because quantitative laboratory data are not available.

(See Figures E-6 and E-7)

Residential Area Air:

Ambient air samples collected by USEPA ESD from the landfill surface are not used in this assessment because no 24-hour samples were collected and because the collection periods were generally breezy; few or no volatile contaminants were detected. Residential area air sampling on May 24-25 and May 25-26 was also not evaluated because meteorological conditions were more conservative on May 26-27.

E-2 DETERMINATION OF CHEMICALS OF CONCERN

APPENDIX E-2

DETERMINATION OF CHEMICALS OF CONCERN

A review of groundwater, residential well, leachate, surface water, sediment, surface soil, and landfill gas/soil vapor data generated during the remedial investigation resulted in a list of 111 analytes detected in one or more samples. Analytes are grouped into the following categories as dictated by the types of analyses run during the two investigations. The number of chemicals detected in each category is presented in parentheses.

- Volatile organics (38)
- Semivolatile organics (30)
- Chlorinated pesticides (17)
- Metals (23)
- Inorganics (ammonia, cyanide & sulfide) (3)

In this section of the report, two water soluble organics, *N,N*[1]-dimethyl formamide (N,N-DMF) and acrylamide, are included under the category of semivolatile organics.

To keep the calculation of risks manageable, the report focuses on chemicals of greatest concern at the site. Selection of these chemicals is presented in this appendix. Information indicative of the contribution of each chemical to a total medium-specific risk was considered. This included a concentration-toxicity screening for each media (which is explained later in this section), a comparison of each chemical to essential nutrient information, a review of chemicals of historic concern at the site, and a comparison of groundwater chemical concentrations to drinking water standards. Detected analytes are included in Tables E-1 through E-7. All data from the study area are included; data from the three disposal areas are not considered separately for selection of chemicals of concern.

Analyte Concentrations in Groundwater, Residential Wells, Leachate, Surface Water, Sediment, Surface Soil, and Landfill Gas: Data were separated by media and analytes were separated into the five categories of volatile organics, semivolatile organics, chlorinated pesticides, metals, and inorganics. Maximum detections were used for each group. The maximum detections are reported in mg/kg for sediment and surface soils and in μg/L for all other media, except landfill gas. Landfill gas maximum detections were originally reported in parts per billion by volume and transformed to $\mu g/m^3$ using an ideal gas equation conversion of 24.45 liters per mole at 25°C.

Toxicity Values: Where available, toxicity values for ingestion and inhalation exposures were compiled from the Integrated Risk Information System (IRIS, U.S. EPA, 1993a) and Health Effects Assessment Summary Tables (HEAST, U.S. EPA, 1993b). Where toxicity values existed from more than one source, IRIS values were taken first followed by HEAST. For carcinogens, slope factors and inhalation unit risk factors were reported and for noncarcinogenic compounds, oral RfDs and reference concentrations (RfC) were presented.

Specific assumptions had to be made for the enclosed tables and are as follows: the RfD for chromium VI was used for chromium; the RfD for cadmium and manganese was based on water criteria; the RfD for *cis*-1,2-dichloroethene was used when "1,2-dichloroethene (total)" was reported; the slope factor for all carcinogenic polycyclic aromatic hydrocarbons (PAHs) was taken as the slope factor for benzo(a)pyrene (following Region I guidance); and, the RfD for naphthalene was used for phenanthrene and benzo(g,h,i)perylene (following Region I guidance).

Drinking Water Standard: Proposed and promulgated Maximum Contaminant Levels (MCLs) are presented.

SELECTION OF CHEMICALS OF CONCERN

Background

A limited number of samples selected to be representative of background conditions were collected. This included three soil samples and one groundwater sample north of the site. Also, two surface water samples north of the site and two west of the site are believed to be upgradient of site contamination. Chemical concentrations in those background samples have been discussed in section 5.0, Nature and Extent, for qualitative purposes. However, due to the small number of background samples, it is not possible to demonstrate that on-site contaminant concentrations are essentially equivalent to background concentrations with any statistical power. Also, no data set indicative of local background concentrations of metals has been located. Therefore, no chemicals are eliminated as chemicals of concern based on a comparison to background concentrations.

Comparison to Standards

Relevant public health standards were identified for groundwater and residential wells. Chemicals detected in these samples, are first compared to existing and proposed Maximum Contaminant Levels (MCLs) for drinking water (U.S. EPA, 1993c). All such chemicals exceeding standards are included as chemicals of concern (COCs).

Groundwater chemicals included as COCs due to elevation above standards were the following: 1,2-dichloroethene(total), benzene, vinylchloride, pentachlorophenol, bis(2-ethylhexyl)phthalate, antimony, beryllium, cadmium, chromium, and nickel. Among these are three which were detected in less than 5% of samples (frequencies in parentheses): bis(2-ethylhexyl)phthalate (2/76), pentachlorophenol (1/76), and antimony (3/76). Inclusion of these three chemicals is a conservative element in the COC selection process. None of the residential wells sampled had maximum concentrations greater than standards (MCLs).

Chemicals of Historic Concern

N,N^1-dimethylformamide (N,N-DMF) was preselected as a COC based on its historical significance at the site. N,N-DMF was present in groundwater, residential wells, and surface water.

Essential Nutrients

Several metals are common elements, essential human nutrients, and normally not considered in assessment of risks. Calcium, iron, magnesium, potassium, and sodium were therefore not included in the list of COCs for any media.

Frequency

Many chemicals detected at Rose Hill were detected at very low frequencies, indicating either that these contaminants are not pervasive on the landfill or are generally present at very low concentrations. As noted above, such low-frequency contaminants are included as COCs for groundwater if they exceed the MCL in any sample. Residential well contaminants are not screened out on the basis of frequency. Similarly, chemicals detected in residential area air were not screened out based on frequency. Otherwise, chemicals detected in less than 5% of samples for any one medium are eliminated as COCs in that medium.

Chemicals screened on the basis of low frequency are shown in Tables E-1, E-4, E-5, and E-6. Because there are only 6 samples and one duplicate for soil gas, chemicals detected in soil gas were not screened on the basis of low frequency. The duplicate was treated as a separate sample rather than averaging its results with the field sample for reasons discussed in Section 4.2.7 of this report. A total of seven sample results (6 field and 1 duplicate) were analyzed to determine the maximum concentration for each chemical detected in landfill gas/soil vapor.

Although many chemicals are screened out on the basis of low frequency, the net effect is small since all chemicals excepting N-nitroso-di-n-propylamine and acrylamide in groundwater; chloroethane and copper in surface water; four carcinogenic PAHs, antimony and cadmium in sediment; and hexanone and antimony in surface soils would have screened out if the C-T screening below was performed with no prior elimination based on frequency.

Concentration - Toxicity Screening (C-T Screening)

As a concentration - toxicity screening, the maximum concentration is multiplied by a toxicity value to arrive at a risk factor for each chemical in each of the following data sets: groundwater, residential wells, leachate, surface water, sediment, surface soils, and landfill gas/soil vapor. Each data set was evaluated with carcinogenic and noncarcinogenic concentration-toxicity screens done separately. The risk factors are used only for comparisons between chemicals and do not have meaningful units. As presented by EPA, the individual chemical scores are calculated using the following equation (U.S. EPA, 1989):

$$R_{ij} = C_{ij} * T_{ij} \qquad \text{where,}$$

R_{ij} = risk factor for chemical i in medium j

C_{ij} = concentration of chemical i in medium j

T_{ij} = toxicity value for chemical i in medium j (i.e., slope factor or inhalation unit risk factor for carcinogenic risks, or 1/RfD or 1/RfC for noncarcinogenic risks)

Chemicals excluded on the basis of low frequency are not included in these calculations for Rose Hill. The risk factors for carcinogenic and noncarcinogenic compounds are then summed to obtain a total medium-specific risk factor in the following manner:

$$R_j = \sum_{i=1}^{n} R_{ij} \quad \text{for n chemicals in medium j}$$

The risk factor ratio R_{ij}/R_j is the fraction of the total medium-specific risk factor from chemical i. This analysis includes only those chemicals detected within a given medium that have either a carcinogenic or noncarcinogenic toxicity value available. Toxicity values were taken from two different sources (IRIS and HEAST) as described previously in this appendix.

EPA guidance (U.S. EPA, 1989) suggests, as an example, that analytes with a risk factor ratio of less than 0.01 in a particular media could be eliminated from that media at this stage. This should result in an inclusion in the quantitative assessment of all chemicals contributing a majority of the total risk for each media. Thus, for each of the media, a chemical with a risk factor ratio of less than 0.01 would ordinarily be eliminated as a chemical of concern. This procedure was modified in the C-T screens for surface water and landfill gas. In surface water, acrylamide would have a risk factor ratio above 0.95 which would overshadow and exclude most other chemicals based on a C-T screen, so acrylamide has been dropped from the ratio calculations (but retained as a COC). Similarly, vinyl chloride in landfill gas would have a carcinogenic risk factor ratio greater than 0.95, so it also was excluded from the ratio calculation but retained as a COC. In sediment, arsenic and beryllium together account for 90% of the total carcinogenic risk factor but they are retained in the C-T screening because the other carcinogenic risk factors are very small. In groundwater, acrylamide was reinstated as a COC because of its high carcinogenic risk factor, in spite of occurring at a frequency below 5%.

Chemicals chosen from various media as a function of the concentration-toxicity screen are included in Tables E-1 for groundwater, E-2 for residential wells, E-3 for leachate, E-4 for surface water, E-5 for sediment, E-6 for surface soils, and E-7 for landfill gas/soil vapor.

All chemicals detected in ambient and indoor air from residential areas in the site study area were included as COCs except methane and those chemicals rejected due to quality control. Ambient and indoor air from residential areas were sampled by USEPA ESD following the remedial investigation.

As a result of updating toxicity data through November 1993, it was decided that if a chemical's relative risk value rose above 0.01 the chemical was added as a COC. On the other hand, chemicals were not dropped from the list of COCs if the relative risk value dropped below 0.01, based on the updated toxicity data. Chemicals remaining on the COC lists solely due to previous toxicity data are so noted in the COC selection tables.

Chemicals of Concern Selected for Each Media

Table E-8 shows the chemicals of concern selected for each media. Tables E-1 through E-7 show the reason each detected chemical was selected or rejected from the list of chemicals of concern for each media. The selection includes the following: 5 VOCs, 6 SVOCs, 14 metals, ammonia and sulfide in groundwater; 3 VOCs, 2 SVOCs, 1 pesticide, 6 metals, and sulfide in residential wells; 2 VOCs, 1 SVOC, 10 metals, and ammonia in leachate; 2 SVOCs, 4 metals, ammonia and sulfide in surface water; 13 metals, ammonia, and sulfide in sediments; 2 VOCs, 6 SVOCs, and 12 metals in surface soils; 18 VOCs in landfill gas; and 9 VOCs in residential ambient and indoor air.

Many chemicals overlap as chemicals of concern for more than one media. The total number of chemicals selected as chemicals of concern is 55, with the breakdown of analytes by category as follows:

- Volatile organics (22)
- Semivolatile organics (13)
- Chlorinated pesticides (1)
- Metals (17)
- Inorganics (2)

References

U.S. EPA, 1989. Risk Assessment Guidance for Superfund. Volume I - Human Health Evaluation Manual. Office of Emergency and Remedial Response. EPA/540/1-89/002.

U.S. EPA, 1993(a). Integrated Risk Information System, on-line database, accessed November 1993.

U.S. EPA, 1993(b). Health Effects Assessments Summary Tables, Annual Update. Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. EPA 540-R-93-058. March 1993.

U.S. EPA, 1993(c). Drinking Water Regulations and Health Advisories. Office of Water, Washington, D.C. May 1993.

E-3 TOXICITY PROFILES

APPENDIX E-3

TOXICITY PROFILES

Contaminants found at Rose Hill are grouped here according to chemical characteristics: volatile organics, semivolatile organics, water-soluble organics, pesticides, metals and inorganics. These toxicity profiles present information specific to each compound selected as a chemical of concern for the human health risk assessment. Weight-of-evidence classes for carcinogens are shown in Table E-9.

The toxicity profiles are presented in the following order:

Acetone
Benzene
Carbon disulfide
Chloroethane
Dichlorodifluoromethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene(cis)
1,2-Dichloroethene(trans)
Ethylbenzene
4-Methyl-2-pentanone
Methylene chloride
1,1,2,2-Tetrachloroethane
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
Trichloroethene
Trimethylbenzenes
Vinyl chloride
Xylenes
2-Methylnaphthalene
Benzo(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Bis(2-ethylhexyl)phthalate

4-Chloro-3-methylphenol
4-Methylphenol (p-cresol)
Pentachlorophenol
Acrylamide
N,N-Dimethylformamide
Dieldrin
Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Manganese
Mercury
Nickel
Selenium
Thallium
Vanadium
Zinc
Ammonia
Sulfide

Acetone

Absorption - Acetone is readily absorbed by all routes of exposures. It has been reported that approximately 71% of inhaled acetone vapor was absorbed (Clayton and Clayton, 1982).

Distribution - Due to the high water solubility of acetone, it is widely distributed in body tissues. Exposure to radio-labeled carbon in acetone has resulted in observations of the labeled carbon in cholesterol, hepatic glycogen, amino acids, and carcass proteins in rats (Clayton and Clayton, 1982).

Metabolism - No information was located.

Carcinogenicity - Mutagenicity has not been shown and there are no data on any possible carcinogenicity, so acetone is presently considered as a Group D, not classifiable as to human carcinogenicity, chemical (U.S. EPA, 1993b).

Threshold Effects - A concentration of 500 ppm in air is an irritant to the eyes, nose, and throat (Clement Associates, 1985). Very high concentrations in air (10,000 ppm) will cause central nervous system (CNS) depression, slight decreases in organ and body weights, and intoxication, headaches, and insomnia (Clement Associates, 1985). Exposure to the skin can cause defatting resulting in leathery, cracked skin. Acetone increases the toxic effects of trichloroethane (U.S. EPA, 1984); this is a relationship known as potentiation. A 1986 study reported by EPA identified increased liver and kidney weights and nephrotoxicity (toxicity to part of the kidney) following oral exposures of rats to acetone. A chronic oral RfD of 0.1 mg/kg/day has been developed by the EPA based on that study, using an uncertainty factor of 1000 (U.S. EPA, 1993b). A subchronic oral RfD of 1 mg/kg/day was set, based on the same study (U.S. EPA, 1993a). No reference concentration (RfC) is published (U.S. EPA, 1993a).

Reproductive/Developmental Effects - No information available.

References

Clayton and Clayton, 1982. Patty's Industrial Hygiene and Toxicology. Volume II C - Toxicology. Third Revised Edition.

Clement Associates, Inc., 1985. Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites. Prepared for U.S. EPA.

U.S. EPA, 1984. Health Effects Assessment for Acetone. Office of Research and Development, Cincinnati, Ohio.

U.S. EPA, 1993a, Health Effects Assessment Summary Tables, Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

U.S. EPA, 1993b. Integrated Risk Information System (IRIS); Acetone, dated 8/93.

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Benzene

Absorption - Both animal and human data indicate that benzene is absorbed from ingestion and inhalation exposures and to a lesser extent through intact skin (U.S. PHS, 1989). It has been estimated that 50 percent of inhaled benzene is absorbed (U.S. PHS, 1989). Benzene's health effects have been associated with its metabolites; thus, the amount of compound absorbed that undergoes biotransformation often determines the magnitude of toxic response in the body (U.S. PHS, 1989).

Distribution - Following absorption into the human body through the established exposure pathways, benzene is widely distributed to tissues by the blood. Target systems for benzene are the circulatory system, central nervous system (CNS), and the immune system. Benzene's lipophilic nature accounts for the tendency to accumulate in fatty tissues (U.S. PHS, 1989).

Metabolism and Excretion - Metabolism of benzene primarily occurs in the liver, where conversion to benzene oxide is followed by the formation of phenol. Excretion of unchanged benzene occurs through the lungs and benzene metabolites are excreted in the urine (U.S. PHS, 1989).

Carcinogenicity - Benzene is classified by the U.S. EPA as a Group A, human carcinogen, based on EPA's Guidelines for Carcinogen Risk Assessment. Group A applies to agents for which sufficient evidence exists and supports causal association between exposure and cancer in humans. A slope factor for benzene has been calculated as 2.9×10^{-2} per mg/kg/day for oral exposures and an inhalation unit risk factor of 8.3×10^{-6} $\mu g/m^3$ has been calculated for inhalation exposures. For inhalation concentrations greater than 100 $\mu g/m^3$, this RfC value should not be used since above this value, the unit risk may not be appropriate (U.S. EPA, 1992). These values were based on pooled data from numerous epidemiologic studies demonstrating increased incidence of leukemia in workers exposed to benzene vapors (U.S. PHS, 1989; U.S. EPA, 1992).

Threshold Effects - Chronic exposure has been shown to cause a decrease in one or more of the circulating elements of the blood (red blood cells, white bloodcells, and/or platelets). The hematoxicity of benzene may be synergistic with other solvents, such as toluene (U.S. EPA, 1987). CNS effects include dizziness, nausea, and in extreme cases, coma.

Currently no reference dose (RfD) or reference concentration (RfC) is available from EPA (U.S. EPA, 1992).

Reproductive and Developmental Effects - Benzene has been demonstrated as an embryotoxic and fetotoxic compound in study animals as evidenced by increased incidents of resorption, reduced fetal weight and skeletal variations (U.S. PHS, 1989). In humans, benzene has not been identified as a teratogenic.

References

U.S. EPA, 1987. Health Advisory for 25 Organic Chemicals, Office of Drinking Water, Washington, D.C.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Benzene, dated May 1992.

U.S. PHS, 1989. Toxicological Profile for Benzene. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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Carbon Disulfide

Absorption - Studies indicate that carbon disulfide is readily absorbed in humans and animals following inhalation exposure. Significant absorption via the dermal route occurs in humans and animals (U.S. PHS, 1990).

Distribution - Once absorbed via inhalation, carbon disulfide is taken up by the blood and distributed throughout the body, especially to lipid-rich tissues and organs like the brain and liver. Studies regarding absorption in humans by oral exposure could not be located (U.S. PHS, 1990).

Metabolism - Proposed metabolic pathways suggest that carbon disulfide is metabolized to an unstable oxygen intermediate; which after several reactions ultimately result in the formation of a sulfate or other nonvolatile metabolite (U.S. PHS, 1990). In the liver, carbon disulfide reacts with amino acids to form thiocarbonate.

Carcinogenicity - No information is available.

Threshold Effects - Carbon disulfide affects the central nervous system, cardiovascular system, eyes, kidneys, liver and skin. A subchronic oral no observed effect level (NOEL) was found to be 11.0 mg/kg/day in a rat and rabbit inhalation teratogenic study (U.S. EPA, 1992; 1993). Rats and rabbits underwent inhalation exposure during the entire length of pregnancy and also 34 weeks before breeding to simulate occupational exposure. One oral study resulted in adverse effects to rabbit fetuses. In an oral study, fetotoxicity and fetal malformations were observed in rabbits. The uncertainty factor of 100 compensates for inter- and intra-species variability in the toxicity of this chemical. The oral RfD of 1×10^{-1} mg/kg/day was derived by the EPA (U.S. EPA, 1992). This RfD may change in the near future pending the outcome of a further review being conducted by the RfD work group (U.S. EPA, 1992). A chronic reference concentration (RfC) for carbon disulfide is 1×10^{-2} mg/cu. m (U.S. EPA, 1993). This RfC is presently under review and is subject to change.

Reproductive/Developmental Effects - Studies indicate that exposure to carbon disulfide results in human reproductive effects such as decreased sperm count and decreased libido in men and intestinal regularities in women (U.S. PHS, 1990). These observations have been supported in animal studies (U.S. EPA, 1992). No developmental effects have been observed in the offspring of men or women occupationally exposed to carbon disulfide.

References

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Carbon Disulfide dated 1/92.

U.S. EPA, 1993. Health Effects Assessment Summary Tables, Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

U.S. PHS, 1990. Draft Toxicological Profile for Carbon Disulfide. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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Chloroethane

Absorption - Chloroethane, also known as ethyl chloride, is readily absorbed through the lungs (Torkelson and Rowe, 1981).

Distribution - No information was located.

Metabolism and Excretion - Chloroethane is readily desorbed through the lungs (Torkelson and Rowe, 1981). No information on metabolism or other routes of excretion was located.

Carcinogenicity - No evidence of carcinogenicity was located.

Threshold Effects - Chloroethane has been used as an anaesthetic. The principal occupational hazard of chloroethane is CNS intoxication (i.e., "drunkenness") and in decreased coordination, leading to increased risk of physical injury (Torkelson and Rowe, 1981). Anaesthesia is also the principal effect of acute exposures in animals. Chronic exposure of guinea pigs to chloroethane has been associated with liver and kidney toxicity (Torkelson and Rowe, 1981). Slight symptoms of human intoxication have been observed at concentrations of chloroethane in air of 13,000 ppm (34,300 mg/m^3) (Torkelson and Rowe, 1981). The inhalation RfC is set based on developmental effects (q.v.). Based on developmental toxicity observed above an air concentration NOAEL of 4,000 mg/m^3, in rats exposed in utero, and a uncertainty factor of 300, EPA has calculated an inhalation RfC, for chronic exposures, at 10 mg/m^3. (U.S. EPA, 1992).

Reproductive and Developmental Effects - Chloroethane has been demonstrated as a fetotoxic compound in study animals as evidenced by the increased incidence of small openings between the skull bones. (U.S. EPA, 1992).

References

Torkelson, T.R., and V.K. Rowe, 1981. Halogenated Aliphatic Hydrocarbons Containing Chlorine, Bromine, and Iodine. (Chapter 48 in Patty's Industrial Hygiene and Toxicology, 3rd ed., Clayton and Clayton, eds.) New York: Wiley.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); chloroethane, dated January, 1992.

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Dichlorodifluoromethane (FC12)

Fluorocarbon 12 (FC12) was the most widely used high pressure propellant prior to the banning of fluorocarbons in aerosol products. However, its use continues as a refrigerant (Aviado and Micozzi, 1981).

Absorption - As a group, fluorocarbons have low lipid solubility and there is rapid uptake into tissues following exposure to this type of chemical (Aviado and Micozzi, 1981).

Distribution - Following exposure to fluorocarbons, there is significant accumulation in the brain, liver and lungs relative to blood levels. Following human inhalation exposures, the rate of transfer of FC12 from blood to tissue compartments was more rapid than of FC11, a low pressure propellant commonly used in conjunction with FC12 (Aviado and Micozzi, 1981).

Metabolism and Excretion - There is no information available on the metabolism of fluorocarbons. Studies have shown that following exposure, fluorocarbons are eliminated slowly from the body, partly in expired air (Aviado and Micozzi, 1981).

Carcinogenic Effects - Carcinogenic studies were conducted in rats, however, except for decreased weight gain, no other adverse effects were reported (U.S. EPA, 1992).

Threshold Effects - Fluorocarbons generally are low in toxicity. The presence of two fluorine atoms in a FC12 molecule is associated with a reduction in toxicity relative to fluorocarbons with one fluorine atom. Human volunteer studies showed that inhalation of 10,000 ppm of FC12 for 2.5 hours caused a 7% reduction in standardized psychomotor scores and concentrations of 27,000 ppm for 15 or 60 seconds caused an increase in airway resistance and electrocardiographic changes (Aviado and Micozzi, 1981).

The chronic oral RfD is $2x10^{-1}$ mg/kg/day based on a chronic oral study in rats (U.S. EPA, 1992). The critical effect for the study was reduced body weight. An uncertainty factor of

100 for this RfD accounts for interspecies extrapolation and for sensitive individuals. A chronic inhalation RfC of $2x10^{-1}$ mg/m^3 has been calculated (U.S. EPA, 1993). This RfC is based on a critical effect of liver lesions reported in guinea pigs following a subchronic inhalation exposure.

Reproductive and Developmental Effects - Reproductive studies were conducted in rats; however, at this time no adverse reproductive effects have been attributed to this compound (U.S. EPA, 1992).

References

Aviado, D.M. and Micozzi, M.S., 1981. Fluorine-Containing Organic Compounds. (Chapter 42 in Patty's Industrial Hygiene and Toxicology, 3rd ed., Clayton and Clayton, eds.) New York, Wiley.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Dichlorodifluoromethane. Online database, dated 1/22/92.

U.S. EPA, 1993. Health Effects Assessment Summary Tables (HEAST), Annual FY 1993. (March). Office of Research and Development, Office of Emergency and Remedial Response. Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

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1,1-Dichloroethane

Absorption - No studies regarding the rate of absorption of 1,1-dichloroethane (1,1-DCA) from ingestion or inhalation were located.

Distribution - No data were located.

Metabolism and Excretion - No data were located.

Carcinogenicity - Female rats showed a statistically significant trend of increased incidence of hemangiosarcoma and mammary adenocarcinoma when exposed to 1,1-DCA, as measured by one test (Cochran-Armitage) but not using a different statistical test (Fisher Exact) (U.S. EPA, 1984). The test was marred by the occurrence of murine pneumonia and kidney inflammation among the treatment and control groups (U.S. EPA, 1984). Based on the statistical increase in hemangiosarcoma in one species, EPA classified 1,1-DCA in Group C as a possible human carcinogen by the oral and ingestion routes (U.S. EPA, 1992). No slope factor or unit risk is published.

Threshold Effects - 1,1-DCA is associated with central nervous system depression and skin irritation when inhaled, and liver and kidney damage when ingested (NIOSH, 1990). Based on kidney damage in cats exposed to 500 ppm of 1,1-DCA in air, subchronic and chronic inhalation RfCs of 5 mg/m^3 and 0.5 mg/m^3 were selected (U.S. EPA, 1993). Based on the lack of effects in rats exposed to 500 ppm of 1,1-DCA in air, subchronic and chronic oral RfDs of 1 mg/kg/day and 0.1 mg/kg/day were selected (U.S. EPA, 1993).

Reproductive and Development Effects - No data were located.

References

NIOSH, 1990. NIOSH Pocket Guide to Chemical Hazards. National Institute for Occupational Safety and Health. DHHS Publication No. 90-117.

U.S. EPA, 1984. Health Effects Assessment for 1,1-Dichloroethane. September 1984. EPA/540/1-86-027.

U.S. EPA, 1992. Integrated Risk Information system (IRIS); 1,1-Dichloroethane dated January 1992.

U.S. EPA, 1993. Health Effects Assessment Summary Tables, Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

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1,1-Dichloroethene

Absorption - Animal data demonstrate that 1,1-dichloroethene (1,1-DCE) is rapidly absorbed via either the oral or inhalation route (U.S. EPA, 1984).

Distribution - Studies in rats show that 1,1-DCE is distributed throughout the soft tissues of the body, and that the highest concentrations are found in the liver and kidneys (U.S. EPA, 1987).

Metabolism and Excretion - 1,1-DCE is metabolized to chlorinated alcohols and carboxylic acids in the liver. The metabolized product is excreted fairly rapidly in urine and bile. Metabolic capacity may be reached at high doses, in which case greater amounts of 1,1-DCE are eliminated unchanged through the lungs (U.S. EPA, 1987).

Carcinogenicity - 1,1-Dichloroethylene is classified by the U.S. EPA as a Group C, possible human carcinogen (U.S. EPA, 1992), based on EPA's cancer risk assessment guidelines. This category applies to agents for which there is limited evidence of carcinogenicity in animals. This classification is based on one inhalation study in mice in which the high dose group had an increase in kidney tumors. A unit risk for inhalation exposures of 1,1-DCE has been calculated as 5×10^{-5} per $\mu g/m^3$ based on this study. An oral slope factor of 0.6 per mg/kg/day has been calculated for oral exposures, based on a non-statistically significant increase in tumors following oral exposures in rats (U.S. EPA, 1992).

Threshold Effects - In humans, acute exposures to high levels of 1,1-DCE depress the central nervous system. The principal target of chronic exposure to 1,1-DCE is the liver, in humans and animals, with fatty changes and swelling of hepatocytes noted in rats (U.S. EPA, 1987). Workers chronically exposed to 1,1-DCE in combination with related compounds exhibit liver toxicity, headaches, fatigue, and other neurological disturbances (U.S. EPA, 1987). The EPA has calculated a reference dose for oral exposure to 1,1-DCE, but not for inhalation exposure. The RFD is based on the occurrence of hepatic lesions in rats

chronically exposed to 1,1-DCE (U.S. EPA, 1992). The oral RfD, for both subchronic and chronic exposures, is $9x10^{-3}$ mg/kg/day (U.S. EPA, 1992; 1993).

Reproductive and Development Effects - Exposure of rats and rabbits has produced fetotoxicity and minor skeletal abnormalities in offspring, at doses that are maternally toxic.

References

U.S. EPA, 1984. Health Effects Assessment for 1,1-Dichloroethylene. September 1984. EPA/540/1-86/051.

U.S. EPA, 1987. Health Advisories for 25 Organics. 1,1-Dichloroethylene. March 31, 1987. Office of Drinking Water, Washington, D.C.

U.S. EPA, 1992. Integrated Risk Information System. 1,1-Dichloroethylene, dated January 20, 1992.

U.S. EPA, 1993. Health Effects Assessment Summary Tables, Annual FY-1993 (HEAST March). Office of Research and Development and Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303 (93-1). Updated July 1993.

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1,2-Dichloroethene (cis)

Two isomers, cis-1,2-DCE and trans-1,2-DCE, come under the name 1,2-dichloroethylene. Physical properties of the two compounds are fairly similar. The two compounds may occur as a mixture as intermediates in solvent manufacture. Some analytical techniques may not distinguish between the cis and trans isomers. This profile is for cis-1,2-dichloroethene.

Absorption. No studies of 1,2-dichloroethylene (1,2-DCE) absorption have been located. On the basis of its physical characteristics, 1,2-DCE at environmental concentrations is expected to be readily absorbed through the skin and lungs, and by ingestion (U.S. EPA, 1987).

Distribution. Information on the distribution of 1,2-DCE in the body was not located. By analogy with 1,1-DCE, it may be predicted that the highest concentrations would be in the liver and kidney (U.S. EPA, 1987).

Metabolism. In vitro hepatocytes metabolize cis-1,2-DCE at a faster rate than trans-1,2-DCE. The rat liver converts cis-1,2-DCE to dichloroethanol and dichloroacetic acid (U.S. EPA, 1987). By analogy with 1,1-DCE, 1,2-DCE may be excreted in the urine within days of exposure.

Carcinogenicity. cis-1,2-Dichloroethene is listed in Group D, not classifiable as to human carcinogenicity. This is based on the lack of data from humans and animals and the generally nonpositive results in mutagenicity assays. (U.S. EPA, 1992).

Threshold Effects - Historically, cis-1,2-DCE was used as an anaesthetic, with minimal apparent side effects. Exposures to high concentrations thus primarily affect the central nervous system. Chronic exposure to 1,2-DCE may cause changes in the liver including lipid accumulation and reduction in liver enzyme activities (U.S. EPA, 1987).

A chronic oral reference dose (RfD) of $1x10^{-2}$ mg/kg/day is reported by EPA (U.S. EPA, 1993). This RfD is based on a NOAEL of 32 mg/kg/day given to study rats over a 90 day period and incorporates an uncertainty factor of 3000. The critical effects are decreased hemoglobin and decreased hematocrit (U.S. EPA, 1993). No reference concentration was reported and the above RfD is under review and subject to change.

Reproductive/Developmental Effects. No information available.

References

U.S. EPA, 1987. Health Advisory for 25 Organic Chemicals. Cis-1,2-Dichloroethylene and Trans-1,2-Dichloroethylene. March 31, 1987. Office of Drinking Water, Washington, D.C.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Cis-1,2-Dichloroethene dated January, 1992.

U.S. EPA, 1993, Health Effects Assessment Summary Tables, Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

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1,2-Dichloroethene (trans)

Two isomers, cis-1,2-DCE and trans-1,2-DCE, come under the name 1,2-dichloroethlene. Physical properties of the two compounds are fairly similar. The two compounds may occur as a mixture as intermediates in solvent manufacture. Some analytical techniques may not distinguish between the cis and trans isomers. This profile is for trans-1,2-dichloroethene.

Absorption - No studies of 1,2-dichloroethlene (1,2-DCE) absorption have been located. On the basis of its physical characteristics, 1,2-DCE at environmental concentrations is expected to be readily absorbed through the skin and lungs, and by ingestion (U.S. EPA, 1987).

Distribution - Information on the distribution of 1,2-DCE in the body was not located. By analogy with 1,1-DCE, it may be predicted that the high concentrations would be in the liver and kidney (U.S. EPA, 1987).

Metabolism - In vitro hepatocytes metabolize cis-1,2-DCE at a faster rate than trans-1,2-DCE. The rat liver converts cis-1,2-DCE to dichloroethanol and dichloroacetic acid (U.S. EPA, 1987). By analogy with 1,1-DCE, 1,2-DCE may be excreted in the urine within days of exposure.

Carcinogenicity - No evidence of carcinogenicity was located.

Threshold Effects - The subchronic oral RfD for trans-1,2-dichloroethene was generated from a NOEL of 17 mg/kg/day resulting from a 90-day, subchronic drinking water study on mice. The critical effect was increased serum alkaline phosphatase in male mice. Doses ranged from 17 to 452 mg/kg/day. An uncertainty factor of 1000 was used to compensate for possible inter-species differences, uncertainty in the threshold for sensitive humans, and uncertainty when extrapolating from subchronic to chronic exposures. The chronic oral RfD generated from this study is 2×10^{-2} mg/kg/day. (U.S. EPA, 1992). No inhalation RfDs have been generated.

Reproductive/Developmental Effects. No information available.

References

U.S. EPA, 1987. Health Advisory for 25 Organic Chemicals. Cis-1,2-Dichloroethylene and Trans-1,2-Dichloroethylene. March 31, 1987. Office of Drinking Water, Washington, D.C.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); trans-1,2-dichloroethene dated January, 1992.

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Ethylbenzene

Absorption - Data regarding absorption by humans of ethylbenzene as a result of ingestion is limited; however, in rabbit studies it was shown that ethylbenzene is readily absorbed. In a study of humans an average of 64 percent of inhaled ethylbenzene was absorbed (U.S. EPA, 1987).

Distribution - In rats, the absorbed ethylbenzene is distributed throughout the body; higher concentrations are found in the kidneys, lungs, adipose tissues, digestive tract and liver (U.S. EPA, 1987).

Metabolism and Excretion - Metabolic products are different in both human and rats. Following inhalation, ethylbenzene undergoes rapid metabolism, leading to the formation of mandelic acid and phenylglyoxylic acids in humans. These metabolites are not the same as those produced in the rat. Excretion in humans is most efficient via the urinary tract.

Carcinogenicity - There are no data suggesting this compound is either carcinogenic or mutagenic. Ethylbenzene is listed as a Group D compound, not classifiable as to human carcinogenicity (U.S. EPA, 1992).

Threshold Effects - Ethylbenzene has been shown to be toxic to the liver, kidneys, lungs, and central nervous system. Acute exposures in animals produces conjunctive irritation, slight corneal tissue damage, and mortality (U.S. EPA, 1987). Based on a 1956 rat oral bioassay study by Wolf et al., chronic and subchronic reference doses (RfDs) for oral exposure have been developed by EPA. Using an NOEL of 37.1 mg/kg/day and an uncertainty factor of 1000, the chronic RfD is 0.1 mg/kg/day. (U.S. EPA, 1992). The critical effect is identified as liver and kidney toxicity for the study group of rats.

In one study, pregnant rats exposed to 1000 ppm ethylbenzene in air had fetuses with a higher incidence of extra ribs than controls. An inhalation reference concentration of

1 mg/m^3 was derived by EPA based on a NOAEL of 100 ppm and an uncertainty factor of 300. (U.S. EPA, 1992). The critical effect was identified as developmental toxicity.

Reproductive and Developmental Effects - Although pulmonary exposure in rats resulted in fetal resorption, ethylbenzene is not considered strongly embryotoxic, fetotoxic, or teratogenic (U.S. EPA, 1987). Pregnant rats exposed to 1000 ppm ethylbenzene in air had fetuses with a higher incidence of extra ribs than controls (U.S. EPA, 1992). Changes in rib number is not generally considered evidence of teratogenicity.

References

U.S. EPA, 1987. Health Advisory for 25 Organic Chemicals, Office of Drinking Water, Washington, D.C.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Ethylbenzene, dated May, 1992.

Revised 11/93 by DM

4-Methyl-2-Pentanone (Methyl Isobutyl Ketone; (MIBK)

Absorption - MIBK appears to be absorbed by the skin, mucous membranes, and by the respiratory tract following inhalation exposure, judging by the health effects seen after exposure to MIBK. MIBK has a low degree of oral toxicity (Krasavage et. al., 1981).

Distribution - Limited data are available on the distribution of MIBK; however, it has been shown to affect the central nervous system, cardiovascular system, kidney, and liver (Krasavage et. al., 1981).

Metabolism and Excretion - MIBK is metabolized in guinea pigs to 4-hydroxy-4-methyl-2-pentanone and by carbonyl reduction to 4-methyl-2-pentanol (Krasavage et. al., 1981). Limited data are available on excretion; however, MIBK has been detected in human urine samples (Krasavage, 1981).

Carcinogenic Effects - No information available.

Threshold Effects - Dermal exposure to MIBK has been shown to cause irritation in animals, presumably as a result of its defatting properties (Krasavage, 1981). Human studies have shown that exposure to 200 to 400 ppm has an objectionable odor and is irritating to the eyes, nose, and throat while exposures to 100 to 500 ppm produces gastrointestinal effects. The principal health hazard results from exposure by inhalation; exposures to 1000 ppm produce central nervous system depression and narcosis (Krasavage, 1981).

The subchronic and chronic oral RfDs are 5×10^{-1} and 5×10^{-2} mg/kg/day, respectively, based on a subchronic study in rats administered MIBK by gavage (U.S. EPA, 1993). Critical effects are kidney and liver effects. The subchronic and chronic inhalation RfC are 8×10^{-1} and 8×10^{-2} mg/cm^3, respectively, based on a subchronic inhalation study in rats (U.S. EPA, 1993). Critical effects from inhalation exposure are liver and kidney toxicity.

Reproductive and Developmental Effects - No information available.

References

Krasavage, W.J., O'Donoghue, J.L., Divincenzo, G.D., 1981. Ketones (Chapter 56 in Patty's Industrial Hygiene and Toxicology, 3rd ed., Clayton and Clayton, eds.) New York: Wiley.

U.S. EPA, 1993. Health Effects Assessment Summary Tables, Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

Revised 11/93 by DM

Methylene Chloride

Absorption - Methylene chloride absorption occurs primarily via inhalation and ingestion. Some dermal absorption also occurs but at a slower rate (U.S. PHS, 1989).

Distribution - Following absorption, methylene chloride is quickly distributed to a wide range of tissues and body fluids. There is evidence of methylene chloride accumulation in body fats (U.S. PHS, 1989).

Metabolism - Methylene chloride is metabolized via two metabolic pathways; the mixed function oxidose system (MFO) where carbon monoxide and carbon dioxide is produced, and the glutathione S-transferase system (GST), which metabolizes methylene chloride at low exposures (U.S. PHS, 1989).

Carcinogenicity - Methylene chloride has been classified in group B2, as a probable human carcinogen, based on inhalation and drinking water studies with mice. Data on the development of lung tumors as a result of inhalation exposure resulted in an inhalation unit risk of 4.7×10^{-7} per ug/m^3. An oral slope factor of 7.5×10^{-3} per mg/kg/day was derived from both studies based on the development of liver tumors in mice (U.S. EPA, 1992).

Threshold Effects - A chronic oral RfD of 6×10^{-2} mg/kg/day was developed by EPA, based on a 2-year chronic oral drinking water study in rats. Liver toxicity was the critical effect observed (U.S. EPA, 1992). Based on a 2-year chronic inhalation study, a chronic inhalation RfC of 3 mg/m^3 was derived. The critical effect reported was liver toxicity (U.S. EPA, 1993). An uncertainty factor of 100 was used for both studies (U.S. EPA, 1992 and 1993).

Reproductive/Developmental Effects - Limited studies suggests that inhalation of methylene chloride at concentrations of 1250 ppm and above results in developmental and maternal toxicity.

References

U.S. EPA, 1992. Integrated Risk Information System (IRIS); methylene chloride dated January, 1992.

U.S. EPA, 1993, Health Effects Assessment Summary Tables, Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

U.S. PHS, 1989. Toxicological Profile for Methylene Chloride. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM

1,1,2,2-Tetrachloroethane

Absorption - In humans, 97 percent of a single breath of 1,1,2,2-tetrachloroethane was absorbed, while in rabbits, 30 percent of an inhaled dose was absorbed over a 3-hour period (U.S. PHS, 1989). Data on absorbtion in humans following oral exposure were not available; however, in animals, a high percentage of an oral dose of 1,1,2,2-tetrachloroethane appears to be absorbed (U.S. PHS, 1989).

Distribution - A high degree of hepatic protein binding in mice was observed following oral exposure to 1,1,2,2-tetrachloroethane (U.S. PHS, 1989). Since the liver is the primary target organ for this compound it is reasonable to assume that primary distribution is to the liver (U.S. PHS, 1989).

Metabolism and Excretion - In rats and mice, approximately 80 percent of an oral dose of 1,1,2,2-tetrachloroethane is metabolized and excreted within days of exposure (U.S. PHS, 1989). Metabolites of 1,1,2,2-tetrachloroethane include trichloroethanol, trichloroacetic acid, and dichloroacetic acid (U.S. PHS, 1989). In humans, approximately 3 percent of inhaled 1,1,2,2-tetrachloroethane was excreted in the breath (U.S. PHS, 1989). In rats and mice, 1,1,2,2-tetrachloroethane was excreted in urine and feces, and exhaled unchanged and as carbon dioxide, while a portion was retained in the body (U.S. PHS, 1989).

Carcinogenicity - EPA has classified 1,1,2,2-tetrachloroethane in Group C, as a possible human carcinogen (U.S. EPA, 1994). An oral slope factor has been set at $2x10^{-1}$ per mg/kg/day based on increased incidence of hepatocellular carcinomas in mice, and an inhalation unit risk of $5.8x10^{-5}$ per μg/cu.m has been set based on the same study (U.S. EPA, 1994).

Threshold Effects - 1,1,2,2-Tetrachloroethane produces acute and chronic toxic effects in laboratory animals exposed by various routes (Clement Associates, 1985). Toxic action is primarily on the liver; however, CNS effects, and effects on kidneys and other tissues are also reported (Clement Associates, 1985). Numerous deaths in humans have been reported, primarily as a result of occupational exposure by ingestion, inhalation, or skin contact

(Clement Associates, 1985). This compound is currently under review and neither a RfD nor RfC has been published (U.S. EPA, 1994).

Reproductive and Developmental Effects - Administration of 300-400 mg/kg/day to mice during organogenesis is reported to produce embryotoxic effects and slightly increase the incidence of malformations (Clement Associates, 1985).

References

Clement Associates, Inc., 1985. Chemical, Physical and Biological Properties of Compounds Present at Hazardous Waste Sites. Prepared for U.S. EPA.

U.S. EPA, 1994. Integrated Risk Information System (IRIS); 1,1,2,2-Tetrachloroethane, dated 2/7/94.

U.S. PHS, 1989. Draft Toxicological Profile for 1,1,2,2-Tetrachloroethane. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Revised 3/94 by DM

Toluene

Absorption - Toluene is readily absorbed through the respiratory tract, less readily through the gastrointestinal tract and to an even lesser extent through the skin (U.S. PHS, 1988).

Distribution - Limited data exist concerning the distribution of toluene in human tissue. However, due to this compound's low water solubility, toluene is expected to distribute to and accumulate in lipid tissue and bone marrow (U.S. PHS, 1988). Toluene administered orally or by inhalation to rats resulted in high levels in adipose tissue and bone marrow and lower concentrations in the liver and kidneys (U.S. PHS, 1988).

Metabolism and Excretion - In humans and animals, approximately 60 to 70 percent of an absorbed dose of toluene is metabolized to hippuric acid, which is excreted in urine. Some toluene is excreted, unchanged, in expired air (U.S. PHS, 1988).

Carcinogenicity - Various studies have examined the carcinogenicity of toluene in mice as a result of direct dermal application and no incidence of skin or systemic tumors was demonstrated (U.S. EPA, 1992). Toluene has not been found to be teratogenic, mutagenic, or carcinogenic and is classified as a group D compound by U.S. EPA (U.S. EPA, 1992).

Threshold Effects - Acute exposure to toluene, approximately 200 ppm, can result in acute central nervous system (CNS) toxicity such as fatigue, headache, nausea, and confusion. Chronic exposure also affects the CNS with symptoms of ataxia (inability to coordinate body movements), tremors, impaired speech, vision, hearing, and memory (U.S. PHS, 1988). A subchronic gavage study in rats provided data from which the U.S. EPA derived an oral RfD. The chronic RfD of $2x10^{-1}$ mg/kg/day (with an uncertainty factor of 1,000) and subchronic RfD of 2.0 mg/kg/day (with an uncertainty factor of 100) for oral exposures are based on increases in liver and kidney weights in rats (U.S. EPA, 1992; 1993). The chronic

inhalation RfC of 0.4 mg/m^3 is based on central nervous system effects and neurological effects (U.S. EPA, 1992).

Reproductive and Developmental Effects - Exposure to toluene has resulted in a significant increase in fetal mortality, a decrease in birth weights, and an increase in cleft palates in mice (U.S. EPA, 1984).

References

U.S. EPA, 1984. Health Effects Assessment for Toluene. Office of Research and Development. Cincinnati, Ohio.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Toluene, updated 8/92.

U.S. EPA, 1993. Health Effects Assessment Summary Tables, Annual FY-1993 (March 1993). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C., OERR 9200.6-303 (93-1). Updated July 1993.

U.S. PHS, 1988. Draft Toxicological Profile for Toluene. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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1,2,4-Trichlorobenzene

Absorption - No data available.

Distribution - No data available.

Metabolism and Excretion - No data available.

Carcinogenic Effects - 1,2,4-Trichlorobenzene has been classified in Group D; not classifiable as to human carcinogenicity (U.S. EPA, 1993b).

Threshold Effects - The subchronic and chronic inhalation RfCs are 9×10^{-2} and 9×10^{-3} mg/m^3, respectively (U.S. EPA, 1993a). These values are based on a subchronic rat study and a NOEL of 22.3 mg/m^3 (U.S. EPA, 1993a). The critical effect is increased uroporphyrin. The subchronic and chronic oral RfD is 1×10^{-2} (U.S. EPA, 1993a,b). This value is based on critical effects to the adrenal glands. These effects are listed as increased adrenal weights and vacuolization of the zone fasciculata in the cortex. Uncertainty factors of 100 and 1,000 for the inhalation RfCs and of 1,000 for the oral RfDs were used. The uncertainty factor of 1,000 accounts for extrapolation from a subchronic study, sensitive subpopulations, and a lack of chronic studies.

Reproductive and Developmental Effects - No data available.

References

U.S. EPA, 1993a. Health Effects Assessment Summary Tables (HEAST), Annual FY 1993 (March). Office of Research and Development, Office of Emergency and Remedial Response. OERR 9200.6-303 (93-1). Updated July 1993.

U.S. EPA, 1993b. Integrated Risk Information System (IRIS); 1,2,4-trichlorobenzene, dated 8/93.

1,1,1-Trichloroethane

Absorption - 1,1,1-Trichloroethane (1,1,1-TCA) is readily absorbed through the lungs and via the gastrointestinal tract (U.S. EPA, 1987).

Distribution - No data were located.

Metabolism and Excretion - Metabolism of 1,1,1-TCA is limited - less than 6% of a dose may be metabolized (U.S. EPA, 1987). Metabolites include trichloroethanol, trichloroacetic acid, and TCA glucuronide. Unchanged 1,1,1-TCA is primarily excreted via the lungs (U.S. EPA, 1987).

Carcinogenicity - 1,1,1-TCA is classified as Group D, not classified as to human carcinogenicity (U.S. EPA, 1993).

Threshold Effects - Acute inhalation exposure in humans (3 to 8 hours) results in disruption of central nervous system function and eye, nose, and throat irritation (U.S. EPA, 1984).

Oral RfDs and inhalation RfCs for both chronic and subchronic exposures have been set based on hepatotoxicity in guinea pigs exposed to 1,1,1-TCA by inhalation (U.S. EPA, 1992). The chronic oral RfD is 9×10^{-2} mg/kg/day; the chronic inhalation RfC is 1 mg/m^3; the subchronic oral RfD is 0.9 mg/kg/day; and the subchronic inhalation RfC is 10 mg/m^3 (U.S. EPA, 1992). The RfD and RfC were withdrawn from IRIS on 8/91 and have since been withdrawn from HEAST.

Reproductive and Developmental Effects - A study reported in 1982 showed no dose-dependent effect of 1,1,1-TCA on reproduction of mice (U.S. EPA, 1987).

References

U.S. EPA, 1984. Health Effects Assessment for 1,1,1-Trichloroethane. September 1984. EPA/540/1-86/005.

U.S. EPA, 1987. Health Advisories for 25 Organics. 1,1,1-Trichloroethane. March 31, 1987. Office of Drinking Water, Washington, D.C.

U.S. EPA, 1992. Health Effects Assessment Summary Tables FY 1992 (HEAST). Office of Research and Development, Office of Emergency and Remedial Response. Washington, D.C. OERR 9200.6-303 (92-1).

U.S. EPA, 1993. Integrated Risk Information System (IRIS), online database. 1,1,1-Trichloroethane, dated April 1, 1993.

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Trichloroethene

Absorption - Trichloroethene (also known as trichloroethylene or TCE) is readily absorbed via the lungs and gastrointestinal tract. The lungs absorb TCE at a high initial rate, and continue to absorb TCE as equilibrium is reached. Oral exposure studies in rats show that over 90% of orally administered TCE is absorbed. No studies of dermal absorption of TCE dissolved in water were available (U.S. PHS, 1988).

Distribution - There are only a few studies of TCE distribution, all in animals (U.S. PHS, 1988). The studies indicate that TCE accumulates in the brain, liver, lungs, and adipose tissue following either inhalation or oral exposure.

Metabolism and Excretion - The major metabolites of TCE, according to human and animal data, are trichloroethanol and trichloroacetic acid, both found as free compound and conjugated. Minor metabolites may include chloral hydrate, dichloroacetic acid, and N-(hydroxyacetyl)-aminoethanol. TCE itself is excreted via the lungs. Trichloroethanol glucuronide, trichloroethanol, and trichloroacetic acid are excreted in the urine of exposed humans (U.S. PHS, 1988).

Carcinogenicity - Trichloroethene is classified by the U.S. EPA as a group B2, probable human carcinogen, based on EPA's cancer risk assessment guidelines (U.S. EPA, 1991). This category applies to agents for which sufficient evidence exists and supports causal association between exposure and cancer in animals, but for which there is not adequate evidence of such an association in humans. A toxicity classification for HEAST has since been withdrawn (U.S. EPA, 1993a). A slope factor for oral TCE exposure has been calculated as 1.1×10^{-2} per mg/kg/day, based on the geometric average of four potency factors from studies showing an increase in liver cell cancers in mice (U.S. EPA, 1991). An inhalation unit risk of 1.7×10^{-6} per ug/m^3 was derived by EPA (U.S. EPA, 1991). EPA also reports an inhalation slope factor, based on "metabolized trichloroethylene" or "amount of metabolite", of 1.7×10^{-2} per mg/kg/day. A unit risk of 5.95×10^{-5} per μg/m^3 may be back-

calculated based on 20 m^3/day inhalation by a 70 kg person to represent the unit risk in terms of inhaled TCE, rather than metabolized TCE.

These slope factors were withdrawn from IRIS on July 7, 1989, for further review (U.S. EPA, 1991). The most recent update of IRIS for TCE did not contain a carcinogenicity assessment (U.S. EPA, 1993b).

Threshold Effects - A wide variety of effects have been observed in animals threshold effects at similar doses, including CNS depression, increased liver weights, renal dysfunction, suppressed immune response, and inhibition of an enzyme important in heme synthesis (U.S. PHS, 1988). EPA selected a reference dose of 7.35×10^{-3} mg/kg/day for lifetime oral exposure to TCE (U.S. EPA, 1987); however, this RfD has been withdrawn. A subchronic reference dose is not available. EPA has not selected a reference dose or concentration for inhalation (U.S. EPA, 1993b).

Reproductive and Developmental Effects - Data from studies with mice and rats indicate that only the male reproductive system is affected by trichloroethene exposure: sperm motility is reduced and the incidence of morphological abnormalities in sperm is increased. Studies with rats indicate that the following fetotoxic developmental effects may occur from exposure to trichloroethene: skeletal ossification anomalies, decreased fetal weight, and behaviors indicative of delayed development (U.S. PHS, 1988).

References

U.S. EPA, 1987. Health Advisory for 25 Organic Chemicals. Trichloroethylene, March 31, 1987. Office of Drinking Water, Washington, D.C.

U.S. EPA, 1991. Health Effects Assessment Summary Tables, Annual FY-1991. January, 1991. Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200. 6-303 (91-1).

U.S. EPA, 1993a, Health Effects Assessment Summary Tables, Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

U.S. EPA, 1993b. Integrated Risk Information System (IRIS); Trichloroethylene, Updated 11/93.

U.S. PHS, 1988. Draft Toxicological Profile for Trichloroethylene. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM.

Trimethylbenzenes

Trimethylbenzenes are colorless, flammable liquids that occur in three isomeric forms, two of which are chemicals of concern at Rose Hill; 1,2,4-trimethylbenzene, also known as pseudo cumene and 1,3,5-trimethylbenzene, also named mesitylene. These isomers may occur in refined petroleum and coal tars and from industrial use in paint thinners, solvents, and motor fuel components (Sandmeyer, 1981).

Absorption - No data available.

Distribution - Limited information is available on the distribution of trimethylbenzenes. From the gastrointestinal tract, the trimethylbenzenes are readily absorbed into the vascular system. Trimethylbenzenes are also similar to types of materials which pass through the placenta (Sandmeyer, 1981).

Metabolism and Excretion - Following orally administered doses to the rat, the 1,2,4-isomer was excreted as the corresponding 3,4-dimethylbenzoic acid conjugate and the 1,3,5-isomer as the 3,5-dimethyl derivative. The excretion of the respective free trimethylphenols in minor quantities for both isomers has also been confirmed (Sandmeyer, 1981). Excretion of trimethylbenzenes in animal studies is primarily as urinary metabolites. Trimethylbenzenes have also been identified in air exhaled by humans (Sandmeyer, 1981).

Carcinogenic Effects - No data available.

Threshold Effects - Studies of inhalation exposures to the 1,2,4 and 1,3,5 isomers in the mouse, rabbit, and rat have noted health effects such as loss of righting response (prostration), loss of reflexes, necrosis, thrombocytosis, thrombopenia, and inhibition of phagocytic actions (Sandmeyer, 1981). Data are insufficient to determine oral and inhalation RfDs and RfCs (U.S. EPA, 1993).

Reproductive and Developmental Effects - No data available.

References

Sandmeyer, E.E., 1981. Aromatic Hydrocarbons. (Chapter 47 in Patty's Industrial Hygiene and Toxicology, 3rd ed., Clayton and Clayton, eds.). New York, Wiley.

U.S. EPA, 1993. Health Effects Assessment Summary Tables, Annual FY 1993 (March). Office of Research and Development, Office of Emergency and Remedial Response. OERR 9200.6-303 (93-1). Updated July 1993.

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Vinyl Chloride

Absorption - Vinyl chloride is rapidly absorbed via oral and inhalation routes in animals (U.S. EPA, 1987). Vinyl chloride gas is minimally absorbed through the skin (U.S. PHS, 1989). In humans, an estimated 42% of inhaled vinyl chloride (independent of concentration) is retained during a six hour exposure period (U.S. PHS, 1989).

Distribution - After rats are exposed to radiolabelled vinyl chloride, the radiolabeled carbon is found concentrated in liver and kidney. When metabolism of vinyl chloride is artificially blocked, the highest levels are found in fat (U.S. PHS, 1989). This suggests that vinyl chloride naturally partitions into the fat but is withdrawn and metabolized by the liver.

Metabolism and Excretion - Exhalation of unmetabolized vinyl chloride does not appear to be an important elimination pathway following low exposures (U.S. PHS, 1989). Two proposed saturable metabolic pathways for vinyl chloride involve formation of an aldehyde, via either alcohol or an epoxide intermediates, and finally metabolism to 2-chloroacetic acid (U.S. PHS, 1989). Urinary metabolites in rats include conjugated versions of these compounds; also, binding of 2-chloroethylene oxide to liver macromolecules has been reported (U.S. PHS, 1989).

Carcinogenicity - Vinyl chloride is classified by the U.S. EPA as a Group A, human carcinogen, based on EPA's cancer risk assessment guidelines (U.S. EPA, 1993). Vinyl chloride produces cancers of the liver, kidney, lung, and brain in animals, and the liver, brain, and lung in humans (U.S. EPA, 1984). Toxicity values for vinyl chloride as estimated by EPA are 1.9 per mg/kg/day for an oral slope factor and 8.4×10^{-5} per $\mu g/m^3$ for an inhalation unit risk (U.S. EPA, 1993).

Threshold Effects - Among the many and varied toxic effects in humans which together are called vinyl chloride disease, there is no one endpoint identified as the critical effect (U.S. PHS, 1989). In animal models, changes in liver cells and function occurred at oral

doses as low as 1.3 mg/kg/day (U.S. PHS, 1989). Due to the carcinogenicity of vinyl chloride, the EPA has not selected reference doses or concentrations for this compound (U.S. EPA, 1991).

Reproductive/Development Effects - An 1976 epidemiological study suggested that occupational exposure to vinyl chloride was correlated with fetal loss, and that living near a vinyl chloride plant was correlated with an increased incidence of birth defects. Several subsequent studies questioned the validity of and/or contradicted the 1976 study (U.S. PHS, 1989). Animal data have associated vinyl chloride exposures with testicular effects (U.S. PHS, 1989).

References

U.S. EPA, 1984. Health Effects Assessment for Vinyl Chloride. September 1984, EPA/540/1-86/036.

U.S. EPA, 1987. Health Advisories for 25 Organics. Vinyl Chloride, March 31, 1987. Office of Drinking Water, Washington, D.C.

U.S. EPA, 1991. Integrated Risk Information System (IRIS); vinyl chloride, dated 8/91.

U.S. EPA, 1993. Health Effects Assessment Summary Tables Annual FY-1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303 (93-1). Updated July 1993.

U.S. PHS, 1989. Toxicological Profile for Vinyl Chloride. Prepared for the Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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Xylenes

There are three isomers of xylene: the ortho, meta, and para forms. Much of the toxicity information on xylene is not specific to an isomer, but is considered to apply to xylenes in general.

Absorption - Inhaled xylene is rapidly absorbed. Data on absorption of ingested xylene are limited; however, it is inferred from monitoring of excretion products that absorption by this route is nearly complete.

Distribution - In a study conducted in 1978, xylene and its metabolites were principally detected in the lungs, liver, and kidneys of mice to which radio-labeled xylene had been administered. Distribution of xylene to the brain and adipose tissues was also evident (U.S. EPA, 1987).

Metabolism and Excretion - Xylene metabolism is isomer dependent but generally achieved by the oxidation of methyl groups and ring hydroxylation. Resulting metabolites include methyl hippuric acid and xylenols (U.S. EPA, 1987). In rabbits, 85 to 90 percent of an oral dose of xylene was accounted for in the urine (U.S. EPA, 1984). Pulmonary excretion may have accounted for the remaining xylenes.

Carcinogenicity - Oral administration of xylene to rats and mice did not result in the significant incidence of tumor induction. The U.S. EPA classifies xylenes as Group D compounds, based on inadequate animal bioassay and human studies (U.S. EPA, 1992).

Threshold Effects - Exposure to xylenes has been shown to result in CNS disturbances such as disturbances of short-term memory, decrease in analytical ability and hyperactivity. The 1986 NTP chronic oral exposure rat study is the basis of the EPA chronic oral reference dose (RfD). The chronic oral RfD for mixed xylenes of 2.0 mg/kg/day is based on critical adverse health effects in rats of hyperactivity, decreased body weight, and increased mortality (U.S. EPA, 1992). The former chronic inhalation reference concentration (RfC) of

0.3 mg/m^3 for mixed xylenes was based on CNS effects, and nose and throat irritation. The former chronic inhalation reference concentration (RfC) of 0.7 mg/m^3 for o-xylene was based on hepatomegaly. The identified critical effect from chronic inhalation exposure to either m-xylene or o-xylene was hepatomegaly; however, the identified critical effects from chronic inhalation exposure to p-xylene and to mixed xylenes were nose and throat irritation and CNS effects (U.S. EPA, 1991). The RfC values are not currently published (U.S. EPA, 1992; 1993).

Reproductive and Developmental Effects - Xylene is reported to be fetotoxic and teratogenic at high oral doses (U.S. EPA, 1992).

References

U.S. EPA, 1984. Health Effects Assessment for Xylene, Office of Research and Development. Cincinnati, Ohio.

U.S. EPA, 1987. Health Advisory for 25 Organic Chemicals, Office of Drinking Water, Washington, D.C.

U.S. EPA, 1991. Health Effects Assessment Summary Tables, Annual FY1991 (January). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C., OERR 9200.6-303 (91-1).

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Xylenes, dated 1/22/92.

U.S. EPA, 1993. Health Effects Assessment Summary Tables, Annual FY 1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303 (93-1). Updated July 1993.

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2-Methylnaphthalene

Absorption - No information was located.

Distribution - No information was located.

Metabolism - No information was located.

Carcinogenicity - This compound is not known or expected to be carcinegenic.

Threshold Effects - This compound is generally less toxic than naphthalene (Sandmeyer, 1981). Specifically, methylnaphthalenes are not human skin irritants or photosensitizers (Sandmeyer, 1981). No RfD has been established by the EPA for this compound.

Reproductive/Developmental Effects - No information was located.

Reference

Sandmeyer, E.E., 1981. "Aromatic Hydrocarbons" in Patty's Industrial Hygiene and Toxicology, 3rd ed., Volume 2B, Clayton and Clayton, eds. New York: Wiley.

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Benzo(a)anthracene

Absorption - Benzo(a)anthracene is readily absorbed by oral and dermal routes, as evidenced in rat and mouse studies. In one study, levels of this Polynuclear Aromatic Hydrocarbon (PAH) compound reached a maximum in the blood, liver and brain only 1 to 2 hours after oral administration (U.S. PHS, 1990). Quantitative information on absorption via the respiratory tract is not available, but uptake has been determined to be dependent on the blood perfusion rate of the affected tissue.

Distribution - Due to rapid absorption via oral exposure, this PAH is rapidly distributed among several body tissues including liver, blood, and brain, and slowly distributed in mammary and adipose tissues, where it tends to accumulate (U.S. PHS, 1990).

Metabolism and Excretion - Metabolism in animals and humans is very similar to the benzo(a)pyrene biotransformation pathways. Primary biotransformations include the oxidation of the aromatic nucleus to form arene oxides, dihydrodiols, and diol epoxides. (U.S. PHS, 1990). These resulting intermediates are responsible for the toxic action and carcinogenic effects of benzo(a)anthracene. These metabolites are then excreted predominantly in the feces, as is characteristic of all PAHs (U.S. PHS, 1990).

Carcinogenicity - Benzo(a)anthracene has been classified in Group B2 as a possible human carcinogen (U.S. EPA, 1993). Although human data are lacking, there are sufficient data from animal bioassays to classify benzo(a)anthracene in group B2. Tumors were produced in mice exposed by gavage; intraperitoneal, subcutaneous or intramuscular injections; and topical application. Mutations in bacteria and in mammalian cells have been produced. No slope factor has been published for benzo(a)anthracene. As an approximation, the slope factor for benzo(a)pyrene is used (7.3 per mg/kg/day, oral route).

Threshold Effects - Repeated injection of benzo(a)anthracene in mice had little effect on the longevity or the organ weights of the animals (U.S. EPA, 1979), suggesting that direct toxic effects (other than cancer or reproductive effects) may not be critical in this compound.

Benzo(a)anthracene has also demonstrated immunotoxic effects (U.S. EPA, 1990). Oral and inhalation RfDs have not been established for benzo(a)anthracene (U.S. EPA, 1993).

Reproductive/Developmental Effects - No information was located.

References

U.S. EPA, 1979, referenced in PEER, 1990. Draft Remedial Investigation Report for Pine Street Canal Site, Burlington, Vermont.

U.S. EPA, 1990. 44 Federal Register 30370, 8/25/90.

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Benzo(a)anthracene, dated 11/93.

U.S. PHS, 1990. Toxicological Profile for Benzo(a)anthracene. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM

Chrysene

Absorption - Absorption of chrysene occurs principally via the gastrointestinal tract and also through the skin. No quantitative data on the absorption of chrysene by inhalation exists (U.S. PHS, 1990).

Distribution - One study using rats found that orally absorbed chrysene is distributed to adipose, mammary, brain, liver, and blood tissues, but preferentially accumulates in the adipose and mammary tissues (U.S. PHS, 1990).

Metabolism and Excretion - Metabolism of chrysene in humans and animals parallels the biotransformation pathways described for benzo(a)pyrene (U.S. PHS, 1990). Chrysene is metabolized to reactive derivatives which are believed to be responsible for its carcinogenic nature. After an oral dose, chrysene is eliminated primarily via the feces. However, it has been identified in the urine of smokers.

Carcinogenicity - The EPA has classified chrysene in Group B2, as a probable human carcinogen (U.S. EPA, 1993). Although no human data are available, sufficient data from animal bioassays exist to establish this classification (U.S. EPA, 1993). Chrysene produced carcinomas and malignant lymphoma in mice after intraperitoneal injection and skin carcinomas in mice following dermal exposure. Chromosomal abnormalities in hamster and mouse germ cells were produced after gavage exposure to chrysene; also, positive responses in bacterial gene mutation assays occurred and transformation of mammalian cells exposed in culture was produced by chrysene.

The International Agency for Research on Cancer (IARC) listed chrysene only as a possible human carcinogen - not as a probable human carcinogen. It is the only EPA Group B2 PAH so designated by IARC. There is currently neither an oral cancer slope factor nor an inhalation unit risk for chrysene.

As a conservative estimate, the slope factor for benzo(a)pyrene is used for oral exposure (7.3 per mg/kg/day). Chrysene is considered to be weakly genotoxic (U.S. PHS, 1990).

Threshold Effects - No information available.

Reproductive/Developmental Effects - No information available.

References

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Chrysene, dated 11/93.

U.S. PHS, 1990. Toxicological Profile for Chrysene. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM

Benzo(b)fluoranthene

Absorption - Absorption of benzo(b)fluoranthene (BbF) through the lungs and skin is expected to be similar to that of benzo(a)pyrene (U.S. PHS, 1990).

Distribution - No information available.

Metabolism and Excretion - The pathways of benzo(b)fluoranthene metabolism in the liver have been extensively investigated. Insoluble metabolites can be classified as dihydrodiols and phenols. Subsequent hepato-biliary excretion results in elimination of dihydrodiol and phenol and glutathione conjugates in the feces (U.S. PHS, 1990).

Carcinogenicity - The data in currently available studies are inadequate for determining whether BbF is mutagenic. The evidence that BbF is active in short-term genetic assays is inadequate (U.S. PHS, 1990).

Mice developed skin tumors at an average daily dose of 1.2 mg/kg/day. Rats developed tumors when BbF was injected in a waxy pellet into the lung. It is not known whether BbF will cause tumors when it is breathed or ingested, and there are no quantitative data on the bioavailability of BbF in soil or on air particulates (U.S. PHS, 1990). Benzo(b)fluoranthene is classified in Group B2, as a probable human carcinogen (U.S. EPA, 1993). Although no human data are available, sufficient data from animal bioassays exist to establish this classification. Benzo(b)fluoranthene produced tumors in mice after lung implantation, intraperitoneal or subcutaneous injection, and skin painting. No slope factor has been established for benzo(b)fluoranthene (U.S. EPA, 1993). The oral slope factor for benzo(a)pyrene (7.3 per mg/kg/day) is used here to estimate the oral carcinogenicity of BbF.

Threshold Effects - Inhalation and oral RfDs have not been established.

Reproductive/Developmental Effects- No information available.

References

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Benzo(b)fluoranthene, dated 11/93.

U.S. PHS, 1990. Toxicological Profile for Benzo(b)fluoranthene. Prepared for Agency for Toxic Substance and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM

Benzo(k)fluoranthene

Absorption - Benzo(k)fluoranthene (BkF), as a polycyclic aromatic hydrocarbon (PAH), is highly lipid soluble and is expected to be readily absorbed from the GI tract (U.S. EPA, 1984).

Distribution - No information specific to this compound was located.

Metabolism - No information specific to this compound was located.

Carcinogenicity - Benzo(k)fluoranthene has been classified in group B2, as a probable human carcinogen, due to sufficient data from animal bioassays (U.S. EPA, 1993). Although there are no human data that specifically link exposure to benzo(k)fluoranthene to human cancers, BkF is a component of mixtures that have been associated with human cancer (U.S. EPA, 1993). No slope factor has been established for benzo(k)fluoranthene (U.S. EPA, 1993). The oral slope factor for benzo(b)pyrene (7.3 per mg/kg/day) is used to estimate the potency of BkF.

Threshold Effects - No oral or inhalation RfDs have been established.

Reproductive/Developmental Effects - No information available.

References

U.S. EPA, 1984. Health Effects Assessment for Benzo(k)fluoranthene. Office of Research and Development, Cincinnati, Ohio.

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Benzo(k)fluoranthene, dated 11/93.

Revised 11/93 by DM

Benzo(a)pyrene

Absorption - Benzo(a)pyrene (BaP) is readily absorbed through the respiratory tract, the gastrointestinal tract, and the skin (U.S. PHS, 1987). Three percent of a dose of BaP applied at 10 ug/cm^2 "permeated" human skin within 24 hours (Kao, 1985, in U.S. PHS, 1987). This is within the range of 0.1% to 10% dermal absorption reported in a variety of mammal species (U.S. PHS, 1987). Data on the absorption from soil or particulate matter are limited; absorption may actually be quite low (U.S. PHS, 1987) or it may be readily absorbed by all routes (U.S. PHS, 1987). BaP is reported to be readily transported across the mucous membranes of the digestive system (Sees, 1971, in U.S. EPA, 1984b).

Distribution - After absorption, benzo(a)pyrene is rapidly distributed to and absorbed by several tissues, including the esophagus, intestines, kidneys, liver, lungs and stomach (U.S. PHS, 1987). This information is based on data from inhalation studies conducted with rats.

Metabolism and Excretion - The pathways of benzo(a)pyrene metabolism are well described, based on results of human and animal studies. This polycyclic aromatic hydrocarbon (PAH) is metabolized to varying degrees by several tissues including the kidneys, liver, and lungs, as well as other tissues of the respiratory and gastrointestinal tracts. The first metabolic phase results in the formation of arene oxides and phenols. Subsequent reactions produce quinones, dihydrodiols phenol-diols, and diol epoxides, which may hydrolyze to tetrols. These compounds may then form conjugates with glutathione, sulfate, or glucuronic acids to form Phase III metabolites, which are eliminated in the feces following hepatobiliary excretion (U.S. PHS, 1987).

Carcinogenicity - Benzo(a)pyrene has been classified in Group B2 as a possible human carcinogen (U.S. EPA, 1993). Multiple studies in rodent and nonrodent species demonstrate BaP to be carcinogenic following administration by oral, intratracheal, inhalation and dermal routes. Oral administration of BaP has induced stomach tumors, lung tumors, and leukemia in experimental animals. Oral administration by gavage has induced lung and liver tumors in mice. Administration of BaP by inhalation has induced nasal, tracheal, pharyngeal, and

upper digestive tumors in hamsters. Dermal administration of BaP has induced skin tumors in rats, mice, rabbits, and guinea pigs (U.S. PHS, 1987). Benzo(a)pyrene has produced positive results in several in vitro bacterial and mammalian genetic toxicology assays (U.S. EPA, 1993).

Human data specifically linking benzo(a)pyrene to a carcinogenic effect are lacking. In one study, investigators applied a 1% solution of BaP in benzene to patients. Skin changes called regressive verricae (resembling warts) developed in all patients (U.S. EPA, 1984b). This reaction resembled that which preceded skin cancer in test animals, so the test was discontinued. The Agency for Toxic Substances and Disease Registry (ATSDR) called the study "seriously flawed" (U.S. PHS, 1987), but similar reactions noted following accidental exposures (U.S. EPA, 1984b) substantiate the findings. The patients' skin reverted to normal following discontinuation. Lung cancer has been shown to be included in humans by various mixtures of polynuclear aromatic hydrocarbons known to contain benzo(a)pyrene. It is not possible, however, to conclude from this information that benzo(a)pyrene is the responsible agent.

Previously published EPA cancer potency factors for BaP were withdrawn several years ago pending recalculation and review. The oral potency factor was based on a mouse study in which mice in nine different dose groups - from 1 to 250 ppm in the diet - were compared to controls (Neal and Rigdon, 1967, in U.S. EPA, 1984a). Durations of exposures were not consistent. These appeared to be a marked increase in tumors above 45 ppm in the diet. The current oral slope factor for BaP is 7.3 mg/kg/day (EPA, 1993) and was calculated as the geometrical mean of a range of slope factors between 4.5 and 11.7 per mg/kg/day. The inhalation unit risk, which has since been withdrawn, is reported by EPA to be 1.7 x 10^{-3} per $\mu g/m^3$ (U.S. EPA, 1992).

Threshold Effects - Subchronic oral exposure of one strain of mice to 120 mg/kg/day of BaP apparently led to bone marrow depression. The mice developed aplastic anemia and died within one month due to hemorrhage or infection (U.S. PHS, 1987; U.S. EPA, 1984a). There are reports in the literature that BaP suppressed and destroyed sebaceous glands (oil

glands in skin) in animals, however, no control results were reported (U.S. PHS, 1987). No reference dose for evaluation of non-carcinogenic effects was derived from the study results. There is no approved RfD for BaP (U.S. EPA 1993).

Reproductive and Developmental Effects - No data are available on the reproductive and developmental effects of benzo(a)pyrene on humans. Reproductive and developmental toxicity was demonstrated in several rodent studies (in U.S. EPA, 1984a and U.S. PHS, 1987). Reduced reproductive function has been observed in treated animals. Reduced fetal weights, altered gonad and germ cell development, possible birth defects and decreased fertility in progeny have also been observed, with nearly complete sterility following parental doses of 40 mg/kg/day. The rodent studies indicate that decreased fertility and progeny sterility may constitute reproductive effects expected in humans (U.S. PHS, 1987). Potential developmental effects include low birth weight, stillbirth, resorption, and malformations (U.S. PHS, 1987).

References

Kao, 1985, referenced in U.S. PHS, 1987.

Neal and Rigdon, 1967, referenced in U.S. EPA, 1984a.

Sees, 1971, referenced in U.S. EPA, 1984b.

Thyssen et al., 1981, referenced in U.S. EPA, 1984a.

U.S. EPA, 1984a. Health Effects Assessment for Benzo(a)pyrene. Office of Research and Development, Cincinnati, Ohio.

U.S. EPA, 1984b. Health Effects Assessment for PAHs. Office of Research and Development, Cincinnati, Ohio.

U.S. EPA, 1992. Health Effects Assessment Summary Tables, Annual FY-1992 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200 6-303 (92-1).

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Benzo(a)pyrene. Updated 9/93.

U.S. PHS, 1987. Draft Toxicological Profile for Benzo(a)pyrene. Prepared for Agency for Toxic Substance and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM

Indeno(1,2,3-cd)pyrene

Absorption - No information specific to this compound was located.

Distribution - No information specific to this compound was located.

Metabolism - No information specific to this compound was located.

Carcinogenicity - Indeno(1,2,3-cd)pyrene (IP) has been classified by EPA in Group B2, as a probable human carcinogen (U.S. EPA, 1993). No slope factor has been published by U.S. EPA. The oral slope factor for benzo(a)pyrene (7.3 per mg/kg/day) is substituted here.

Threshold Effects - There are no data available to determine oral and inhalation RfDs.

Reproductive/Developmental Effects - No information specific to this compound was located.

References

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Indeno (1,2,3-cd)pyrene, on line database dated 11/93.

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Bis(2-Ethylhexyl)phthalate

Absorption - Upon oral administration, bis(2-ethylhexyl)phthalate (DEHP) and its principal metabolites are readily absorbed from the gastrointestinal tract in animals. In rats, inhaled DEHP is absorbed by the lung whereas dermal application to rat skin results in poor absorption of this chemical. No human data are available (U.S. PHS, 1989).

Distribution - Absorbed DEHP is readily distributed to the organs and tissues with the liver being the principal initial repository organ (U.S. PHS, 1989). Clearance is rapid; no apparent accumulation has been observed (U.S. PHS, 1989).

Metabolism - Bis(2-ethylhexyl)phthalate is hydrolyzed to its corresponding monoester primary metabolite and subsequently an alcoholic substituent, 2-ethylhexanol, is released (U.S. PHS, 1989). The monoester metabolite and 2-ethylhexanol are quickly oxidized to a variety of more polar products.

Carcinogenicity - Based on significant dose-related increases in liver tumor responses in rats and mice, bis(2-ethylhexyl)phthalate is classified as a B2, probable human carcinogen (U.S. EPA, 1993). Results from human data are considered inadequate. Bis(2-ethylhexyl)phthalate has mixed results in mutagenicity assays. The oral slope factor of 1.4×10^{-2}/mg/kg/day was generated from a NTP study using male and female rats and mice (U.S. EPA, 1993). The rats were fed diets ranging from 0 to 12,000 mg/kg/day bis(2-ethylhexyl)phthalate for 103 weeks, and the mice were given 0 to 6000 mg/kg/day in the diet for 103 weeks. No inhalation unit risk has been derived.

Threshold Effects - A chronic oral RfD for DEHP was generated as 2×10^{-2} mg/kg/day from a lowest observed adverse effects level (LOAEL) of 19 mg/kg/day in a 1-year guinea pig feeding study (U.S. EPA, 1993). The critical effect was increased relative liver weight in treated females. An uncertainty factor of 1000 was used to compensate for inter-species variation to protect sensitive human subpopulations because the guinea pig exposure was longer than subchronic, but less than lifetime. While the RfD is set on a LOAEL, the effect

observed was considered to be minimally adverse, so a higher uncertainty factor was not employed.

Reproductive/Developmental Effects - Studies demonstrate that DEHP is a reproductive toxicant in mice and rats. Testicular damage and fertility reduction was observed by organ relative weight decrease, histological changes in the seminiferous tubules and reduction in fertility (U.S. PHS, 1989). No human data regarding reproductive effects via inhalation, ingestion or dermal exposure are available (U.S. PHS, 1989).

References

U.S. EPA, 1993. Integrated Risk Information System (IRIS); bis(2-Ethylhexyl)phthalate, dated 2/93.

U.S. PHS, 1989. Toxicological Profile for di(2-Ethylhexyl)phthalate. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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4-Chloro-3-methylphenol

No toxicological data on this compound were readily available from EPA sources.

4-Methylphenol (p-Cresol)

Absorption - The oral and inhalation absorption of 4-methylphenol is assumed because of toxicity resulting from these types of exposures. However, the quantities absorbed have not been determined (U.S. EPA, 1984).

Distribution - No information available.

Metabolism - No information available.

Carcinogenicity - Data are not available regarding the carcinogenicity of 4-methylphenol; it is classified in Group C (U.S. EPA, 1993a).

Threshold Effects - Cresol isomers, in general, are highly irritating to skin, mucous membranes, and eyes. Exposure may impair kidney and liver functions and result in CNS effects and cardiovascular problems (Clement, 1985). The subchronic and chronic oral reference doses, $5x10^{-2}$ and $5x10^{-3}$ mg/kg/day, respectively, are based on the oral exposure of rabbits to 4-methylphenol during gestation and the resulting critical effects of maternal death, respiratory distress, eye discharge, hypoactivity, and cyanosis (U.S. EPA, 1993b). There is currently no inhalation RfCs available for 4-methylphenol.

Reproductive and Developmental Effects - According to the Health Effects Assessment for Cresols (U.S. EPA, 1984), Lysol®, which contains cresol, has been used in several human cases as an abortifactant. Because Lysol® contains other chemical components in addition to cresol, this information does not provide strong evidence of reproductive and developmental toxicity from exposure to cresols.

References

Clement Associates, Inc. 1985. Chemical, Physical and Biological Properties of Compounds Present at Hazardous Waste Sites. Prepared for: U.S. EPA.

U.S. EPA. 1984. Health Effects Assessment for 4-Methylphenol. Office of Research and Development. Cincinnati, Ohio.

U.S. EPA. 1993a. Integrated Risk Information System (IRIS); 4-Methylphenol, dated 8/93.

U.S. EPA. 1993b. Health Effects Assessment Summary Tables (HEAST). Annual FY 1993 (March). Office of Research and Development. Office of Emergency and Remedial Response. OERR 9200.6-303 (93-1). Updated July 1993.

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Pentachlorophenol

Absorption - Absorption of pentachlorophenol has been documented as essentially complete, following oral administration in humans. Complete absorption occurs due to the non-polar nature of this compound, and the average half-life or absorption has been calculated to be approximately 1.3 hours, indicating that oral absorption of pentachlorophenol in humans is rapid (U.S. EPA, 1984). Inhalation of pentachlorophenol also results in rapid absorption.

Distribution - Analysis of human tissues and fluids revealed that the highest concentrations of pentachlorophenol occur in the liver, kidney, and brain (U.S. PHS, 1987). Lower levels were also detected in the spleen and body fat. In rats, however, pentachlorophenol did not seem to accumulate following inhalation. Rapid clearance occurred and a high percentage of the compound was recuperated from the urine. In general, the binding of pentachlorophenol to plasma proteins plays an important role in pentachlorophenol distribution.

Metabolism and Excretion - Animal and human studies indicate that pentachlorophenol is not readily metabolized, based on the high concentration of unchanged pentachlorophenol which is excreted upon administration (U.S. PHS, 1987).

Carcinogenicity - Based on sufficient evidence of carcinogenicity in animals, pentachlorophenol is classified in group B2, a probable human carcinogen (U.S. EPA, 1993). Statistically significant increases in the incidences of multiple biologically significant tumor types were found in mice using two different preparations of pentachlorophenol in daily feed administered (U.S. EPA, 1993). In addition, a high incidence of two uncommon tumors was observed with both preparations. This classification is supported by mutagenicity data, which provide some indication that pentachlorophenol may cause chromosomal abnormalities. Human carcinogenic data is inadequate. An oral slope factor for pentachlorophenol developed by the U.S. EPA is 1.2×10^{-1} mg/kg/day (U.S. EPA, 1993). No inhalation unit risk for pentachlorophenol is available.

Threshold Effects - The chronic oral RfD for pentachlorophenol was generated from a NOAEL of 3 mg/kg/day from a study involving oral exposures of rats (U.S. EPA, 1993). Rats were administered 1 of 3 doses in a diet. At 30 mg/kg/day, reduced body weight and fetal toxicity were seen. Pigmentation of the liver and kidneys was observed in exposure levels of 10 mg/kg/day and 30 mg/kg/day. A chronic oral RfD of 3×10^{-2} mg/kg/day was derived by the EPA based on developmental effects (U.S. EPA, 1993). An oral uncertainty factor of 100 accounts for the expected intra- and inter-species variability to the toxicity of the chemical. An inhalation RfD summary risk assessment for pentachlorophenol is under review by an EPA work group.

Reproductive/Developmental Effects - A teratogenicity study was conducted where oral administration of a high dose level of purified pentachlorophenol resulted in delayed skull bones ossification in rats (U.S. PHS, 1987). In another study, rats fed high levels of pentachlorophenol prior to mating and through gestation and lactation exhibited fetotoxic effects as well as maternal toxicity (U.S. EPA, 1984). Research indicates that pentachlorophenol apparently does not cross the placental barrier, so the observed fetotoxicity may be a reflection of maternal toxicity.

References

U.S. EPA, 1984. Health Effects Assessment for Pentachlorophenol. Office of Research and Development, Cincinnati, Ohio.

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Pentachlorophenol, dated 7/93.

U.S. PHS, 1987. Toxicological Profile for Pentachlorophenol.

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Acrylamide

Absorption - Animal studies show that acrylamide is absorbed following ingestion and to a lesser extent through intact skin (U.S. EPA, 1988). Acrylamide is a small organic molecule that is very soluble in water. Following oral administration in rats, acrylamide was rapidly and completely absorbed from the gastrointestinal tract. However, following dermal exposure to intact rat skin, approximately 25 percent of the applied dose was absorbed in a twenty-four hour period (U.S. EPA, 1988).

Distribution - Acrylamide was found to distribute readily throughout the body after oral administration in rats (U.S. EPA, 1988). Acrylamide did not concentrate in any tissue; however, approximately 12 percent of an absorbed dose was shown to accumulate and persist in the red blood cells presumably from a reaction with sulfhydryl groups present in hemoglobin (U.S. EPA, 1988). Acrylamide has been shown to distribute readily in the bodies of other species as well, including swine, beagle dogs, and mice. In pregnant mice, it was uniformly distributed in the fetuses as well (U.S. EPA, 1988).

Metabolism and Excretion - Studies show that acrylamide is rapidly metabolized; approximately 60 percent of the applied dose was excreted in the urine within 24 hours following absorption (U.S. EPA, 1988). Metabolism occurs primarily by conjugation with glutathione. N-acetyl-S-(3-amino-3-oxypropyl) cysteine is the primary urinary metabolite, accounting for approximately 50 percent of the absorbed dose. In addition, small amounts were eliminated in the urine, unchanged, in the lungs as CO_2, and in the feces as unidentified metabolites (U.S. EPA, 1988). Acrylamide has also been reported to bind to nucleic acids and proteins in vivo, potentially playing some role in its toxicity (U.S. EPA, 1988).

Carcinogenicity - Acrylamide is classified as a Group B2, probable human carcinogen, by both the oral and inhalation route (U.S. EPA, 1993). An oral slope factor for acrylamide has been calculated as 4.5 per mg/kg/day for oral exposures and an inhalation unit risk as 1.3×10^{-3} per ug/m^3 (U.S. EPA, 1993). These toxicity values are based on increased incidence of benign and/or malignant tumors at multiple sites in male and female rats

following administered doses in drinking water and on carcinogenic effects by several routes of exposure in mice (U.S. EPA, 1993). Supporting data for this classification is acrylamide's adduct formation activity and structure-activity relationship to vinyl carbamate and acrylonitrile (U.S. EPA, 1993).

Threshold Effects - The chronic oral RfD for acrylamide is calculated as $2x10^{-4}$ mg/kg/day (U.S. EPA, 1993). This is based on a subchronic study in which rats were exposed to acrylamide in drinking water. The critical effect for the oral RfD is nerve damage. An uncertainty factor of 1,000 represents extrapolation from animal studies to humans and subchronic to chronic exposures. Data are insufficient to determine inhalation RfCs (U.S. EPA, 1993).

Reproductive and Development Effects - Acrylamide has been shown to have an adverse effect on reproduction (U.S. EPA, 1988). Decreased copulatory performance in rats and decreased fertility in mice have been observed. Data indicate that acrylamide can act directly on the reproductive system. Acrylamide has also been shown to effect both fetal and postnatal development, including neurotoxic effects and enzyme effects, in mouse and rat offspring following exposures during gestation (U.S. EPA, 1988).

References

U.S. EPA, 1988. Preliminary Assessment of Health Risks from Exposure to Acrylamide, Draft Document. Office of Toxic Substances. March.

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Acrylamide, online database, dated 7/93.

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N,N-Dimethylformamide (N,N-DMF)

N,N-DMF is a hepatotoxic solvent extensively used in laboratories and in the production of acrylic resins. Human exposure occurs mainly through inhalation of vapors and through skin contact (Klaassen et. al., 1986).

Absorption - No information available.

Distribution - No information available.

Metabolism and Excretion - There is little information available concerning metabolism and excretion of N,N-DMF. Methylhydroxy methyl-formamide has been reported as the main urinary metabolite in both animals and humans (Klaassen et. al., 1986).

Carcinogenic Effects - No information available.

Threshold Effects - The subchronic and chronic oral RfDs are 1.0 and 1.0×10^{-1} mg/kg/day, respectively (U.S. EPA, 1993). These toxicity values are based on liver effects in the rat following dietary exposure to N,N-DMF in a subchronic study. Uncertainty factors for subchronic and chronic values are 100 and 1000, respectively. The inhalation RfC for chronic exposure is 3×10^{-2} mg/m^3, (U.S. EPA, 1991). This RfC is based on an epidemiological study of occupational exposures to N,N-DMF. Study results indicated that any additional exposure to N,N-DMF via dermal contact was not a significant confounder. Liver and gastrointestinal effects are the critical effects for the RfC. An uncertainty factor of 300 accounts for the protection of sensitive human subpopulations, the use of a LOEL, lack of reproductive toxicity data, and the less than chronic duration of exposure (U.S. EPA, 1991).

Reproductive and Developmental Effects - No information available.

References

Klaassen, C.D., Amdur, M.O. and Doull, J. (eds.), 1986. Casarett and Doull's Toxicology, Third Edition. MacMillan Publishing Company.

U.S. EPA, 1991. Integrated Risk Information System (IRIS); N,N-Dimethylformamide, dated 5/7/91.

U.S. EPA, 1993. Health Effects Assessment Summary Tables (HEAST). Annual FY 1993 (March). Office of Research and Development, Office of Emergency and Remedial Response. OERR 9200.6-303 (93-1). Updated July 1993.

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Dieldrin

Dieldrin is a chlorinated cyclodiene insecticide that is structurally related to aldrin. Both were widely used during the 1950s and early 1970s. Aldrin is readily converted to dieldrin in the environment. Dieldrin is considered extremely persistent in the environment and in biological systems.

Absorption - Both aldrin and dieldrin are well absorbed through the lungs, skin, and gastrointestinal tract. Results from animal metabolic studies indicate that gastrointestinal tract and dermal absorption of dieldrin proceeds slowly (U.S. PHS, 1989).

Distribution - Several studies have been conducted with human volunteers who ingested dieldrin, and autopsy studies of dieldrin exposed individuals. The highest concentrations of dieldrin were recovered from adipose tissue followed by liver, brain, and whole blood. Laboratory animal studies support the observation that adipose tissue is the primary storage depot for dieldrin (U.S. PHS, 1989). Studies of human adipose tissue indicate that the average concentrations of dieldrin have been declining since the use of aldrin and dieldrin was discontinued in the mid-1970s (U.S. PHS, 1989).

Metabolism and Excretion - Liver microsomal enzymes readily convert aldrin to its epoxide, dieldrin. Metabolism of dieldrin is primarily limited to hydroxylation and subsequent conjugation with glucuronic acid. In humans, it has been observed that intake, storage, and metabolism and excretion of dieldrin reach equilibrium up to the limits of adipose tissue storage capacity. As the concentration of dieldrin in the liver increases, metabolism and excretion also increase. The primary route of excretion for dieldrin is through the bile in feces, with smaller amounts of both and its metabolites found in urine (U.S. PHS, 1989).

Carcinogenicity - There is no epidemiological evidence which clearly associates exposure to aldrin or dieldrin with cancers in humans. Long-term bioassays have been conducted in mice and rats using both aldrin and dieldrin. Since aldrin is rapidly converted to dieldrin by the

liver, it may be inferred that the toxic effects of aldrin are at least partially attributable to dieldrin. Aldrin produced increases in hepatocellular tumors in three studies where mice were fed levels of aldrin ranging from 3 to 10 ppm. Aldrin was not carcinogenic in long-term studies with rats. Studies in which 0, 1.0, or 10 ppm dieldrin was fed to mice for up to 132 weeks produced a dose-related increase in hepatomas in both sexes. Several additional studies with mice yielded similar results. Bioassays where rats were fed various levels of dieldrin produced negative results. However, reanalysis of the histology reports from the rat studies has suggested a significant increase in hepatocellular carcinomas (U.S. PHS, 1989). On the basis of tumorigenic activity in mice, the U.S. Environmental Protection Agency has placed dieldrin in Group B2 as a probable human carcinogen. U.S. EPA has developed an oral cancer slope factor for dieldrin of 16 per mg/kg/day and an inhalation unit risk of 4.6×10^{-3} per $\mu g/m^3$ (U.S. EPA, 1993).

Threshold Effects - The principal symptoms of acute aldrin and/or dieldrin poisoning are similar to those produced by other chlorinated cyclodiene insecticides. Acute toxicity is characterized by central nervous system effects such as irritability, salivation, tremors and convulsions, which may be followed by coma and death. Occupational exposures to aldrin and/or dieldrin have reportedly resulted in neurotoxicity both on acute and cumulative chronic exposure. Similar effects on the nervous system have been reported in laboratory animal studies. Liver toxicity, other than neoplasms, has been reported in rats, dogs, hamsters, and rhesus monkeys which were fed various amounts of aldrin and/or dieldrin. Signs of hepatotoxicity included increased liver to body weight ratios, histological changes, and microsomal enzyme induction. Dieldrin has also been demonstrated to suppress immune system responses in mice (U.S. PHS, 1989). The U.S. EPA has set a chronic oral reference dose (RfD) for dieldrin of 5×10^{-5} mg/kg bw/day based on liver lesions (U.S. EPA, 1993).

Reproductive and Developmental Effects - There is no information currently available concerning the developmental and reproductive effects of aldrin or dieldrin in humans (U.S. PHS, 1989). Results from developmental studies in animals are somewhat mixed. Aldrin or dieldrin administered by gavage during the critical period of gestation was reportedly teratogenic in hamsters and mice but the observed effects on the pups may have

been secondary to maternal toxicity. Animal studies have shown that high levels of aldrin and dieldrin can be fetotoxic (U.S. PHS, 1989). Decreased fertility, reduced litter size, and postnatal mortality have been reported in reproductive studies with mice and rats (U.S. PHS, 1989).

References

U.S. EPA, 1993. Integrated Risk Information system (IRIS); Dieldrin, online database dated 7/93.

U.S. Public Health Service (PHS), 1989. Toxicological Profile for Aldrin/Dieldrin. Prepared for the Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM

Aluminum

Absorption - Occupational studies regarding aluminum absorption in humans determined that following a 1-day exposure (8-hour work shift) to a time-weighted concentration of 2.4 mg/m^3 aluminum, aluminum levels in the urine rapidly increased (U.S. PHS, 1990). Human and animal studies indicate that absorption readily occurs following inhalation and ingestion exposure to aluminum. However, absorption via the oral route is very dependent on its chemical form.

Distribution - The normal total body burden in healthy human subjects ranges from 30 to 50 mg (U.S. PHS, 1990). Of the total body burden, about one-half is in the skeleton and approximately one-fourth is in the lungs (U.S. PHS, 1990). Evidence indicates that, with an increase in age, aluminum concentrations increase in the lungs, liver, kidneys, and brain tissue of humans.

Metabolism - Aluminum is an element; therefore, it can not be destroyed in the body. In the body, aluminum is found in four different forms: as a free ion, as a low molecular weight complex, as a reversible macromolecular complex and as an irreversible macromolecular complex (U.S. PHS, 1990).

Carcinogenicity - No information available.

Threshold Effects - Data are reported as inadequate for quantitative risk assessment (U.S. EPA, 1993). Studies indicate that in human infants, excessive aluminum accumulation and encephalopathy may occur, especially in premature infants with reduced renal function given dialysis with aluminum-contaminated intravenous fluid (U.S. PHS, 1990). Bone disease has been reported in those infants with renal failure who were treated with aluminum hydroxide. No RfDs have been generated for aluminum.

Reproductive/Developmental Effects - There is no evidence from several studies that aluminum alters human or animal reproductive capabilities.

References

U.S. EPA, 1993. Health Effects Assessment Summary Tables Annual FY 1993 (March). Office of Research and Development, Office of Emergency and Remedial Response, Washington, D.C. OERR 9200.6-303(93-1). Updated July 1993.

U.S. PHS, 1990. Draft Toxicological Profile for Aluminum. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Revised 11/93 by DM

Antimony

Compounds involving elemental antimony occur naturally in trace amounts in the earth's crust. Antimony is used commercially in lead and zinc alloys, lead storage batteries, solder, sheet and metal pipe, pewter, electronic devices, as a fire retardant in plastics and rubber, and in the treatment of certain types of parasitic infections.

Absorption - Although there is no definitive evidence that antimony is absorbed through the lungs, elevated blood and urine antimony levels have been observed in workers exposed to antimony (U.S. PHS, 1990). Laboratory animal studies suggest that gastrointestinal tract absorption of antimony salts is probably less than 10% (U.S. PHS, 1990). Concentrated mixtures of antimony salts may be absorbed dermally (U.S. PHS, 1990).

Distribution - Low levels of antimony, less than 1.0 ug/gram of tissue, have been found at autopsy of apparently unexposed humans in Japan (U.S. PHS, 1990). It appears that antimony is well distributed in most body tissues. Evidence from animal studies suggest that tissue distribution of antimony differs by animal species and by valence state of the antimony (U.S. PHS, 1990).

Metabolism And Excretion - The metabolism of antimony is confined to reversible binding interactions with sulfhydryl groups, phosphates, and other endogenous molecules such as proteins. The primary routes of excretion for antimony compounds are through the urine and feces (U.S. PHS, 1990).

Carcinogenicity - There is no evidence that antimony is associated with cancer in humans. In inhalation studies, rats exposed to 4.2 mg antimony/m^3 as antimony trioxide developed an increased incidence of lung tumors, but no increase in lung tumors was observed in pigs at the same air concentration (U.S. PHS, 1990). No change in tumor incidence was observed in rats fed 0.262 mg potassium antimony tartrate/kg bw/day or in rats fed 0.35 mg antimony as potassium antimony tartrate/kg bw/day for a lifetime (U.S. PHS, 1990).

Threshold Effects - Occupational exposures to antimony trioxide and/or pentoxide dusts have resulted in altered pulmonary function including pneumoconiosis, bronchitis, and emphysema (U.S. PHS, 1990). A variety of respiratory effects have also been observed in animals exposed to antimony dusts. Cardiovascular changes including altered electrocardiograms and increased blood pressure were observed in workers exposed to 2.15 mg antimony trisulfide/m^3 for eight months to two years (U.S. PHS, 1990). Cardiovascular changes including myocardial degeneration were observed in rats, rabbits, and dogs. In humans, acute oral exposure to antimony has led to gastrointestinal distress (U.S. EPA, 1992). Perinatal exposure of rats to 0.0748 mg antimony kg bw/day as antimony trichloride altered cardiovascular reflexes important in regulating systemic arterial blood pressure (U.S. PHS, 1990). Dogs given 6,644 mg antimony kg bw/day as antimony trioxide for 32 days developed muscle weakness and difficulty moving the hind legs (U.S. PHS, 1990). In a study where rats of both sexes were given 5 ppm antimony tartrate in water, lifespan was decreased, blood glucose levels decreased, and cholesterol levels were altered. Studies with mice yielded similar, but somewhat less severe manifestations of toxicity. Based on this evidence, and using an uncertainty factor of 1000, an oral reference dose (RfD) of 4E-4 mg antimony/kg bw/day has been established (U.S. EPA, 1992).

Reproductive and Developmental Effects - An increase in spontaneous abortions and menstrual cycle changes were reported in women working in an antimony metallurgical plant (U.S. PHS, 1990). Sixty seven percent of rats exposed to 209 mg antimony trioxide/m^3 for 63 days failed to conceive (U.S. PHS, 1990).

References

U.S. PHS, 1990. Draft Toxicological Profile for Antimony. Prepared for the Agency for Toxic Substances and Disease Registry, Atlanta, GA. October 1990.

U.S. EPA, 1992. Integrated Risk Information System (IRIS), On-Line Database. Dated 1/20/92.

Revised 11/93 by DM

Arsenic

Arsenic in the environment is largely found as inorganic arsenic in the trivalent or pentavalent oxidation states. Organic methane arsenates may be formed by metabolism of arsenic in the environment. In extreme reducing environments, arsine gas may be produced. Fish and shellfish may accumulate high levels of arsenic complexed with large organic molecules.

Absorption - Soluble inorganic arsenic compounds are extensively absorbed by humans and other animals, following ingestion. Less soluble compounds are less readily absorbed. Organic arsenic compounds have various absorption characteristics. Absorption of inhaled arsenic compounds also depends on the chemical form and on particle size (U.S. PHS, 1989). Absorption through intact skin has not been adequately characterized. Since dermal contact is associated with skin irritation there must at least be local absorption of arsenic, if not systemic absorption (U.S. PHS, 1989).

Distribution - Inorganic arsenic is distributed throughout the body by the blood, and initially accumulates in liver, kidney, lung, spleen, aorta, skin, hair, and upper gastrointestinal tract. Retention depends on the specific arsenic species (U.S. PHS, 1989). The highest levels are found in hair and nails. Lungs and skin have higher concentrations than other soft tissues. A portion of inhaled arsenic may bind irreversibly to lung tissue (U.S. PHS, 1989).

Metabolism and Excretion - In humans and most animals, trivalent inorganic arsenic is metabolized to dimethylarsinic acid (DMA) and monomethylarsonic acid (MMA). Methylation occurs largely in the liver. The methylation enzyme system may become saturated beginning at a dose between 0.5 and 1 mg/day (U.S. PHS, 1989). Arsenic is excreted largely in the urine of humans, in the proportions of about 60 percent DMA, 20 percent MMA, and 20 percent inorganic compound. The complex forms of arsenic found in fish and shellfish are rapidly excreted in the urine (U.S. PHS, 1989).

Arsenic is thought to be an essential element required in the diet. However, there has never been an identified case of arsenic deficiency in humans (U.S. PHS, 1989).

Carcinogenicity - Arsenic is classified by the U.S. EPA as a Group A, human carcinogen, based on EPA's cancer risk assessment guidelines. This category applies to agents for which sufficient evidence exists and supports causal association between exposure and cancer in humans. (U.S. EPA, 1993a). The inhalation unit risk is 4.3×10^{-3} per ug/m^3 (U.S. EPA, 1993a), based on increased lung cancer mortality in smelter workers exposed to arsenic. An inhalation slope factor of 5.0×10^{1} per (mg/kg/day) for inhalation exposure has been calculated from the unit risk, based on an assumption that 30% of inhaled arsenic is absorbed (U.S. EPA, 1993b). Lung cancer cases have also been reported elevated in various groups exposed to arsenical pesticides (U.S. EPA, 1993a).

The administrator of the EPA has recommended the adoption of a unit risk of 5×10^{-5} per ug/L for exposure to arsenic in drinking water (U.S. EPA, 1993a). However, risk managers are mandated to note that this risk estimate could be modified downwards by as much as an order of magnitude, relative to estimates for other carcinogens (U.S. EPA, 1993a). The drinking water unit risk was based on increases in the incidence of nonmelanoma skin cancer in a Taiwanese population exposed to high arsenic levels in drinking water. Only a fraction of these skin cancers are fatal. Increases in some internal organ cancers have also been reported as related to arsenic ingestion (U.S. EPA, 1988). Using standard exposure assumption (2L/70 kg/day water ingestion) this unit risk is equivalent to an oral slope factor in water of 1.75 per mg/kg/day dose; this value is used in this assessment for all ingestion exposures.

Threshold Effects - The toxic effect of arsenic ingestion with the lowest threshold is keratosis of the skin, with associated hyperpigmentation, observed in human populations consuming water containing arsenic at concentrations of 0.17 mg/L or higher (U.S. EPA, 1993a). Several other toxic effects have been noted such as anemia, leukopenia, gastrointestinal distress, hepatic and renal injury, and neuropathies (U.S. PHS, 1989). Chronic oral exposures of humans to arsenic has been shown to cause peripheral neuropathy,

skin lesions, and a peripheral circulatory disease called blackfoot, characterized by gangrene of the extremities (U.S. EPA, 1984). The EPA has selected $3x10^{-4}$ mg/kg/day as the oral reference dose for chronic effects, based on keratosis and hyperpigmentation in humans (U.S. EPA, 1993a).

Occupational exposure to airborne arsenic is associated with some risk of hyperpigmentation and keratosis, and irritation of the skin and mucous membranes (U.S. PHS, 1989). Inhalation of some arsenic compounds causes an acute toxicity, including skin lesions, cardiovascular and respiratory effects, and peripheral neuropathy (U.S. EPA, 1984). The EPA has not selected a reference dose for inhalation of arsenic.

Reproductive and Developmental Effects - The U.S. EPA has noted that arsenic is more toxic in early life stages than chronically (U.S. EPA, 1986). Some prominent developmental effects include decreased fetal weights and the occurrence of fetal malformations (U.S. EPA, 1984). Possibly in support of this, a study by Boxley, et al. indicated that a single oral dose of 40 to 45 mg/kg body weight on any day of gestation between days 8 and 15 will produce adverse effects in developing mice (U.S. EPA. 1984).

References

U.S. EPA, 1984. Health Effects Assessment for Arsenic. Office of Research and Development, Cincinnati, Ohio.

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U.S. EPA, 1988. Special report on Ingested Inorganic Arsenic. Skin Cancer; Nutritional Essentiality. U.S. EPA Risk Assessment Form, Washington D.C. EPA/625/3-87/013.

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U.S. PHS, 1989. Toxicological Profile for Arsenic. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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Barium

Absorption - The observation that systemic toxic effects have followed oral exposure to barium suggests that some absorption of this metal does occur. Barium chloride is absorbed more readily than barium sulfate, which is absorbed more readily than barium carbonate, according to one study (U.S. EPA, 1984). Absorption of barium through the lung appears to be slow.

Results of studies with experimental animals suggest that the rate and extent of absorption of barium from the respiratory tract depends on the exposure level and initially barium is deposited in the nasal region and eventually it is absorbed into the body (U.S. PHS, 1990). Barium is poorly absorbed from the gastrointestinal tract upon oral exposure.

Distribution - Barium injected into the mouse is distributed widely, but principally in the bone (U.S. EPA, 1987). In this regard, the body handles barium similarly to calcium, its close relative in the alkaline earth metal family.

Metabolism and Execution - No reports of barium metabolites were found. Levels in human bone do not change markedly with increasing age (U.S. EPA, 1987). Ingested barium is eliminated primarily in the feces (U.S. EPA, 1987).

Carcinogenicity - Barium has been designated as a Group D chemical: not classified as to carcinogenicity (U.S. EPA, 1984).

Threshold Effects - Soluble barium compounds are toxic in humans by ingestion or inhalation. Acute barium poisoning results in a prolonged stimulant action on the muscle. Fatal doses to humans for barium carbonate and barium chloride have been established at 57 mg/kg and 11.4 mg/kg, respectively (Clement Associates, 1985). The oral reference dose (RfD) for barium is 7×10^{-2} mg/kg/day for both subchronic and chronic exposures, based on no increased blood pressure in humans drinking water with 10 mg/L of barium in the form of barium chloride (U.S. EPA, 1992; 1993).

EPA based inhalation reference concentrations (RfCs) for barium on fetotoxicity in rats. Chronic and subchronic inhalation RfCs of 5×10^{-4} and 5×10^{-3} mg/m^3, respectively, were derived by a method no longer in use by EPA's RfD/RfC Work Group (U.S. EPA, 1992; 1993). These inhalation reference concentrations (RfCs) were generated from a subchronic study of rats exposed to barium carbonate, which resulted in fetotoxicity (U.S. EPA, 1992; 1993).

Reproductive/Developmental Effects - Laboratory tests on male and female rats have shown that inhalation of barium carbonate has an effect on gametogenesis and on the reproductive organs. Developmental effects were reported in one study by Tarasenko et al. in 1977 in which female rats were orally administered barium carbonate and the observed effects included increased mortality and disturbances in liver function (U.S. PHS, 1990).

References

Clement Associates, 1985. Chemical, Physical and Biological Properties of Components Present at Hazardous Waste Sites. Prepared for U.S. EPA.

U.S. EPA, 1984. Health Effects Assessment for Barium. Office of Research and Development, Cincinnati, Ohio.

U.S. EPA, 1987. Health Advisories for Legionella and Seven Inorganics. March, 1987. PB87-235586.

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U.S. EPA, 1992. Integrated Risk Information System (IRIS); Barium, dated 1/20/92.

U.S. PHS, 1990. Toxicological Profile for Barium. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Beryllium

Absorption - Based on animal studies, compounds of beryllium appear to be poorly absorbed both through the gastrointestinal (GI) tract and the skin. Absorption most readily occurs via inhalation. Factors such as dose, particle size and solubility play an important role in determining absorption rates and clearance (U.S. PHS, 1987). Acute dermal exposure to soluble beryllium compounds may cause contact dermatitis due to its ability to penetrate the skin.

Distribution - Inhaled beryllium is distributed slowly in the blood and deposited in bone, bone marrow, liver, and spleen (Hammond and Beliles, 1980). Human tissue analysis from occupationally exposed workers indicates that inhaled beryllium is generally found at highest concentration in the lungs and in the bones, with lower concentrations in the liver and kidneys. Studies with hamsters indicate that upon oral administration of beryllium, appreciable concentrations could be observed in the liver, large and small intestines, kidneys, lung, stomach and spleen (U.S. PHS, 1987).

Metabolism and Excretion - Beryllium in the lungs is slowly converted to soluble beryllium compounds (U.S. PHS, 1987). Colloidal beryllium phosphate is formed in the blood; beryllium citrate may also be formed (Hammond and Beliles, 1980). As observed in animal studies, beryllium is primarily excreted in the feces, and only trace amounts appear in the urine. This observation has been attributed to beryllium's poor absorption through the GI tract.

Carcinogenicity - Beryllium is classified in Group B2, as a probable human carcinogen, based on lung cancer resulting from inhalation in rats and monkeys and osteosarcomas resulting from intravenous or intramedullary injection in rabbits. The oral slope factor for beryllium is 4.3 mg/kg/day based on a slight, statistically insignificant increase in total cancers in rats drinking beryllium sulfate at 5 ppm (U.S. EPA, 1993a). The inhalation unit risk is 0.0024 per (ug/m^3), based on lung cancer deaths in workers in a beryllium-processing plant which may have been smoking-related (U.S. EPA, 1993a).

Threshold Effects - Various types of skin damage has been observed in industrial situations. Chronic inhalation of beryllium may lead to shortness of breath, cough, weight loss and fatigue (Hammond and Beliles, 1980). The chronic oral RfD for beryllium was generated from a NOAEL of 5 mg/L (0.54 mg/kg bw/day) in a rat drinking water bioassay. Exposure was for the lifetime of the animals. The rats were dissected after natural death and gross and microscopic changes were noted in the heart, kidney, liver and spleen. An oral RfD of 5 x 10^{-3} mg/kg/day was generated by the EPA for both subchronic and chronic exposures (U.S. EPA, 1993a,b); based on no observed effects. An oral uncertainty factor of 100 reflects compensation for potential interspecies differences and for the protection of sensitive human subpopulations. No inhalation RfD is available.

Reproductive and Developmental Effects - Data regarding reproductive toxicity resulting from exposure to beryllium could not be located. Developmental effects have been observed. Injection of beryllium salts into pregnant mice resulted in behavioral abnormalities in the offspring. Intratracheal administration of beryllium oxide and chloride to pregnant rats resulted in increased fetal mortality, decreased fetal weight and increased internal abnormalities (U.S. PHS, 1987).

References

Hammond, P.B., and R.P. Beliles, 1980. "Metals" in Casarett and Doull's Toxicology. Doull, Klaasen and Amdur, eds. MacMillan, New York.

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U.S. EPA, 1993b. Health Effects Assessment Summary Tables, Annual FY 1993. OERR 9200.6-303 (93-1). Washington, D.C.

U.S. PHS, 1987. Draft Toxicological Profile for Beryllium. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, Georgia.

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Cadmium

Absorption - Studies have shown that cadmium is poorly absorbed after oral administration. The absorption through the respiratory tract, however, appears to be much more extensive (U.S. EPA, 1984). Thirty to fifty percent is absorbed through the lung after inhalation (U.S. PHS, 1987). Cadmium is not readily absorbed through the skin (U.S. EPA, 1987). The EPA assumes that 2.5% of cadmium in food, and 5% of cadmium in water, is absorbed (U.S. EPA, 1987).

Distribution - Cadmium is distributed throughout the body but is concentrated in the kidney and the liver, following exposure (U.S. EPA, 1987).

Metabolism and Excretion - Some of the cadmium in the body complexes with a low molecular weight protein called metallothionein (U.S. EPA, 1987). Once cadmium is absorbed, it is eliminated primarily in the urine. However, this process is extremely slow; the half-life in humans has been estimated as between 10 and 33 years (U.S. EPA, 1987). Once cadmium enters the body it is strongly retained, so even small chronic exposures can result in high levels of cadmium in the body (U.S. PHS, 1987). In an EPA model it is assumed that 0.01% of the cadmium body burden is eliminated each day (U.S. EPA, 1992).

Carcinogenicity - Epidemiological studies of cadmium smelter workers suggest that inhalation of cadmium or cadmium oxide dust may cause lung cancer and other tumors. Administration of cadmium chloride aerosol and cadmium oxide to the lungs of rats each produced an increase in tumors (U.S. PHS, 1987). There is no evidence that cadmium is carcinogenic by oral or dermal routes (U.S. PHS, 1987).

The Carcinogen Assessment Group of the EPA classifies cadmium as a Group B1 carcinogen (probable human carcinogen), based on limited evidence from an epidemiologic study on cadmium smelter workers and sufficient evidence in animal studies (U.S. EPA, 1992). Exposure to cadmium as cadmium chloride in air by rats resulted in significant increases in lung tumors. Intratracheal exposure to rats resulted in mammary tumors in females and tumors in multiple sites in males. Tumors have also been reported in rats and mice following injection exposures to cadmium compounds. Studies on the carcinogenicity of

cadmium absorbed by the oral route have shown no evidence of a carcinogenic response (U.S. EPA, 1992). The inhalation unit risk developed by the EPA is 1.8×10^{-3} per ug/m^3, (U.S. EPA, 1992).

Threshold Effects - The major effects of long-term exposure to cadmium are similar for both oral and inhalation routes. Target organs in cases of occupational inhalation including the respiratory system, kidneys, and blood (U.S. PHS, 1985). Effects of cadmium include renal dysfunction, kidney stones, and hypertension (U.S. EPA, 1984). There are two reference doses (RfDs) for use when evaluating oral exposure to cadmium. The RfDs are not based on any one study, but rather on the highest level of cadmium in the human renal cortex not associated with proteinuria, combined with a toxicokinetic model (U.S. EPA, 1992). Since the absorption of cadmium from water and food varies, two RfDs have been developed: 5×10^{-4} mg/kg/day for exposure to cadmium in water and 1×10^{-3} mg/kg/day for exposure to cadmium in food (U.S. EPA, 1992). These RfDs incorporate an uncertainty factor of 10 to account for intraspecies variability in sensitivity. The more conservative water-based RfD value is used in this assessment for all ingestion and dermal exposures, since none were food-based. There is currently no reference dose for subchronic exposures or inhalation exposures.

Reproductive and Developmental Effects - Cadmium exposure has not been shown to result in developmental or reproductive effects in humans. Exposure to cadmium by gavage in pregnant rats has resulted in decreased birth weight, impaired neurologic developed in the fetus, and fused or absent legs in rat fetuses. Inhalation studies have noted decreased maternal weight gain and decreased fetal weights in rats (U.S. PHS, 1987). No reproductive effects have been reported following inhalation exposures in animals.

References

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U.S. EPA, 1987. Health Advisories for Legionella and Seven Inorganics. March, 1987. PB87-235586.

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U.S. PHS, 1985, NIOSH Pocket Guide to Chemical Hazards, Department of Health Education and Welfare, National Institute for Occupational Safety and Health Publication No. 78-210 U.S. Government Printing Office.

U.S. PHS, 1987. Draft Toxicological Profile for Cadmium. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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Chromium

The toxicity of chromium is dependent on the form present. This toxicity profile covers both Chromium III (trivalent chromium, or Cr III) and Chromium VI (hexavalent chromium, or Cr VI). Trivalent chromium is an essential nutrient.

Absorption - Chromium can enter the body by ingestion, inhalation and dermal exposures. Entry by ingestion and inhalation are expected to be the primary routes of exposure for the general population (U.S. PHS, 1989). However, only about one percent of dietary nickel is absorbed (Hammond and Beliles, 1980). A typical daily intake is 60 μg per day, 10 μg of which are from water (Hammond and Beliles, 1980).

Distribution - Distribution studies in animals have shown high levels of chromium in the kidney, lungs, and spleen (U.S. PHS, 1989).

Metabolism and Excretion - There is some evidence that some Cr VI is reduced to Cr III, an essential element in the body.

Carcinogenicity - Chromium VI is classified a Group A human carcinogen by inhalation, based on human data supported by animal data, epidemiologic studies of chromate production in four countries, and three studies of the chrome pigment industry in Norway, England, the Netherlands, and Germany. All these studies have linked exposure to lung cancer (U.S. EPA, 1993). Implant site tumors developed when chromium VI was injected into various tissues in rats (U.S. EPA, 1993). There are no studies indicating Cr VI is carcinogenic by ingestion. The inhalation unit risk (Cr VI) is 1.2×10^{-2} per $\mu g/m^3$ (U.S. EPA, 1993). There is no evidence of carcinogenicity for Cr III; whereas Chromium VI has been shown to be both carcinogenic and mutagenic, Chromium III has not (U.S. EPA, 1993).

Threshold Effects - Chromium VI is an irritant that can result in adverse effects at the point of contact resulting in ulcers of the skin, irritation of the nasal mucosa and gastrointestinal tract. It also can cause adverse effects in the kidney and liver (U.S. PHS, 1989). The reference dose (RfD) developed by the EPA for Cr VI is 5×10^{-3} mg/kg/day based on oral ingestion by rats of potassium chromate (K_2CrO_4) (U.S. EPA, 1993). The RfD for insoluble

salts of Chromium III is 1 mg/kg/day (U.S. EPA, 1992), based on oral ingestion by rats of chromic oxide (Cr_2O_3). No critical effect was observed in the studies from which either of the RfDs were derived (U.S. EPA, 1992, 1993).

Reproductive and Developmental Effects - Studies evaluating developmental effects in humans by oral, inhalation or dermal exposures are not adequate to show effects from either Cr III or Cr VI. Increased fetal death and external abnormalities have been documented following injected exposures in hamsters (U.S. PHS, 1989).

References

Hammond, P.B., and R.P. Beliles, 1980, "Metals" in Casarett and Doull's Toxicology, 2nd ed. Doull, Klaasen, and Amdur, eds. MacMillan, New York.

U.S. EPA, 1992. Integrated Risk Information System (IRIS); Chromium (III), dated 6/4/92.

U.S. EPA, 1993. Integrated Risk Information System (IRIS); Chromium (VI), dated 3/93.

U.S. PHS, 1989. Toxicological Profile for Chromium. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

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Cobalt

Absorption - When cobalt particles are inhaled, they are deposited in the respiratory tract and may later be either absorbed into the blood or mechanically transferred to the gastrointestinal tract (U.S. PHS, 1990). Absorption of cobalt from the GI tract of humans varies from 18 percent to 97 percent of the applied dose, depending on the type and dose of the cobalt compound given (U.S. PHS, 1990).

Distribution - Cobalt is an essential element and is found in most human body tissues, with the highest concentrations found in the liver. Other tissues in which cobalt has been found include muscle, lung, lymph nodes, heart, skin, bone, hair, stomach, brain, pancreatic juice, kidneys, plasma, and urinary bladder (U.S. PHS, 1990).

Increased cobalt levels were found in the lungs, lymph nodes, spleen, and liver of metal workers occupationally exposed to cobalt by inhalation. A study in which humans were orally exposed to cobalt-60 chloride showed that most of the cobalt was retained in the liver (U.S. PHS, 1990).

Metabolism and Excretion - Cobalt is a metal, and as such, it is not metabolized. It is an essential element because it is a component of vitamin B12, which is needed to produce red blood cells (U.S. PHS, 1990).

When humans were exposed to cobalt by inhalation, 17 percent of the initial lung burden was excreted after one week, with 90 percent of the excretion taking place through the feces (U.S. PHS, 1990). When humans were orally exposed to cobalt, 3 to 82 percent of the dose was eliminated through the feces. The percentage varied with the dose and type of cobalt given (U.S. PHS, 1990).

Carcinogenicity - There are no data to indicate that cobalt causes cancer in humans. Cobalt has been shown to induce tumors in rats following intramuscular, substaneous, and intrathoracic injections, but these are not relevant routes of exposure (U.S. PHS, 1990).

Threshold Effects - During the 1960's breweries added cobalt salts to beer to improve its foaming properties (U.S. PHS, 1990; Doull et al., 1980). Some beer drinkers who ingested 0.04 to 0.14 mg cobalt/kg/day in beer later died from cardiomyopathy (U.S. PHS, 1990). Elevated levels of cobalt were found in the victim's hearts (Doull et al., 1989), but other factors, such as heavy alcohol consumption, are also believed to have contributed to the cardiomyopathy (U.S. PHS, 1990). Patients who were given 1 mg cobalt/kg/day to raise their hematocrits showed no sign of cardiac injury (U.S. PHS, 1990). No inhalation or oral RfDs have been established for cobalt.

Reproductive and Developmental Effects - No information was located concerning reproductive effects in humans. Adverse effects on the tests of male rats orally exposed to cobalt have been observed (U.S. PHS, 1990).

When human mothers were given cobalt to increase their hematocrits, no developmental effects on their fetuses were observed. However, animal studies in which mothers were orally exposed to cobalt revealed effects such as stunted fetuses, a decrease in the number of litters and litter weights, and an increase in the number of dead pups per litter (U.S. PHS, 1990).

References

Doull, J., C.D. Klaassen, and M.O. Amdur (eds.), 1989. Casarett and Doull's Toxicology, Second Edition. MacMillion Publishing Company, New York.

U.S. PHS, 1990. Draft Toxicological Profile for Cobalt. Prepared for Agency for Toxic Substances and Disease Registry (ATSDR), Atlanta, GA.

Copper

Absorption - Absorption of ingested copper ranges from 15 to 97%. Quantitative data for inhalation absorption are not available.

Distribution - Absorbed copper is rapidly transported in blood serum and taken up by the liver and further transported in the blood plasma. The highest tissue concentrations are found in the liver and brain (U.S. EPA, 1980).

Metabolism - Copper is incorporated into copper proteins in mammals (U.S. EPA, 1980). Copper is an essential nutrient in trace quantities.

Carcinogenicity - Copper is classified as Group D due to a lack of human data, inadequate animal data, and equivocal mutagenicity data (U.S. EPA, 1992b).

Threshold Effects - Ingestion of copper results in a number of elimination responses such as nausea, vomiting, gastritis, and diarrhea. Systematic toxic effects can include hemolysis, liver problems, gastrointestinal bleeding, anemia, convulsions, and death (Clement, 1985). Exposures to copper dust can cause short-term illness characterized by chills, fever, aching muscles, and headache. No RfD is currently available. The Health Effects Assessment Summary Tables lists, in place of an RfD, 1.3 μg/L (U.S. EPA, 1992a), which is the action level for copper in tap water (U.S. EPA, 1992a).

Reproductive and Developmental Effects - No studies documenting reproductive and/or developmental toxicity were found.

References

Clement Associates, Inc., 1985. Chemical, Physical and Biological Properties of Compounds Present at Hazardous Waste Sites. Prepared for U.S. EPA.

U.S. EPA, 1980. Ambient Water Quality Criteria for Copper. Office of Water Regulations and Standards. EPA/440/5-80-036.

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Lead

Lead in the environment may be in organic or inorganic form. The toxicology of organic lead (e.g., tetraethyl lead) is not considered here.

Absorption - Oral absorption of lead has been estimated at 15% in adults and 50% in children, with adult absorption of lead ranging as high as 45% under fasting conditions (U.S. PHS, 1990). Inhalation absorption of the inhalable fraction of lead particles approaches 100% over time. Dermal absorption ranged from 0 to 0.3% in one study (U.S. PHS, 1990).

Distribution - Lead distribution has been described with a three-compartment model (U.S. PHS, 1990). Lead moves in and out of the blood and the soft-tissue compartments more quickly than into and out of bone. Following chronic exposures, most of the body burden of lead is in bone (U.S. PHS, 1990).

Metabolism and Excretion - Inorganic lead is not metabolized to other forms in the body (U.S. PHS, 1990). Lead may remain in the body for a long period of time. Eventual excretion is largely in the feces (U.S. PHS, 1990).

Carcinogenicity - Based on sufficient statistically significant increases in renal tumors in rats, lead is classified in Group B2 - as a probable human carcinogen (U.S. EPA, 1993). Exposure of these rats was to soluble lead salts, which is not representative of environmental exposures. Metallic lead and lead oxide have not been adequately tested according to EPA (U.S. EPA, 1993). The EPA has not established a numerical estimate of carcinogenicity, due to the many uncertainties associated with lead. Epidemiological studies which found higher numbers of certain cancers in workers were generally not statistically significant and did not control for other exposures (U.S. EPA, 1993).

Threshold Effects - Some adverse health effects, such as changes in blood enzymes and the neurobehavioral development of children, occur at extremely low blood levels (U.S. EPA, 1993). These effects occur essentially without a threshold, and the EPA's RfD work group concluded in 1985 that it was inappropriate to develop an RfD for inorganic lead (U.S.

EPA, 1993). Lead decreases the level of circulating vitamin D and at high levels can produce encephalopathy, colic, anemia, and neuropathy. Because lead accumulates in bone, from which it can be mobilized and redistributed in the body, past cumulative exposure contributes to the risk (U.S. PHS, 1990).

Reproductive and Developmental Effects - Lead produces a variety of reproductive effects in both male and female rats (U.S. PHS, 1990). Female rats exhibited irregular estrous cycles, ovarian cysts, and reduced egg production, while male rats experienced testicular atrophy, decreased sperm count, and reduced sperm mobility (U.S. PHS, 1990). Decreased birth weights and an increase in the number of stillbirths also resulted (U.S. PHS, 1990). Adverse developmental effects have been detected in humans at a maternal blood level of 10 to 15 μg/dL (U.S. PHS, 1990).

There is qualitative evidence that lead exposure has adverse effects on human reproduction. Blood lead levels of 40 to 50 μg/dL may cause adverse effects on the sperm and testes. EPA (1986) lists a LOEL of 60 μg/dL for female reproductive effects (U.S. PHS, 1990).

References

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Manganese

Absorption - Inhaled manganese is absorbed directly into the bloodstream only if the particles are small enough to reach the alveoli. Larger particles would be cleared by mucociliary action and swallowed. From a human study of inhaled manganese aerosol absorption in which roughly half of the manganese deposited in the lungs was recovered in waste within four days, EPA reported a conclusion that relatively little pulmonary absorption occurred (U.S. EPA, 1984). The rationale for this conclusion was not elaborated.

Distribution - Enterohepatic circulation of manganese has been reported (U.S. EPA, 1984). This circulation consists of release of manganese in the bile and reabsorption in the duodenum. No other information on manganese distribution was located.

Metabolism and Excretion - Manganese is an essential element in the diet (U.S. EPA, 1993a).

Carcinogenicity - There is insufficient evidence to suggest that manganese is a carcinogen; it is classified in Group D (U.S. EPA, 1993a).

Threshold Effects - Inhalation exposure to manganese can cause central nervous system (CNS) effects like emotional changes and symptoms similar to Parkinson's disease, pneumonitis, increased susceptibility to respiratory disease, and pathological changes (Clement 1985). The EPA subchronic and chronic inhalation reference concentrations (RfCs) are both 4×10^{-4} mg/m^3, based on respiratory symptoms and psychomotor disturbances in humans (U.S. EPA, 1993a,b). There are two reference doses (RFDs) for use when evaluating oral exposure to manganese, based on varying absorption of manganese from water and food. The subchronic and chronic oral RfD for exposure to manganese in water is 5×10^{-3} mg/kg/day and the subchronic and chronic oral RfD for exposure to manganese in food is 1.4×10^{-1} mg/kg/day (U.S. EPA, 1993a,b). An uncertainty factor of 1 was used to derive these RfDs (U.S. EPA, 1993a). The central nervous system is listed as the target organ (U.S. EPA, 1993a). The more conservative water-based RfD value is used in this assessment for all ingestion and dermal exposures, since none were food-based.

Reproductive and Developmental Effects - Exposure to manganese has been connected to impotency, increased stillbirths, and an increase in the number of spontaneous abortions in humans (U.S. EPA, 1984).

Mice exposed to manganese exhibited retarded sexual development while rats showed a decrease in testosterone without interference to reproductive success (U.S. EPA, 1984).

References

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U.S. EPA, 1984. Health Effects Assessment for Manganese (and Compounds). Office of Research and Development, Cincinnati, Ohio.

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Mercury

The main sources of human mercury exposure are methylmercury compounds in the food supply and mercury vapor in the atmosphere of occupational settings.

Absorption - Metallic mercury appears to be poorly absorbed from the gastrointestinal (GI) tract as demonstrated by a study in which animals that ingested gram quantities of mercury only absorbed 0.01 percent of the element. Methylmercury (an alkyl form of mercury), however, was essentially completely absorbed in volunteers who consumed tuna contaminated with the compound (U.S. EPA, 1984).

It is estimated the inorganic mercury compounds are absorbed to an intermediate extent, between 7 and 15% (U.S. EPA, 1987). Nearly half of an administered dose of mercuric oxide was absorbed by dogs within 24 hours. However, results from other studies indicate that inorganic mercury is minimally absorbed from the gastrointestinal tract (U.S. PHS, 1988). A comparative rate of absorption of inorganic mercury through the skin is unavailable, although animal studies report uptake after dermal exposure (U.S. PHS, 1988).

Studies show that humans absorb roughly 80% of inhaled metallic mercury vapor (U.S. EPA, 1984), suggesting it is readily absorbed through the respiratory tract.

Distribution - Mercury is distributed into several organs and tissues following administration. Data from animal studies involving inhalation exposures indicate that elemental mercury, which is highly diffusible and lipophilic once absorbed, can be found in all body tissues. Accumulation of inorganic mercury is reported to occur in the kidneys, intestinal mucosa, epithelial layers of the skin, salivary and sweat glands, pancreas, testes, prostate, brain, and, to some extent, the lung and pleural cavities (U.S. PHS, 1988). Mercury remains extensively only in the kidneys after clearance from the rest of the body (U.S. EPA, 1987).

Metabolism and Excretion - The rate of excretion is dependent on the form of mercury administered. It has been reported that monovalent mercury is rapidly oxidized in red blood cells and the lungs to its divalent form and subsequently reduced to elemental mercury (U.S.

PHS, 1988). Results from studies with rats suggest that inorganic mercury is also oxidized by the liver. In humans, mercury is excreted largely in the feces, with smaller amounts in the urine; however, exhalation and excretion in saliva and sweat may also occur (U.S. PHS, 1988).

Carcinogenicity - Due to a lack of human data and inadequate animal data, mercury has been classified in Group D (U.S. EPA, 1992).

After oral ingestion of inorganic mercury and mercuric salts, microscopic evaluation of the kidneys in exposed rats was performed and showed various degrees of damage to the proximal convoluted tubules and the glomeruli. Other portions of the tubules were affected in later stages of damage (U.S. EPA, 1984).

The acute and chronic effects of methylmercury (an alkyl mercury) have been observed in the central nervous system in poisoning incidents, including the well-documented case of seafood contamination in residents of the area around Minimata Bay, Japan. Effects such as visual and hearing impairment, ataxia and loss of sensation in the extremities and around the mouth have been recorded in humans and seem related to cortical neuron destruction (U.S. EPA, 1984).

Threshold Effects - A chronic and subchronic oral RfD was determined to be 3×10^{-4} mg/kg/day (U.S. EPA, 1993). This value was determined from several oral and parenteral studies in the rat. The effect observed in the studies was kidney damage (U.S. EPA, 1993). An oral RfD uncertainty factor of 1000 was used (U.S. EPA, 1993). The RfD is under review, and is not available on IRIS (1992).

A chronic and subchronic inhalation RfC for elemental mercury was determined to be 3×10^{-4} mg/m^3 (U.S. EPA, 1993). This value was determined from several human occupational studies. The effect observed in the studies was neurotoxicity (1993). An uncertainty factor of 30 was used for the inhalation RfC (U.S. EPA, 1993). The RfC, too, is under review, and unavailable on IRIS (1992).

Reproductive and Developmental Effects - Data regarding teratogenicity could not be located for inorganic mercury. Several investigators have reported embryotoxic and teratogenic effects in animals treated with methylmercury (U.S. EPA, 1984). Neurological defects were the most common effect noted but an increased frequency of cleft palate in mice was also documented at doses of 0.1 mg/kg/day of methylmercury.

References

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Nickel

Absorption - Nickel is absorbed through the skin, lungs, and gastrointestinal tract. According to one report, one to ten percent of dietary nickel is absorbed (U.S. PHS, 1987). Another investigation reported that 27 percent (± 17%) of nickel injected via drinking water is absorbed, whereas only 0.7 % (± 0.4%) of nickel injected via food is absorbed (U.S. EPA, 1992). Animal studies have shown that the rate of absorption of nickel in the lungs is inversely related to particle size; (U.S. PHS, 1987).

Distribution - Absorbed nickel is transported in the blood bound to serum albumin, L-histidine, and a 2-macroglobulin, and may be transferred across membranes to target organs bound to L-histidine (U.S. PHS, 1987). Data from animal studies indicate that the location of nickel accumulation in the body depends on the exposure route. Inhalation exposures result in accumulation of nickel in the lung, elevated concentrations of nickel in the kidneys, lungs, heart, central nervous system, and testes have been reported following oral exposure (U.S. PHS, 1987). Accumulation of nickel in the hair also occurs (U.S. PHS, 1987). Nickel is a normal component of human body fluids at concentrations reported variously as 1.6 μg/l in blood serum (U.S. PHS, 1987), 2.6 μg/l in blood serum (in Hartford, Connecticut; Stokinger, 1981), and 2.3 μg/100 ml in urine (Hammond and Beliles, 1980).

Metabolism - Some nickel is bound to serum proteins, as presented above. Nickel may be excreted in the urine, lost in hair, or released in sweat (U.S. PHS, 1987). Nickel that is not absorbed from the gastrointestinal tract is excreted in the feces (U.S. PHS, 1987).

Carcinogenicity - Based on evidence of cancer in humans, nickel refining dust and nickel subsulfide are classified in Group A, as human carcinogens by inhalation (U.S. EPA, 1993). There are increased risks of lung and nasal cancer in humans exposed to nickel refinery dust (much of which is believed to have been nickel subsulfide) (U.S. PHS, 1987). Increased tumor incidences in animals exposed to nickel, including nickel subsulfide, and positive results in certain genotoxicity assays of soluble nickel salts support this classification (U.S. PHS, 1987). Studies of other nickel compounds by inhalation, and of oral exposure to

nickel, have not demonstrated carcinogenicity. Exposure to nickel, other than inhalation of nickel subsulfide and refinery dust, has not been classified for carcinogenicity.

Threshold Effects - Inhalation of nickel by humans is associated with direct adverse effects in lungs and nasal cavities, asthma, and decreased immune response (U.S. PHS, 1987); animal studies show similar effects. Contact dermatitis occurs in sensitized individuals throughout the population. Oral exposures, especially to soluble salts, are toxic to the immune system in high doses. Hematological effects have also been reported. EPA has determined a subchronic and chronic oral RfD of 2×10^{-2} mg/kg/day for soluble salts of nickel, based on a chronic oral rat study (U.S. EPA, 1992, 1993). Fifty mg/kg/day of nickel as nickel sulfate hexahydrate, which is soluble in water, was administered in diets fed to rats in a 2-year study. High mortality within the study, including among control rats, makes interpretation of the study, problematic (U.S. EPA, 1992). Decreased body and organ weights is listed as the critical effect (U.S. EPA, 1992). The applicability of this RfD to insoluble salts of nickel is not discussed by EPA on IRIS.

Reproductive and Developmental Effects - Reported reproductive effects are based on rat studies using soluble nickel salts. Findings included testicular degeneration, resulting in a decrease in male fertility, and pregnancy complications in females (U.S. PHS, 1987). Reported developmental effects are supported by data from mouse and rat studies, also using soluble nickel salts. Findings included low birth weight, embryonic malformations, and stillbirth (U.S. PHS, 1987). EPA's IRIS database reports no clear indication of reproductive or developmental effects at concentration below that which were maternally or potentially toxic.

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Selenium

Selenium is an element which is widely distributed in rocks and soils in the form of selenate and selenite compounds. Plants readily take up selenates from soil and water, converting them to organic selenium compounds.

Absorption - Evidence from an occupational cohort in a selenium rectifier plant and experimental studies with dogs and rats indicate that selenium is absorbed from the lungs, but the rate of absorption may be dependent on the chemical form of the aerosol. Both inorganic and organic selenium compounds are efficiently (greater than 80%) absorbed from the gastrointestinal tracts of humans and animals (U.S. PHS, 1991).

Distribution - Tissue distribution of selenium is highly variable between compounds and route of exposure. Dogs that inhaled selenious acid or elemental selenium aerosols had the highest concentrations of selenium in liver, kidney, spleen, and lungs. Selenite administered in the drinking water of dogs and rats was widely distributed to body tissues, with the highest concentrations in liver and kidney. Orally administered sodium selenite and selenomethionine concentrated in the pancreas of chicks. On parenteral administration in humans, selenomethionine concentrates in pancreas, while sodium selenite or selenate concentrates in liver and kidneys (U.S. PHS, 1991).

Metabolism and Excretion - Selenium metabolism involves both pathways for incorporation into endogenous molecules and pathways of elimination. Selenium is an integral part of the enzyme, glutathione peroxidase, which is involved in the metabolism of peroxides. Several other selenium requiring proteins have also been identified. Selenium also interacts with a number of essential and non-essential metals, vitamins, xenobiotics, and sulfur containing amino acids. Selenium reduces the toxicity of mercury, cadmium, lead, silver, and copper (U.S. PHS, 1991).

Metabolic studies in rodents indicate that selenate may first be reduced to selenite which then goes through a series of enzymatic and non-enzymatic reactions to produce dimethylselenide. At toxic levels of selenium exposure, dimethylselenide is exhaled where it imparts a garlic

odor to the breath. Under most conditions, selenium is excreted in urine with smaller amounts in feces and breath (U.S. PHS, 1991).

Carcinogenicity - Most epidemiological studies have suggested that a selenium deficient diet may be associated with an increased risk of some types of cancers. The protective effect of selenium supplementation has been supported by the results of some animal studies. However, there are some contrary findings. Oral administration of selenium sulfide was shown to be carcinogenic in rats and female mice (U.S. PHS, 1991). The U.S. Environmental Protection Agency has placed selenium in Group D-not classifiable with respect to carcinogenicity in humans (U.S. EPA, 1992). However, selenium sulfide is listed in IRIS as a B2 carcinogen based on liver and lung tumors in rats and mice.

Threshold Effects - Excess oral and inhalation exposure to selenium compounds may produce toxic effects in multiple organ systems in both humans and animals. It has been suggested that excessive selenium may replace sulfur atoms in endogenous proteins, interfering with normal function. Following acute inhalation or ingestion of selenium compounds, the primary target organ is the lung, with effects also expressed in the cardiovascular system, liver, and kidneys. Chronic ingestion of selenium compounds produces characteristic dermal and neurological signs of toxicity (U.S. PHS, 1991).

Epidemiological studies of endemic selenosis in the People's Republic of China, and studies of livestock grazing on high selenium pasture indicate that the effects of excess selenium are similar in humans and animals (U.S. EPA, 1992). Symptoms include loss of hair or fur, malformation of nails or hooves, anorexia, numbness, paralysis, and "blind staggers" in livestock (U.S. PHS, 1991). Symptoms in humans were associated with intakes exceeding 750 ug selenium/day (U.S. EPA, 1992). The U.S. EPA recommends a chronic oral reference dose (RfD) of 5E-3 mg selenium/kg body weight/day (U.S. EPA, 1992).

Reproductive and Developmental Effects - The majority of developmental studies have not produced evidence that selenium compounds are fetotoxic or teratogenic. However, malformations were reported in chicks hatched in an area of high endemic selenium (U.S. EPA, 1992). In experiments with newborn rats subcutaneous doses of sodium selenate, D,L-selenomethionine, and D,L-selenocystine produced cataracts in a dose-related manner.

Intraperitoneal injections of selenium dioxide at doses up to 0.035 mg selenium for 90 days produced dose dependent histological changes in the testes of rats (U.S. PHS, 1991). Developmental and multigenerational studies with rodents reported variable findings, from no effects to a decrease in fertility and viability of offspring (U.S. EPA, 1992).

References

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Thallium

Thallium usually occurs in combination with other elements in inorganic compounds in both the monovalent and trivalent states. The monovalent state is the more stable including compounds such as thallium sulfate, thallium oxide, thallium nitrate, thallium acetate, and thallium carbonate.

Absorption - Both animal studies and limited data on humans show direct gastrointestinal tract absorption following oral exposure to thallium (U.S. PHS, 1990). No studies were located regarding absorption in humans or animals after inhalation or dermal exposure to thallium.

Distribution - Limited human data indicate that thallium is distributed throughout the body after oral exposure (U.S. PHS, 1990). Tissue levels in a cancer patient, administered thallium orally, were highest in scalp hair, renal papilla, renal cortex, heart, bone tumor, and spleen. The brain contained relatively lower levels of thallium (U.S. PHS, 1990).

Animal studies in rats, administered thallium in drinking water, indicate a rapid distribution of thallium throughout the body with the highest levels defected in the kidney (U.S. PHS, 1990).

Metabolism and Excretion - Thallium is excreted slowly from the body primarily in the urine and to a lesser extent in the feces following both inhalation and oral exposure in humans and animals (U.S. PHS, 1990). No studies were available regarding thallium metabolism in humans or animals.

Carcinogenic Effects - No studies have been located regarding carcinogenic effects of thallium exposure. Thallium sulfate is classified as a Group D, not classifiable as to human carcinogenicity (U.S. EPA, 1992).

Threshold Effects - Thallium may cause gastrointestinal irritation, paralysis, psychic disturbances and cardiovascular effects in humans, and hair loss, cataracts, paralysis, and liver damage in rats (Hammond and Belites, 1980). The subchronic and chronic oral RfDs

for thallium (I) sulfate are 8×10^{-4} and 8×10^{-5} mg/kg/day, respectively, based on a subchronic oral study in rats (U.S. EPA, 1992, 1993). Critical effects for the study were increased SGOT and serum LDH levels and hair loss (U.S. EPA, 1993). The chronic RfD is based on an uncertainty factor of 3,000. Correcting for the weight of the sulfate anion, the RfD for thallium alone can be calculated as 7×10^{-5}. Data are insufficient to determine inhalation RfCs.

Reproductive and Developmental Effects - Abnormalities in testicular morphology, function, or biochemistry were evident in rats following oral administration of thallium for 60 days (U.S. PHS, 1990). Thallium can cross the human placenta, however, no reliable data is available regarding developmental effects. Limited animal data showed an impairment of learning after prenatal exposure at doses of 0.08 mg thallium/kg/day in rats (U.S. PHS, 1990).

References

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Vanadium

Absorption - Once inhaled, vanadium absorption occurs in humans as observed primarily in the occupational setting. Intratracheal administration of vanadium in rats support the evidence that vanadium absorption in humans may occur following acute exposure (U.S. PHS, 1990). The absorption of vanadium through the gastrointestinal tract or the skin is very low.

Distribution - Data regarding distribution of vanadium in humans immediately following exposure is inconclusive. At autopsy, vanadium has been detected primarily in the lungs and intestines of humans (U.S. PHS, 1990). Rapid distribution occurs in rats, upon acute intratrachael administration. Retention of vanadium primarily occurs in the bones (U.S. PHS, 1990).

Metabolism - Because vanadium is an element, it cannot be eliminated by metabolism alone. In the body, vanadium interconversion occurs to two oxidation states: vanadyl (the tetravalent form) and vanadate (the pentavalent form); The pentavalent form is more toxic than the tetravalent form. Vanadium in the plasma may exist in a bound or unbound form.

Carcinogenicity - No data are available to classify vanadium.

Threshold Effects - Based on a chronic oral lifetime drinking water study done in rats, a subchronic and chronic oral RfD for vanadium of 7×10^{-3} mg/kg/day was derived (U.S. EPA, 1993). Rats were administered 5 ppm of vanadium in drinking water over a lifetime. An uncertainty factor of 100 was used (U.S. EPA, 1993). A reference dose of 9×10^{-3} mg/kg/day was derived for vanadium pentoxide, based on a decrease in the amount of the amino acid, cystine, in rat hair (U.S. EPA, 1992).

Reproductive and Developmental Effects - No studies were located which describe reproductive effects in humans or animals (U.S. PHS, 1990).

Developmental effects information is limited. One study showed no embryolethality, teratogenicity or significant skeleton or visceral abnormalities in pups exposed during

gestation (U.S. PHS, 1990). There was an increase in facial and dorsal hemorrhage but the significance of this observation is unknown.

References

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Zinc

Absorption - Approximately 20 percent to 30 percent of ingested zinc is absorbed in the gastrointestinal tract. Inhalation absorption is assumed since toxicity results from inhalation exposure to zinc oxide fume, but such absorption is not quantified (U.S. PHS, 1988).

Distribution - Zinc concentrations are highest in the prostate, and to a lesser extent in the muscle. It is also found in a number of other organs, such as the kidneys, liver, and heart, but at less concentrated levels (U.S. PHS, 1988).

Metabolism and Extraction - Studies indicate that zinc levels in humans are hemostatically controlled, meaning that adsorption and excretion of zinc vary depending on bodily needs (U.S. PHS, 1988).

Carcinogenicity - There is no evidence that zinc is a carcinogen and it is, therefore, classified in Group D (U.S. EPA, 1992).

Threshold Effects - Zinc is a necessary metal for the human body. The subchronic and chronic oral RfD is 0.3 mg/kg/day, based on decreased blood enzyme from therapeutic dosages to humans (U.S. EPA, 1992, 1993). An uncertainty factor of 3 was used. The EPA has concluded that adverse health effects are not expected from zinc in drinking water, so it is not presently regulated.

Reproductive and Developmental Effects - Anemia induced by zinc can prevent reproduction. Elevated levels in the diet can reduce fetal body weights, decrease fetal concentrations or iron and copper, increase fetal resorption, and reduce growth in offspring (U.S. PHS, 1988).

References

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Ammonia

Ammonia, NH_3, is a gas. It is readily soluble in water. Household ammonia is a 10% aqueous solution. A 28% aqueous solution of ammonia is called ammonium hydroxide (Wands, 1981).

Absorption - Ammonia gas is absorbed by moist body surfaces. Information on the absorption of ammonium ion from the gut was not located. Unlike most other alkaline hazards, ammonia readily penetrates the cornea of the eye (Potts and Gonasum, 1980).

Distribution - Ammonia can be distributed throughout the body by the blood; however, normal regulation of ammonia levels prevents systemic distribution of excess ammonia.

Metabolism and Excretion - Ammonia is a normal endogenous product of protein catabolism and is also consumed by amino acid production. Excess ammonia is converted to urea in the liver. As part of the blood electrolyte system, ammonia is regulated at 0.08 mg per deciliter (Wands, 1981).

Carcinogenicity - No data were found indicative of carcinogenicity.

Threshold Effects - Ammonia is a lung irritant. It causes constriction of the bronchial muscles (Menzel and McClellan, 1980). Depending on duration of contact and pH level, ammonia may cause alkali burn of the eye, and irritation of the iris (Potts and Gonasum, 1980). Injury to the eye may be delayed. Systemic effects are not normally experienced. However, if liver function is greatly impaired, both protein metabolism and external sources of ammonia are highly toxic (Wands, 1981). The EPA selected an inhalation reference concentration of 0.1 mg/m^3 based on a study in which no effects were observed in humans at 6.4 mg/m^3 (U.S. EPA, 1992). Although no effects were noted in the study, the critical effect is identified as "lack of evidence of decreased pulmonary function or changes in subjective symptomatology" (U.S. EPA, 1992). The oral reference dose for drinking water, identified only in HEAST, is 34 mg/L, based on the taste threshold; no relationship to health effects was identified (U.S. EPA, 1993).

Reproductive and Development Effects - No information was located.

References

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Sulfide

Sulfides include inorganic sulfide salts, alkyl sulfides, and hydrogen sulfide gas. Sulfides with alkyl chains of one to five carbons occur in earth gas or crude oil. The lower molecular weight compounds occur in decaying matter caused by bacterial action on tissue components (Sandmeyer, 1981). Sewer gas refers to the presence of hydrogen sulfide wherever organic matter undergoes putrification. Hydrogen sulfide is also a pollutant in the atmosphere in the proximity of some industrial paper plants, depending on their process. The leather industry uses sodium sulfide to remove hair from hides prior to the tanning process (Klaassen et. al., 1986).

Absorption - The uptake of gases such as hydrogen sulfide occurs throughout the respiratory system, diffusion being the dominant driving force. For this reason, the solubility of a gas is generally the major characteristic determining the relative toxicity of a gas (Klaassen et. al., 1986).

Distribution - No information was available.

Metabolism and Excretion - At low levels, the alkyl sulfides are metabolized by the mammalian system and excreted as sulfone or sulfate (Sandmeyer, 1981). The evolution of S-methyl transferases in the liver is believed to have occurred in order to metabolize hydrogen sulfide produced by anaerobic bacteria in the intestinal tract. Hydrogen sulfide is methylated to methane thiol, which is further methylated to dimethylsulfide (Klaassen, et. al., 1986).

Carcinogenic Effects - No information was available.

Threshold Effects - There are no toxicity values available for sulfide salts. Symptoms of hydrogen sulfide gas exposure in humans and in animals, following administration of soluble sulfide salts, appear to be similar to those produced by cyanide poisoning. The results are inhibition of electron transfer processes and an inability of cells to utilize oxygen. Death is

due to respiratory arrest. In addition, conjunctivitis and pulmonary edema are potential adverse effects following chronic exposure to low concentrations of hydrogen sulfide, as a result of the irritancy of this compound (Klaassen, et. al., 1986).

Reproductive and Development Effects - No information was available.

References

Klaassen, C.D., Amdur, M.O. and Doull, J. (eds.) 1986. Casarett and Doull's Toxicology, Third Edition, MacMillan Publishing Company.

Sandmeyer, E.E., 1981. Organic Sulfur Compounds. (Chapter 30 in Patty's Industrial Hygiene and Toxicology, 3rd ed., Clayton and Clayton, eds.). New York, Wiley.

Revised 11/93 by DM

E-4 EVALUATION OF RISK FROM FISH INGESTION

APPENDIX E-4

EVALUATION OF RISK FROM FISH INGESTION

The Saugatucket River is a Class B surface water, suitable for swimming and fishing. As described in Section 6.4.2.5, ingestion and dermal adsorption of chemicals in the Saugatucket River are not expected to create any health risks. The calculations presented in tables cited in Section 6.4.2.5 do not include ingestion of fish. This appendix demonstrates by a screening evaluation for risk from fish ingestion, that adverse effects from ingestion of fish from the Saugatucket river are not anticipated. Ingestion of fish from Mitchell Brook is not expected due to the small size of the brook.

Contaminant concentration in fish can be modeled based on ambient contaminant concentration and either bioconcentration factors (BCFs) or bioaccumulation factors (BAFs). BCFs account for the tendency of a chemical contaminant in water to accumulate in fish tissue (USEPA 1986).

BAFs may be designed to account for contaminant uptake through the fish's diet, but may not account for the fish's metabolism. Only BCFs are discussed in the primary EPA risk assessment guidance document (USEPA 1989), so BCFs are used here to evaluate potential human exposures through fish ingestion. Similarly, only BCFs for water are available, so bioaccumulation from sediments is not considered quantitatively here. This omission may not be important since the sediment samples do not appear to be out of line with the surface water data.

BCFs are available from EPA (USEPA 1986) for several chemicals detected in the Saugatucket River or for closely related compounds. These calculations are conservative because they assume fish are constantly exposed to the contaminants; when theoretically the fish migrate; no edible fish were observed on site. Table E-10 shows estimated concentrations in fish of toluene, xylenes, DDD, dimethylphthalate, antimony, arsenic, copper, and zinc, based on BCFs and on maximum chemical concentrations detected in Saugatucket River water near the Rose Hill Regional Landfill site. Table E-10 also shows estimated exposures to these chemicals based on assumption of an average of 54 grams of locally caught fish ingested per day (USEPA 1991), 350 days per year (USEPA 1991) for 30 years (USEPA 1991). Using oral reference doses and slope factors, a hazard index and a cancer risk are calculated, following the method described in Section 6.4.1.

According to the simple calculations, arsenic levels would appear to create an excessive cancer risk. However, as described in Appendix E-3, high concentrations of arsenic in fish are a present complexed with large organic molecules, and these forms of arsenic are rapidly excreted in the urine. Therefore, excess health risks from ingestion of Saugatucket River fish are not anticipated, based on environmental sampling at the site.

References

U.S. EPA, 1986, Superfund Public Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, D.C., EPA/540/1-86/060.

U.S. EPA, 1989, Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Office of Emergency and Remedial Response, Washington, D.C., EPA/540/1-58/001.

U.S. EPA, 1991. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Assumption" Interim Final. Office of Emergency and Remedial Response, Washington, D.C., OSWER Directive 9285.6-03.

E-5 SOIL VAPOR EMISSIONS CALCULATIONS

APPENDIX E-5

SOIL VAPOR EMISSIONS CALCULATIONS

The purpose of this appendix is to present gas emission rates for the Rose Hill Regional Landfill sewage sludge area generated gases and to document the approach used to calculate the rate of soil vapor emissions. The calculation of emission rates for the compounds found in the sewage sludge area takes into consideration both molecular diffusion and convection. Emission rates due to molecular diffusion are presented in Table E-13; emission rates due to convection are presented in Table E-14. Molecular diffusion rates are calculated using Fick's 1st Law; convection rates are calculated using Darcy's Law. Both laws are defined below and the source(s) of the variables are provided.

Refined gas generation rates using the Scholl Canyon Model have been calculated for the solid waste area and bulky waste area as a preliminary Feasibility Study task. These refined gas generation rates for the solid waste area and bulky waste area are used in this baseline risk assessment. Calculations for these gas generation rates are presented in Tables E-11 and E-12.

Molecular Diffusion

The flux of gas to the atmosphere caused by molecular diffusion can be predicted by Fick's 1st Law:

$$F = \frac{-D \times n_{gas}}{phi} \times \frac{dC}{dz}$$

where:

F = flux of gas through cover material

D = diffusion coefficient of gas components in air at specified temperature and pressure

n_{gas} = gas porosity of the cover material

phi = tortuosity of cover material

$\frac{dC}{dz}$ = concentration gradient of gas component below cap and at surface of landfill

The emission rate is then calculated by multiplying the flux by the surface area of each disposal area.

The source of each of the variables used in calculating the flux is described in detail below.

Diffusion Coefficients

The diffusion coefficient for many hazardous compounds are cited in Table 2-3 of the Superfund Exposure Assessment Manual (U.S. EPA, 1988). Most components found in the landfill gases at the Rose Hill disposal areas were included in the table. For those that were not included on the table, coefficients were calculated using the method suggested in the manual. The method suggests calculating the molecular weight and atomic diffusion volume of the compound not listed on the table using relevant atomic diffusion volumes cited in the document. The diffusion coefficient is calculated by selecting a compound on the table with a similar molecular weight and atomic diffusion volume and multiplying the diffusion coefficient of the compound on the table by the square root of the ratio of the molecular weights (known compound/unknown compound). All diffusion coefficients were then adjusted for temperature assuming field conditions as measured during the collection of gas samples in the impinger system. Since no pressure measurements were obtained in the field and the calculation of the molecular diffusion flux assumes that there is no pressure differential across the soil cover, it was assumed that the diffusion coefficients (expressed in the table at atmospheric pressures) did not require adjustment. Pages 14 through 19 of the Superfund Exposure Assessment Manual (U.S. EPA, 1988) includes the list of diffusion coefficients and the method for determining a coefficient if it is not included in EPA's Table 2-3.

Porosity (n_{gas})

The gas porosity of the cover material is typically calculated from bulk density and particle density, or bulk density and saturation moisture measurements for a soil. These data were not collected on the cover material from the Rose Hill disposal areas. The data that were collected on the cover material included hydraulic permeability, grain size and moisture content. Several empirical formulas have been developed to determine porosity based on permeability. Using the Bretjinski formula (de Marsily, 1986) for sandy soils and hydraulic conductivities obtained on five cover material samples, porosities were calculated; values ranged between 5.6 and 8.2, which is very low for sandy loam. More typical porosities are as follows (Dunn et al, 1980):

	well sorted sand or gravel	25-50%
>	sand & gravel mixed soil	20-35%
	glacial till	10-20%
	silt	35-50%
	clay	33-60%

Other references include Peck et al, 1974:

mixed-grained sand, loose	0.40
mixed-grained sand, dense	0.30

In the exposure assessment manual, it states that the typical maximum range for hydraulic porosities is 24-62% with 55% typical for dry, non-compacted soils. For compacted soils, it states that the typical porosities is 35%. Based on this information and soil classification based

on grain size data, a 40% porosity was selected for the sandy soil cover on the Rose Hill disposal areas.

Tortuosity

Tortuosity is a parameter which is the average length of flow path along the direction of flow. It accounts for the degree of interconnection between the voids. It is most typically measured for a hydraulic fluid. For gases, the tortuosity factor most typically ranges between 1.2 and 1.7. For dry soil, the tortuosity factor can be estimated as the cube root of the gas porosity. Millington (1977) has calculated tortuosity factors for wet soils, however, this reference could not be obtained in time to develop the emission rates. As a result, the tortuosity factor used in the equation was taken to be the cube root of the porosity, or 0.74 (for porosity of 0.40).

Concentration Gradient

The concentration gradient represents the difference in concentration of each gas component between the landfill surface and a location at depth, typically the location directly beneath the landfill cover material. Multiple soil gas points were monitored during the field investigation at a depth of approximately 5 feet below the ground surface. No determination of the depth of the cover material was made at those points, however, based on several observations it was judged that the depth of cover material ranged between 0 and 3 feet. In the calculation of the concentration gradient, it was assumed that the distance over which the gas was diffusing was equal to the sampling depth and the concentration at that depth was the concentration noted during the field observation. It was also assumed that the concentration of each component in the gas was zero at the landfill surface. The error in these assumptions is that the landfill cover (on which the porosity and tortuosity values are based) is not actually 5 feet. However, it is not unreasonable to assume that there is little difference in concentration of each of the components two feet deep into the waste and at a location just below the cover material.

Landfill Area

The landfill area used to calculate a total flux of each gas component coming off the landfill was estimated by digitizing the areas marked on the base map used in the RI. Each disposal area was digitized three times and the area was taken to be the average of those three measurements.

Convection

The flux of gas to the atmosphere caused by convection can be predicted by Darcy's Law:

$$v = \frac{-k \, dP}{n_{gas} \, dx}$$

where:

v = velocity of gas

k = gas conductivity of the soil cover

$\frac{dP}{dx}$ = pressure difference between the atmosphere and a location, x, beneath the cover

n_{gas} = gas porosity of the cover material

The emission rate is then calculated by multiplying the velocity of the gas escaping the disposal area at the surface by the surface area of the disposal area and the concentration of the individual component (to obtain convective flux of individual gas components).

The source of each of the variables used in calculating the velocity is described in detail below.

Gas Conductivity (k)

The gas conductivity of the cover material is related to the hydraulic conductivity of the cover material by a factor equal to the ratio of the density of water/viscosity of water to the density of landfill gas/viscosity of landfill gas. This calculation assumes that the landfill gas is incompressible. The value for hydraulic conductivity used in this equation is based on an average of three of five values obtained on cover material samples; the average value is 0.26 ft/d. Values for landfill gas density and viscosity were obtained from Farquhar, 1977. The values assume that the gas is composed of 50% methane and 50% carbon dioxide. At 1 atm and 0°C, the density of landfill gas is 13.2 N/m^3, and the viscosity is 1.21×10^{-5} Pa s. The factor was calculated assuming the density and viscosity of water at similar temperatures and pressures. Since the hydraulic conductivity test is conducted at ambient temperatures, the density and viscosity constants for both landfill gas and water should be adjusted to this temperature. This was done as part of a calculation check. Results showed a 30% increase in the factor which was considered to be negligible in relation to the result of the calculation.

Pressure Gradient

The pressure gradient represents the difference in pressure between the atmosphere and the landfill at a specific location, typically directly beneath the cap. Since no pressure measurements were obtained in the field during the Rose Hill RI, an approximation had to be made for this calculation. Multiple references cite that the pressure build-up between the constraining cover layer and the atmosphere ranges between 250 Pa and 3 kPa (Bogner, 1989; Farquhar, 1977; and U.S. EPA, 1989). While the cover at the Rose Hill Regional Landfill is not considered to be low permeability and 3 kPa is most reflective of a low permeability cover, a value of 3 kPa was used in the calculation of the velocity. This value was used to make the emission estimate most conservative. Since the pressure gradient needs to be expressed in terms of unit length in the Darcy equation, the pressure gradient is then divided by the density and added to the vertical

distance between the surface of the landfill cover and the depth of measurement. The depth of measurement in the equation was assumed to be 5 feet.

It should be noted that the Air/Superfund National Technical Guidance Study Series: Volume II - Estimation of Baseline Air Emissions at Superfund Sites (U.S. EPA, 1989) suggests that for closed landfills with internal gas generation the (Thibodeaux) Convective Add-On Model be used to calculate total emissions due to both molecular diffusion and convective mechanisms. This model combines both Fick's 1st Law and Darcy's Law into one equation and makes several simplifying assumptions. For comparison, this equation was used to calculate the emissions coming off the solid waste landfill for cis-1,2-dichloroethene, a compound found to have a high emission rate with respect to other landfill gas components. Using the Convective Add-On Model, an emission rate of 30,331 mg/l was calculated. This value compared well with the value calculated for convection using Darcy's; the result for this calculation was 30,332 mg/s. In calculating the human health risk at the sewage sludge area, the emissions resulting from molecular diffusion and the emissions resulting from convection are added together to present a worse case scenario.

REFERENCES

deMarsily, G. 1986. *Quantitative Hydrogeology.* Academic Press, Inc., San Diego, CA.

Farquhar, G.J., Ph.D. University of Waterloo, Department of Civil Engineering, Waterloo, Ontario, Canada; course lecture notes on Landfill Gas Migration and Control.

U.S. Environmental Protection Agency (USEPA). 1988. Superfund Exposure Assessment Manual, U.S. EPA Office of Emergency and Remedial Response, Washington, D.C., EPA/540/1-88/001. April 1988.

U.S. Environmental Protection Agency (USEPA). 1989. Air/Superfund National Technical Guidance Study Series: Volume II - Estimation of Baseline Air Emissions at Superfund Sites.

E-6 TABLES REFERENCED IN SECTIONS E-1 THROUGH E-5

TABLE E - 1
SELECTION OF CHEMICALS OF CONCERN FOR GROUNDWATER
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	MCL (ug/L)	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/L) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
VOLATILE ORGANICS														
1,1,1-Trichloroethane	VOC-CLP		4 of 76	200	0.09	na	34.0		377.8	0.000			NO	C-T
1,1-Dichloroethane	VOC-CLP		27 of 76	na	0.1	na	220.0	J	2200.0	0.001			NO	C-T
1,1-Dichloroethene	VOC-CLP		3 of 76	7	0.009	0.6	2.0	J	(222.2)	LF	(1.2)	LF	NO	LF
1,2-Dichloroethane	VOC-CLP		2 of 76	5	na	0.091	1.0	J			(0.1)	LF	NO	LF
1,2-Dichloroethene(total) (d)	VOC-CLP		25 of 76	70	0.01	na	730.0		73000.0	0.021			YES	MCL
1,2-Dichloropropane	VOC-CLP		4 of 76	5	na	0.068	3.0	J			0.2	0.000	NO	C-T
2-Butanone	VOC-CLP		5 of 74	na	0.6	na	150.0	J	250.0	0.000			NO	C-T
4-Methyl-2-pentanone	VOC-CLP		4 of 76	na	0.05	na	31.0		620.0	0.000			NO	C-T
Acetone	VOC-CLP		5 of 72	na	0.1	na	470.0		4700.0	0.001			NO	C-T
Benzene	VOC-CLP		26 of 76	5	na	0.029	31.0				0.9	0.000	YES	MCL
Carbon Disulfide	VOC-CLP		16 of 76	na	0.1	na	87.0		870.0	0.000			NO	C-T
Chlorobenzene	VOC-CLP		12 of 76	na	0.02	na	13.0		650.0	0.000			NO	C-T
Chloroethane	VOC-CLP		23 of 76	na	na	na	86.0						YES	NT
Ethylbenzene	VOC-CLP		27 of 76	700	0.1	na	72.0		720.0	0.000			NO	C-T
Styrene	VOC-CLP		1 of 76	100	0.2	0.03	10.0		(50)	LF	(0.3)	LF	NO	LF
Tetrachloroethene	VOC-CLP		1 of 76	5	0.01	0.051	1.0	J	(100)	LF	(0.1)	LF	NO	LF
Toluene	VOC-CLP		26 of 76	1000	0.2	na	170.0		850.0	0.000			NO	C-T
Total Xylenes	VOC-CLP		32 of 76	10000	2	na	210.0		105.0	0.000			NO	C-T
Trichloroethene	VOC-CLP		6 of 76	5	na	0.011	5.0	J			0.1	0.000	NO	C-T
Vinyl Chloride	VOC-CLP		11 of 76	2	na	1.9	690.0	J			1311.0	0.542	YES	MCL
SEMIVOLATILES														
1,2-Dichlorobenzene	SVOC		8 of 76	600	0.09	na	3.0	J	33.3	0.000			NO	C-T
1,3-Dichlorobenzene (e)	SVOC		1 of 76	na	0.09	na	5.0	J	(55.6)	LF			NO	LF
1,4-Dichlorobenzene	SVOC		14 of 76	75	0.01	0.024	25.0		2500.0	0.001	0.6	0.000	NO	C-T
2,4-Dimethylphenol	SVOC		6 of 75	na	0.02	na	6.0	J	300.0	0.000			NO	C-T
2-Methylnaphthalene	SVOC		5 of 76	na	na	na	5.0	J					YES	NT
2-Methylphenol	SVOC		5 of 75	na	0.05	na	6.0	J	120.0	0.000			NO	C-T
4-Chloro-3-methylphenol	SVOC		5 of 75	na	na	na	5.0	J					YES	NT
4-Chloroaniline	SVOC		1 of 76	na	0.004	na	1.0	J	(250)	LF			NO	LF
4-Methylphenol	SVOC		10 of 76	na	0.005	na	72.0		14400.0	0.004			NO	C-T
Benzoic Acid	SVOC		1 of 8	na	4	na	12.0	J	3.0	0.000			NO	C-T

TABLE E - 1
SELECTION OF CHEMICALS OF CONCERN FOR GROUNDWATER
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	MCL (ug/L)	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/L) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
Di-n-butylphthalate	SVOC		7 of 76	na	0.1	na	3.0	J	30.0	0.000			NO	C-T
Diethylphthalate	SVOC		17 of 76	na	0.8	na	17.0		21.3	0.000			NO	C-T
N-Nitroso-di-n-propylamine	SVOC		1 of 76	na	na	7	10.0	J			(70)	LF	NO	LF
Naphthalene	SVOC		17 of 76	na	0.04	na	10.0		250.0	0.000			NO	C-T
Pentachlorophenol	SVOC		1 of 76	1	0.03	0.12	3.0	J	(100)	LF	(0.4)	LF	YES	MCL
Phenol	SVOC		3 of 76	na	0.6	na	7.0	J	(11.7)	LF			NO	LF
bis(2-Ethylhexyl)phthalate	SVOC		2 of 76	6	0.02	0.014	36.0		1800.0	0.001	0.5	0.000	YES	MCL
Acrylamide	WSO		1 of 34	na	0.0002	4.5	229.0	J	1145000.0	0.330	1030.5	0.426	YES	LF/CT
N,N-DMF	WSO	HC	13 of 68	na	0.1	na	1440.0	J	14400.0	0.004			YES	HC
PESTICIDES														
4,4'-DDD	P/P		1 of 75	na	na	0.24	0.0050	J			(0.001)	LF	NO	LF
4,4'-DDT	P/P		1 of 75	na	0.0005	0.34	0.0160	J	(32)	LF	(0.01)	LF	NO	LF
Aldrin	P/P		2 of 75	na	0.00003	17	0.0043	J	(133.3)	LF	(0.1)	LF	NO	LF
Aroclor-1260	P/P		3 of 75	0.5	na	7.7	0.2400	J			(1.8)	LF	NO	LF
Dieldrin	P/P		2 of 75	na	0.00005	16	0.0035	J	(80)	LF	(0.1)	LF	NO	LF
Endosulfan II (f)	P/P		2 of 75	na	0.006	na	0.0066	J	(1.1)	LF			NO	LF
Endrin Ketone (g)	P/P		3 of 75	2	0.0003	na	0.0066	J	(23.3)	LF			NO	LF
Heptachlor	P/P		1 of 75	0.4	0.0005	4.5	0.0023	J	(4)	LF	(0.01)	LF	NO	LF
Heptachlor Epoxide	P/P		1 of 75	0.2	0.00001	9.1	0.0063	J	(461.5)	LF	(0.1)	LF	NO	LF
Methoxychlor	P/P		1 of 75	40	0.005	na	0.0130	J	(2.6)	LF			NO	LF
alpha-Chlordane (h)	P/P		3 of 75	2	0.00006	1.3	0.0036	J	(66.7)	LF	(0.01)	LF	NO	LF
beta-BHC	P/P		1 of 75	na	na	1.8	0.0940	J			(0.2)	LF	NO	LF
delta-BHC (i)	P/P		3 of 75	na	0.0003	1.3	0.0100	J	(33.3)	LF	(0.01)	LF	NO	LF
gamma-BHC(Lindane)	P/P		4 of 75	0.2	0.0003	1.3	0.0240	J	80.0	0.000	0.03	0.000	NO	C-T
METALS														
Aluminum	METU		70 of 76	na	na	na	110000.0						YES	NT
Antimony	METU		3 of 76	6	0.0004	na	104.9		(262125)	LF			YES	MCL
Arsenic	METU		17 of 74	50	0.0003	1.75	9.7		32333.3	0.009	17.0	0.007	YES	PT
Barium	METU		69 of 76	2000	0.07	na	508.0		7257.1	0.002			NO	C-T
Beryllium	METU		19 of 76	4	0.005	4.3	13.7		2740.0	0.001	58.9	0.024	YES	MCL
Cadmium (j)	METU		5 of 76	5	0.0005	na	40.0	J	80000.0	0.023			YES	MCL
Calcium	METU	EE	76 of 76	na	na	na	168000.0						NO	EE

TABLE E - 1
SELECTION OF CHEMICALS OF CONCERN FOR GROUNDWATER
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	MCL (ug/L)	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/L) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
Chromium (k)	METU		27 of 76	100	0.005	na	154.0		30800.0	0.009			YES	MCL
Cobalt	METU		38 of 76	na	na	na	101.0						YES	NT
Copper	METU		37 of 76	na	na	na	367.0						YES	NT
Iron	METU	EE	73 of 76	na	na	na	268000.0						NO	EE
Lead	METU		30 of 76	na	na	na	307.0						YES	NT
Magnesium	METU	EE	76 of 76	na	na	na	62000.0						NO	EE
Manganese (j)	METU		74 of76	na	0.005	na	9995.0		1999000.0	0.576			YES	C-T
Mercury	METU		4 of 68	2	0.0003	na	0.3	J	1000.0	0.000			NO	C-T
Nickel	METU		39 of 76	100	0.02	na	125.0		6250.0	0.002			YES	MCL
Potassium	METU	EE	66 of 76	na	na	na	170000.0						NO	EE
Sodium	METU	EE	71 of 76	na	na	na	501000.0						NO	EE
Vanadium	METU		42 of 76	na	0.007	na	142.0	J	20285.7	0.006			YES	PT
Zinc	METU		41 of 74	na	0.3	na	7360.0		24533.3	0.007			YES	PT
Sulfide	H2S		10 of 61	na	na	na	32000.0	J					YES	NT
Ammonia (l)	AMMONIA		12 of 15	na	na	na	51700.0						YES	NT
Cyanide	CN		1 of 75	200	0.02	na	11.1	J	(555)	LF			NO	LF
Sum of Columns (m):									3467479.9	1.000	2419.7	1.000		

NOTES:

(a) - Chemicals are included if they are of historical concern at the site (HC).
Chemicals are excluded if they are Essential Elements (EE).

(b) - Risk Factor (R)=C x T, where C=max. concentration of chemical, and T= toxicity value for the chemical.
(for carcinogenic compounds T=oral slope factor; for noncarcinogens T=1/chronic oral RfD).
Risk factors shown in parentheses are not included in the sum of ratios. - see LF.

(c) - Ratio calculated by R/SUM(R); no R or Ratio reported if RfD or slope factor is not available. Ratio not reported for chemicals with a frequency less than 5%.

na - Toxicity value data is not available.

J - Value is approximate.

(d) - MCL and RfD for cis-1,2-dichloroethene used.

(e) - RfD for 1,2-dichlorobenzene used.

(f) - RfD for endosulfan used.

(g) - MCL, RfD for endrin used.

(h) - MCL, RfD and Slope Factor for chlordane used.

(i) - RfD & slope factor for gamma-BHC used.

(j) - RfD for cadmium and manganese in water used.

(k) - RfD for chromium VI used.

(l) - Exceeds RfC of 34 mg/l in drinking water.

(m) - Risk factors for chemicals excluded due to low frequency are not included in sum.

LF - Chemicals with a low frequency (less than 5 %) are excluded. Risk factors are shown in parenthesis but chemicals are not included in the C-T screen.

C-T - Chemical either included or excluded based on the carcinogenic and non-carcinogenic risk ratios: included if either ratio > 0.01; excluded if both ratios < 0.01.

MCL - Chemical was included because maximum concentration > MCL.

LF/CT - Acrylamide is retained as a groundwater coc in spite of low frequency due to high C-T factor.

NT - Chemical was included due to lack of toxicity data.

PT - Chemical was included based on previous toxicity data; however, due to revised toxicity data on 11/93 ratios are <0.01 (COCs were not excluded based on revised toxicity data).

TABLE E - 2
SELECTION OF CHEMICALS OF CONCERN FOR RESIDENTIAL WELLS
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	MCL (ug/l)	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/L) (C)	FLAG	NON-CARC RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (R)	RATIO (c)	SELECT	REASON
VOLATILES														
1,1-Dichloroethane	VOC-524		2 of 21	na	0.1	na	3.1		31.0	0.000			NO	C-T
Acetone	VOC-524		1 of 21	na	0.1	na	0.6	J	6.0	0.000			NO	C-T
Benzene	VOC-524		1 of 21	5	na	0.029	0.8	J			0.023	0.278	YES	C-T
Carbon Disulfide	VOC-524		1 of 21	na	0.1	na	12.0		120.0	0.000			NO	C-T
Chloroethane	VOC-524		1 of 21	na	na	na	1.0						YES	NT
Ethylbenzene	VOC-524		2 of 21	700	0.1	na	1.4		14.0	0.000			NO	C-T
Toluene	VOC-524		2 of 21	1000	0.2	na	4.1	J	20.5	0.000			NO	C-T
Trichloroethene (d)	VOC-524		2 of 21	5	na	0.011	1.5							
Trichloroethene	VOC-CLP		1 of 1	5	na	0.011	2.0	J			0.022	0.263	YES	C-T
o-Xylene (e)	VOC-524		1 of 18	10000	2	na	0.8	J	0.4	0.000			NO	C-T
trans-1,2-Dichloroethen	VOC-524		1 of 21	100	0.02	na	0.3	J	15.0	0.000			NO	C-T
SEMIVOLATILES														
4-Methylphenol	SVOC		1 of 19	na	0.005	na	63.0		12600.0	0.020			YES	C-T
N,N-DMF	WSO	HC	2 of 12	na	0.1	na	14.0		140.0	0.000			YES	HC
PESTICIDES														
Dieldrin	P/P		1 of 21	na	0.00005	16.000	0.0024	J	48.0	0.000	0.038	0.459	YES	C-T
Endrin Aldehyde (f)	P/P		1 of 12	2	0.0003	na	0.1	J	333.3	0.001			NO	C-T
Endrin Ketone (f)	P/P		1 of 21	2	0.0003	na	0.1	J	333.3	0.001			NO	C-T
METALS														
Aluminum	METU		5 of 21	na	na	na	552.0	J					YES	NT
Barium	METU		8 of 21	2000	0.07	na	44.3		632.9	0.001			YES	PT
Calcium	METU	EE	21 of 21	na	na	na	23400.0						NO	EE
Copper	METU		4 of 21	na	na	na	58.6						YES	NT
Iron	METU	EE	12 of 21	na	na	na	81000.0	J					NO	EE

TABLE E - 2
SELECTION OF CHEMICALS OF CONCERN FOR RESIDENTIAL WELLS
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	MCL (ug/l)	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/L) (C)	FLAG	NON-CARC RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (R)	RATIO (c)	SELECT	REASON
Magnesium	METU	EE	21 of 21	na	na	na	4580.0						NO	EE
Manganese (g)	METU		15 of 21	na	0.005	na	3100.0		620000.0	0.974			YES	C-T
Mercury	METU		1 of 19	2	0.0003	na	0.5	J	1666.7	0.003			YES	PT
Potassium	METU	EE	13 of 21	na	na	na	7470.0						NO	EE
Sodium	METU	EE	21 of 21	na	na	na	891000.0						NO	EE
Zinc	METU		1 of 21	na	0.3	na	165.0		550.0	0.001			YES	PT
Sulfide	H2S		9 of 21	na	na	na	3700.0						YES	NT
Sum of Columns									636511.1	1.000	0.1	1.000		

NOTES:

(a) - Chemicals are included if they are of historical concern at the site (HC). Chemicals are excluded if they are Essential Elements (EE).

(b) - Risk Factor (R)=C x T, where C=max. concentration of chemical, and T= toxicity value for the chemical.
(for carcinogenic compounds T=oral slope factor; for noncarcinogens T=1/chronic oral RfD).

(c) - Ratio calculated by R/SUM(R); no R or Ratio reported if RfD or slope factor is not available.

(d) - Screening uses maximum TCE, see line below.

(e) - MCL & RfD for total xylenes used.

(f) - MCL & RfD for endrin used.

(g) - RfD for manganese in water used.

J - Value is approximate.

na - Toxicity value data is not available.

C-T - Chemical either included or excluded based on the carcinogenic and non-carcinogenic risk ratios: included if either ratio > 0.01; excluded if both ratios < 0.01.

NT - Chemical was included due to lack of toxicity data.

PT - Chemical was included based on previous toxicity data; however, due to revised toxicity data on 11/93, ratios are <0.01 (COCs were not excluded based on revised toxicity data).

TABLE E - 3
SELECTION OF CHEMICALS OF CONCERN FOR LEACHATE
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/Kg) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
VOLATILE ORGANICS													
1,1-Dichloroethane	VOC-CLP		3 of 9	0.1	na	2.0	J	20.0	0.000			NO	C-T
1,2-Dichloroethene(total) (d)	VOC-CLP		2 of 8	0.01	na	44.0		4400.0	0.001			YES	PT
Carbon Disulfide	VOC-CLP		2 of 8	0.1	na	12.0		120.0	0.000			NO	C-T
Chlorobenzene	VOC-CLP		3 of 9	0.02	na	2.0	J	100.0	0.000			NO	C-T
Chloroethane	VOC-CLP		4 of 9	na	na	8.0	J					YES	NT
Ethylbenzene	VOC-CLP		3 of 8	0.1	na	2.0	J	20.0	0.000			NO	C-T
Toluene	VOC-CLP		3 of 9	0.2	na	50.0		250.0	0.000			NO	C-T
Total Xylenes	VOC-CLP		2 of 8	2	na	3.0	J	1.5	0.000			NO	C-T
Trichloroethene	VOC-CLP		1 of 8	na	0.011	4.0	J			0.0	0.001	NO	C-T
SEMIVOLATILES													
Diethylphthalate	SVOC		3 of 9	0.8	na	11.0		13.8	0.000			NO	C-T
Naphthalene	SVOC		3 of 9	0.04	na	0.9	J	22.5	0.000			NO	C-T
bis(2-Ethylhexyl)phthalate	SVOC		1 of 9	0.02	0.014	230.0	J	11500.0	0.004	3.2	0.056	YES	C-T
METALS													
Aluminum	METU		7 of 9	na	na	60500.0	J					YES	NT
Arsenic	METU		1 of 8	0.0003	1.75	3.7		12333.3	0.004	6.5	0.112	YES	C-T
Barium	METU		9 of 9	0.07	na	2120.0		30285.7	0.010			YES	C-T
Beryllium	METU		2 of 9	0.005	4.3	11.2		2240.0	0.001	48.2	0.832	YES	C-T
Calcium	METU	EE	9 of 9	na	na	59000.0						NO	EE
Chromium (e)	METU		2 of 9	0.005	na	23.9		4780.0	0.002			YES	PT
Cobalt	METU		4 of 9	na	na	295.0						YES	NT
Copper	METU		1 of 9	na	na	37.8	J					YES	NT
Iron	METU	EE	9 of 9	na	na	1370000.0	J					NO	EE
Lead	METU		3 of 9	na	na	174.0	J					YES	NT
Magnesium	METU	EE	9 of 9	na	na	16100.0						NO	EE
Manganese (f)	METU		9 of 9	0.005	na	14700.0	J	2940000.0	0.974			YES	C-T
Mercury	METU		1 of 9	0.0003	na	0.2		666.7	0.000			NO	C-T
Nickel	METU		3 of 8	0.02	na	15.8		790.0	0.000			NO	C-T

TABLE E - 3
SELECTION OF CHEMICALS OF CONCERN FOR LEACHATE
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/Kg) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
Potassium	METU	EE	9 of 9	na	na	44800.0						NO	EE
Sodium	METU	EE	9 of 9	na	na	55400.0						NO	EE
Vanadium	METU		3 of 9	0.007	na	65.2		9314.3	0.003			YES	PT
Zinc	METU		4 of 7	0.3	na	209.0	J	696.7	0.000			NO	C-T
Ammonia	AMMONIA		3 of 3	na	na	21800.0						YES	NT
Cyanide	CN		2 of 9	0.02	na	41.7		2085.0	0.001			NO	C-T
Sum of Columns								3019639.4	1.000	57.9	1.000		

NOTES:

(a) - Chemicals are included if they are of historical concern at the site (HC). Chemicals are excluded if they are Essential Elements (EE).

(b) - Risk Factor (R)=C x T, where C=max. concentration of chemical, and T= toxicity value for the chemical.
(for carcinogenic compounds T=oral slope factor; for noncarcinogens T=1/chronic oral RfD).

(c) - Ratio calculated by R/SUM(R); no R or Ratio reported if RfD or slope factor is not available.

(d) - RfD for cis-1,2-dichloroethene used.

(e) - RfD for chromium VI used.

(f) - RfD for manganese in water used.

na - Toxicity value data is not available.

J - Value is approximate

NT - Chemical was included due to lack of toxicity data.

C-T - Chemical either included or excluded based on the carcinogenic and non-carcinogenic risk ratios: included if either ratio > 0.01; excluded if both ratios < 0.01.

PT - Chemical was included based on previous toxicity data; however, due to revised toxicity data on 11/93, ratios are <0.01 (COCs were not excluded based on revised toxicity data).

TABLE E - 4
SELECTION OF CHEMICALS OF CONCERN FOR SURFACE WATER
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/L) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
VOLATILE ORGANICS													
1,2-Dichloroethene(total) (d)	VOC-CLP		1 of 56	0.01	na	4.0	J	(400)	LF			NO	LF
Benzene	VOC-CLP		1 of 56	na	0.029	3.0	J			(0.1)	LF	NO	LF
Carbon Disulfide	VOC-CLP		15 of 56	0.1	na	14.0		140.0	0.000			NO	C-T
Chlorobenzene	VOC-CLP		1 of 56	0.02	na	2.0	J	(100)	LF			NO	LF
Chloroethane	VOC-CLP		1 of 56	na	na	6.0	J					NO	LF
Toluene	VOC-CLP		1 of 56	0.2	na	2.0	J	(10)	LF			NO	LF
Total Xylenes	VOC-CLP		2 of 56	2	na	9.0		(4.5)	LF			NO	LF
SEMIVOLATILES													
Di-n-butylphthalate	SVOC		1 of 56	0.1	na	3.0	J	(30)	LF			NO	LF
Diethylphthalate	SVOC		2 of 56	0.8	na	2.0	J	2.5	0.000			NO	C-T
Dimethylphthalate	SVOC		1 of 56	10	na	1.0	J	(0.1)	LF			NO	LF
bis(2-Ethylhexyl)phthalate	SVOC		1 of 56	0.02	0.014	8.0	J	(400)	LF	(0.1)	LF	NO	LF
Acrylamide	WSO		1 of 15	0.0002	4.5	272.0	J	1360000.0	HF	1224.0	HF	YES	C-T
N,N-DMF	WSO	HC	1 of 31	0.1	na	5.0	J	50.0	0.000			YES	HC
PESTICIDES													
4,4'-DDD	P/P		1 of 56	na	0.24	0.0047	J			(O.001)	LF	NO	LF
Methoxychlor	P/P		1 of 56	0.005	na	0.0140	J	(2.8)	LF			NO	LF
gamma-BHC(Lindane)	P/P		1 of 56	0.0003	1.3	0.0020	J	(6.7)	LF	(0.003)	LF	NO	LF
METALS													
Aluminum	METU		30 of 56	na	na	1140.0	J					YES	NT
Antimony	METU		4 of 56	0.0004	na	28.8		72000.0	0.149			YES	C-T
Arsenic	METU		2 of 56	0.0003	1.75	4.1		(13366.7)	LF	(7.2)	LF	NO	LF
Barium	METU		33 of 45	0.07	na	279.0		3985.7	0.008			YES	PT
Calcium	METU	EE	56 of 56	na	na	27100.0						NO	EE
Chromium (e)	METU		1 of 56	0.005	na	3.2		(640)	LF			NO	LF
Copper	METU		6 of 56	na	na	11.6						NO	LF
Iron	METU	EE	48 of 56	na	na	65000.0	J					NO	EE
Lead	METU		1 of 56	na	na	3.7						NO	LF

TABLE E - 4
SELECTION OF CHEMICALS OF CONCERN FOR SURFACE WATER
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (ug/L) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
Magnesium	METU	EE	56 of 56	na	na	12900.0						NO	EE
Manganese (f)	METU		54 of 56	0.005	na	2030.0		406000.0	0.842			YES	C-T
Mercury	METF		1 of 56	0.0003	na	0.115		(383.3)	LF			NO	LF
Nickel	METU		1 of 56	0.02	na	5.0		(250)	LF			NO	LF
Potassium	METU	EE	31 of 56	na	na	45000.0						NO	EE
Sodium	METU	EE	56 of 56	na	na	59900.0						NO	EE
Zinc	METU		15 of 56	0.3	na	22.8		76.0	0.000			NO	C-T
Ammonia	AMMONIA		17 of 19	na	na	3530.0						YES	NT
Cyanide	CN		3 of 56	0.02	na	210.0	J	(510)	LF			NO	LF
Sulfide	H2S		14 of 37	na	na	2.2						YES	NT
Sum of Columns (g)								482254.2	1.0	0.0	0.0		

NOTES:

(a) - Chemicals are included if they are of historical concern at the site (HC). Chemicals are excluded if they are Essential Elements (EE).

(b) - Risk Factor (R)=C x T, where C=max. concentration of chemical, and T= toxicity value for the chemical (for carcinogenic compounds, T=oral slope factor; for noncarcinogens T=1/chronic oral RfD). Risk factors in parentheses are not included in the sum of risks - see LF.

na - Toxicity value data is not available.

J - Value is approximate.

NT - Chemical was included due to lack of toxicity data.

(c) - Ratio calculated by R/SUM(R); no R or Ratio reported if RfD or slope factor is not available. Ratio not reported for chemicals with a frequency less than 5%.

(d) - RfD for cis-1,2-dichloroethene used.

(e) - RfD for chromium VI used.

(f) - RfD for manganese in water used.

(g) - Risk factors for chemicals excluded due to low frequency are not included in sum.

C-T - Chemical either included or excluded based on the carcinogenic and non-carcinogenic risk ratios: included if either ratio > 0.01; excluded if both ratios < 0.01.

LF - Chemicals with a low frequency (less than 5%) are excluded. Risk factors are shown in parentheses but chemicals are not included in the C-T screen.

HF - Very high relative risk factor; not included in summation total to avoid skewing ratios.

PT - Chemical was included based on previous toxicity data; however, due to revised toxicity data on 11/93, ratios are <0.01 (COCs were not excluded based on revised toxicity data).

TABLE E - 5
SELECTION OF CHEMICALS OF CONCERN FOR SEDIMENT
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM mg/kg (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
VOLATILE ORGANICS													
Acetone	VOC-CLP		5 of 40	0.1	na	0.440	J	4.4	0.000			NO	C-T
Benzene	VOC-CLP		1 of 39	na	0.029	0.001	J			(0.00003)	LF	NO	LF
2-Butanone	VOC-CLP		2 of 40	0.6	na	0.046		(0.08)	LF			NO	LF
Carbon Disulfide	VOC-CLP		2 of 40	0.1	na	0.022	J	(0.2)	LF			NO	LF
Chloroform	VOC-CLP		1 of 40	0.01	0.0061	0.005	J	(0.5)	LF	(0.00003)	LF	NO	LF
1,2-Dichloroethene(total) (d)	VOC-CLP		1 of 40	0.01	na	0.005	J	(0.5)	LF			NO	LF
Ethylbenzene	VOC-CLP		2 of 40	0.1	na	0.008	J	0.1	0.000			NO	C-T
4-Methyl-2-pentanone	VOC-CLP		1 of 40	0.05	na	0.003	J	(0.1)	LF			NO	LF
Tetrachloroethene	VOC-CLP		3 of 40	0.01	0.051	0.004	J	0.4	0.000	0.0002	0.000	NO	C-T
Total Xylenes	VOC-CLP		5 of 40	2	na	0.067	J	0.03	0.000			NO	C-T
Trichloroethene	VOC-CLP		6 of 40	na	0.011	0.150	J			0.0016	0.000	NO	C-T
SEMIVOLATILES													
Anthracene	SVOC		1 of 39	0.3	na	0.064	J	(0.2)	LF			NO	LF
Benzo(a)pyrene	SVOC		1 of 39	na	7.3	0.140	J			(1)	LF	NO	LF
Benzo(b)fluoranthene (e)	SVOC		1 of 39	na	7.3	0.130	J			(0.9)	LF	NO	LF
Benzo(k)fluoranthene (e)	SVOC		1 of 39	na	7.3	0.130	J			(0.9)	LF	NO	LF
Butylbenzylphthalate	SVOC		1 of 39	0.2	na	0.440	J	(2.2)	LF			NO	LF
Chrysene (e)	SVOC		1 of 39	na	7.3	0.180	J			(1.3)	LF	NO	LF
Di-n-butylphthalate	SVOC		1 of 39	0.1	na	0.650	J	(6.5)	LF			NO	LF
Fluoranthene	SVOC		5 of 39	0.04	na	0.330	J	8.3	0.000			NO	C-T
Phenanthrene (f)	SVOC		2 of 39	0.04	na	0.220	J	(5.5)	LF			NO	LF
Pyrene	SVOC		6 of 39	0.03	na	0.280	J	9.3	0.000			NO	C-T
PESTICIDES													
4,4'-DDD	P/P		2 of 37	na	0.24	0.0082				(0.002)	LF	NO	LF
4,4'-DDE	P/P		5 of 37	na	0.34	0.0049	J			0.0017	0.000	NO	C-T
4,4'-DDT	P/P		1 of 37	0.0005	0.34	0.0009	J	(1.8)	LF	(0.0003)	LF	NO	LF
Dieldrin	P/P		1 of 37	0.00005	16	0.0013	J	(26)	LF	(0.021)	LF	NO	LF
Endosulfan II (g)	P/P		1 of 37	0.006	na	0.00031	J	(0.05)	LF			NO	LF
Methoxychlor	P/P		1 of 37	0.005	na	0.0026	J	(0.5)	LF			NO	LF
delta-BHC (h)	P/P		11 of 37	0.0003	1.3	1.3000	J	(1.5)	LF	(0.001)	LF	NO	LF
gamma-Chlordane (i)	P/P		1 of 37	0.00006	1.3	0.00023	J	(3.5)	LF	(0.0003)	LF	NO	LF

TABLE E - 5
SELECTION OF CHEMICALS OF CONCERN FOR SEDIMENT
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM mg/kg (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
METALS													
Aluminum	METU		40 of 40	na	na	8650.00						YES	NT
Antimony	METU		1 of 40	0.0004	na	62.10	J	(155125)	LF			NO	LF
Arsenic	METU		21 of 40	0.0003	1.75	6.10		20333.3	0.078	10.7	0.519	YES	C-T
Barium	METU		40 of 40	0.07	na	64.60		922.9	0.004			YES	PT
Beryllium	METU		18 of 40	0.005	4.3	2.30		460.0	0.002	9.9	0.481	YES	C-T
Cadmium (j)	METU		1 of 40	0.0005	na	1.30		(2600)	LF			NO	LF
Calcium	METU	EE	33 of 40	na	na	1760.00	J					NO	EE
Chromium (k)	METU		23 of 40	0.005	na	18.10		3620.0	0.014			YES	C-T
Cobalt	METU		21 of 40	na	na	6.50						YES	NT
Copper	METU		3 of 39	na	na	56.10	J					YES	NT
Iron	METU	EE	40 of 40	na	na	113000.00						NO	EE
Lead	METU		32 of 40	na	na	243.40	J					YES	NT
Magnesium	METU	EE	35 of 40	na	na	2560.00						NO	EE
Manganese (j)	METU		40 of 40	0.005	na	1150.00	J	230000.0	0.884			YES	C-T
Nickel	METU		19 of 40	0.02	na	20.50		1025.0	0.004			YES	PT
Potassium	METU	EE	18 of 40	na	na	775.00						NO	EE
Selenium	METU		6 of 40	0.005	na	2.10	J	420.0	0.002			YES	PT
Sodium	METU	EE	13 of 39	na	na	115.00						NO	EE
Thallium	METU		2 of 40	0.00007	na	0.37		(5285.7)	LF			NO	LF
Vanadium	METU		28 of 40	0.007	na	17.70		2528.6	0.010			YES	C-T
Zinc	METU		13 of 40	0.3	na	236.00		786.7	0.003			YES	PT
Ammonia	AMMONIA		5 of 11	na	na	25.6						YES	NT
Sulfide	H2S		40 of 40	na	na	850.00	J					YES	NT
Sum of Column (l)								260118.9	1.000	20.6	1.000		

NOTES:

(a) - Chemicals are included if they are of historical concern at the site (HC). Chemicals are excluded if they are Essential Elements (EE).

(b) - Risk Factor (R)=C x T, where C=max. concentration of chemical, and T= toxicity value for the chemical. (for carcinogenic compounds T=oral slope factor; for noncarcinogens T=1/chronic oral RfD). Risk factors in parentheses are not included in the sum of risks - see LF.

(c) - Ratio calculated by R/SUM(R); no R or Ratio reported if RfD or slope factor is not available. Ratio not reported for chemicals with a frequency less than 5%.

na - Toxicity value data is not available.

J - Value is approximate.

LF - Chemicals with a low frequency (less than 5%) are excluded. Risk factors are shown in parentheses but are not included in the C-T screen.

C-T - Chemical either included or excluded based on the carcinogenic and non-carcinogenic risk ratios: included if either ratio > 0.01; excluded if both ratios < 0.01.

NT - Chemical was included due to lack of toxicity data.

PT - Chemical was included based on previous toxicity data; however, due to revised toxicity data on 11/93, ratios are <0.01 (COCs were not excluded based on revised toxicity data).

(d) RfD for cis-1,2-dichloroethene used.

(e) Slope Factor for benzo(a)pyrene used.

(f) RfD for naphthalene used.

(g) RfD for endosulfan used.

(h) RfD & slope factor for gamma-BHC used.

(i) RfD & slope factor for chlordane used.

(j) RfD for cadmium and manganese in water used.

(k) RfD for chromium VI used.

(l) Risk factors for chemicals excluded due to low frequency are not included in sum.

TABLE E - 6
SELECTION OF CHEMICALS OF CONC. . FOR SURFACE SOILS
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (mg/Kg) (C)		NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
VOLATILES													
1,1,1-Trichloroethane	VOC-CLP		1 of 24	0.09	na	0.0080	J	(0.09)	LF			NO	LF
1,1-Dichloroethane	VOC-CLP		2 of 24	0.1	na	0.0250		0.3	0.000			NO	C-T
1,1-Dichloroethene	VOC-CLP		1 of 24	0.009	0.6	0.0040	J	(0.4)	LF	(0.002)	LF	NO	LF
1,2-Dichloroethene(total) (d)	VOC-CLP		4 of 24	0.01	na	2.4000	J	240.0	0.000			NO	C-T
2-Butanone	VOC-CLP		7 of 24	0.6	na	0.8300	J	1.4	0.000			NO	C-T
2-Hexanone	VOC-CLP		1 of 24	na	na	0.0060	J					NO	LF
4-Methyl-2-pentanone	VOC-CLP		1 of 24	0.05	na	0.0030	J	(0.1)	LF			NO	LF
Acetone	VOC-CLP		15 of 24	0.1	na	160.0000	J	1600.0	0.001			YES	PT
Benzene	VOC-CLP		2 of 24	na	0.029	0.0060	J			0.0002	0.000	NO	C-T
Chloroform	VOC-CLP		4 of 24	0.01	0.0061	0.0030	J	0.3	0.000	0.00002	0.000	NO	C-T
Ethylbenzene	VOC-CLP		5 of 24	0.1	na	0.0210	J	0.2	0.000			NO	C-T
Tetrachloroethene	VOC-CLP		7 of 24	0.01	0.051	0.0130	J	1.3	0.000	0.001	0.000	NO	C-T
Toluene	VOC-CLP		6 of 24	0.2	na	0.1100	J	0.5	0.000			NO	C-T
Total Xylenes	VOC-CLP		5 of 24	2	na	0.0840	J	0.0	0.000			NO	C-T
Trichloroethene	VOC-CLP		1 of 24	na	0.011	0.0020	J			(0.00002)	LF	NO	LF
Vinyl Chloride	VOC-CLP		2 of 24	na	1.9	0.2500				0.5	0.033	YES	C-T
SEMIVOLATILES													
4-Chloroaniline	SVOC		1 of 24	0.004	na	0.4900		(122.5)	LF			NO	LF
Benzo(a)anthracene (e)	SVOC		4 of 24	na	7.3	0.0780	J			0.6	0.039	YES	C-T
Benzo(a)pyrene	SVOC		4 of 24	na	7.3	0.0680	J			0.5	0.034	YES	C-T
Benzo(b)fluoranthene (e)	SVOC		5 of 24	na	7.3	0.0760	J			0.6	0.038	YES	C-T
Benzo(g,h,i)perylene (f)	SVOC		4 of 24	0.04	na	0.0570	J	1.4	0.000			NO	C-T
Benzo(k)fluoranthene (e)	SVOC		4 of 24	na	7.3	0.0640	J			0.5	0.032	YES	C-T
Butylbenzylphthalate	SVOC		3 of 24	0.2	na	0.1200	J	0.6	0.000			NO	C-T
Chrysene (e)	SVOC		5 of 24	na	7.3	0.0950	J			0.7	0.048	YES	C-T
Diethylphthalate	SVOC		5 of 24	0.8	na	0.0460	J	0.1	0.000			NO	C-T
Fluoranthene	SVOC		7 of 24	0.04	na	0.1600	J	4.0	0.000			NO	C-T
Indeno(1,2,3-cd)pyrene (e)	SVOC		3 of 24	na	7.3	0.0520	J			0.4	0.026	YES	C-T
Naphthalene	SVOC		1 of 24	0.04	na	0.0350	J	(0.9)	LF			NO	LF
Phenanthrene (f)	SVOC		5 of 24	0.04	na	0.1100	J	2.8	0.000			NO	C-T
Pyrene	SVOC		9 of 24	0.03	na	0.1700	J	5.7	0.000			NO	C-T

TABLE E - 6
SELECTION OF CHEMICALS OF CONCERN FOR SURFACE SOILS
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (mg/Kg) (C)		NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
PESTICIDES													
4,4'-DDD	P/P		2 of 24	na	0.24	0.0052	J			0.001	0.0001	NO	C-T
4,4'-DDE	P/P		7 of 24	na	0.34	0.0110	J			0.004	0.0003	NO	C-T
4,4'-DDT	P/P		8 of 24	0.0005	0.34	0.0052	J	10.4	0.000	0.002	0.0001	NO	C-T
Aldrin	P/P		1 of 24	0.00003	17	0.0006	J	(20)	LF	(0.01)	LF	NO	LF
Dieldrin	P/P		1 of 24	0.00005	16	0.0045	J	(90)	LF	(0.1)	LF	NO	LF
Endrin Ketone (g)	P/P		2 of 24	0.0003	na	0.0023	J	7.7	0.000			NO	C-T
alpha-Chlordane (h)	P/P		1 of 24	0.00006	1.3	0.0037	J	(61.7)	LF	(0.005)	LF	NO	LF
METALS													
Aluminum	METU		24 of 24	na	na	16600.0000						YES	NT
Antimony	METU		1 of 24	0.0004	na	78.8000	J	(197000)	LF			NO	LF
Arsenic	METU		13 of 24	0.0003	1.75	3.5000		11666.7	0.009	6.1	0.422	YES	C-T
Barium	METU		24 of 24	0.07	na	86.2000	J	1231.4	0.001			YES	PT
Beryllium	METU		11 of 24	0.005	4.3	1.1000		220.0	0.000	4.7	0.326	YES	C-T
Cadmium (i)	METU		1 of 24	0.0005	na	0.6200	J	(1240)	LF			NO	LF
Calcium	METU	EE	24 of 24	na	na	1870.0000						NO	EE
Chromium (j)	METU		14 of 24	0.005	na	17.5000		3500.0	0.003			YES	PT
Cobalt	METU		14 of 24	na	na	12.8000						YES	NT
Copper	METU		15 of 25	na	na	253.0000						YES	NT
Iron	METU	EE	24 of 24	na	na	149000.0000						NO	EE
Lead	METU		24 of 24	na	na	124.0000						YES	NT
Magnesium	METU	EE	24 of 24	na	na	1990.0000						NO	EE
Manganese (i)	METU		24 of 24	0.005	na	6120.0000		1224000.0	0.976			YES	C-T
Mercury	METU		4 of 24	0.0003	na	0.4100		1366.7	0.001			YES	PT

TABLE E - 6

SELECTION OF CHEMICALS OF CONC[illegible] FOR SURFACE SOILS

ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	HC or EE (a)	FREQUENCY OF HITS	RfD (T)	SLOPE FACTOR (T)	MAXIMUM (mg/Kg) (C)		NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
Nickel	METU		12 of 24	0.02	na	10.6000		530.0	0.000			NO	C-T
Potassium	METU	EE	23 of 24	na	na	944.0000						NO	EE
Selenium	METU		1 of 24	0.005	na	5.9000	J	(1180)	LF			NO	LF
Silver	METU		3 of 24	0.005	na	1.6000		320.0	0.000			NO	C-T
Thallium	METU		3 of 24	0.00007	na	0.3600		5142.9	0.004			YES	PT
Vanadium	METU		23 of 24	0.007	na	27.2000		3885.7	0.003			YES	PT
Zinc	METU		22 of 24	0.3	na	56.5000		188.3	0.000			NO	C-T
Sum of Columns (k)								1253928.3	1.000	14.5	1.000		

NOTES:

(a) - Chemicals are included if they are of historical concern at the site (HC). Chemicals are excluded if they are Essential Elements (EE).

(b) - Risk Factor (R)=C x T, where C=max. concentration of chemical, and T= toxicity value for the chemical. (for carcinogenic compounds T=oral slope factor; for noncarcinogens T=1/chronic oral RfD). Risk factors in parentheses are not included in the sum of ratios - see LF.

(c) - Ratio calculated by R/SUM(R); no R or Ratio reported if RfD or slope factor is not available. Ratio not reported for chemicals with a frequency less than 5%..

na - Toxicity value data is not available.

LF - Chemicals with a low frequency (less than 5%) are excluded. Risk factors are shown in parentheses but chemicals are not included in the C-T screen.

C-T - Chemical either included or excluded based on the carcinogenic and non-carcinogenic risk ratios: included if either ratio > 0.01; excluded if both ratios < 0.01.

NT - Chemical was included due to lack of toxicity data.

PT - Chemical was included based on previous toxicity data; however, due to revised toxicity data on 11/93, ratios are <0.01 (COCs were not excluded based on revised toxicity data).

(d) RfD for cis-1,2-dichloroethene used.

(e) Slope factor for benzo(a)pyrene used.

(f) RfD for naphthalene used.

(g) RfD for endrin used.

(h) RfD & slope factor for chlordane used.

(i) RfD for cadmium and manganese in water used.

(j) RfD for chromium VI used.

(k) Risk factors for chemicals excluded due to low frequency are not included in sum.

TABL. - 7
SELECTION OF CHEMICALS OF CONCERN FOR LANDFILL GAS/SOIL VAPOR
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	FREQUENCY OF HITS	RfC (mg/m^3) (T)	INHALATION UNIT RISK (ug/m^3)(T)	MAXIMUM (PPBV) (C)	MAXIMUM (ug/m^3)(a) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
VOLATILE ORGANICS													
Acetone	TO-14	2 of 7	na	na	560	1326	J					YES	NT
Benzene	TO-14	5 of 7	na	8.3E-06	2500	7959	J			0.066	0.037	YES	C-T
Bromoform	TO-14	1 of 7	na	1.1E-06	230	2375	J			0.003	0.001	NO	C-T
2-Butanone	TO-14	2 of 7	1	na	740	2175	J	2174.7	0.001			NO	C-T
Carbon Disulfide	TO-14	2 of 7	0.01	na	280	869	J	86857.1	0.048			YES	C-T
Carbon Tetrachloride	TO-14	1 of 7	na	1.5E-05	45	283	J			0.004	0.002	NO	C-T
Chloroethane	TO-14	4 of 7	10	na	6600	17510	J	1751.0	0.001			NO	C-T
Chloromethane	TO-14	1 of 7	na	1.8E-06	1400	2857	J			0.005	0.003	NO	C-T
1,4-Dichlorobenzene	TO-14	1 of 7	0.8	na	72	432	J	540.0	0.000			NO	C-T
1,1-Dichloroethane (d)	TO-14	6 of 7	0.5	na	34000	137388		274775.5	0.151			YES	C-T
1,1-Dichloroethene	TO-14	6 of 7	na	5.0E-05	8100	32069				1.603	0.902	YES	C-T
cis-1,2-Dichloroethene	TO-14	6 of 7	na	na	5900000	23359184						YES	NT
trans-1,2-Dichloroethene	TO-14	6 of 7	na	na	6700	26527	J					YES	NT
Dichlorodifluoromethane (d)	TO-14	6 of 7	0.2	na	22000	108653		543265.3	0.299			YES	C-T
Ethylbenzene	TO-14	5 of 7	1	na	5800	25094		25093.9	0.014			YES	C-T
Freon 113	TO-14	2 of 7	27	na	31	237		8.8	0.000			NO	C-T
Freon 114	TO-14	1 of 7	na	na	280	1954						NO	GN
Hexachlorobutadiene	TO-14	1 of 7	na	2.2E-05	29	309	J			0.007	0.004	NO	C-T
4-Methyl-2-pentanone (d)	TO-14	1 of 7	0.08	na	1600	6531		81632.7	0.045			YES	C-T
Methylene Chloride	TO-14	7 of 7	3	4.7E-07	19000	65918		21972.8	0.012	0.031	0.017	YES	C-T
Styrene	TO-14	2 of 7	1	5.7E-07	1100	4669	J	4669.4	0.003	0.003	0.001	NO	C-T
Tetrachloroethene	TO-14	4 of 7	na	5.2E-07	1200	8131	J			0.004	0.002	NO	C-T
Toluene	TO-14	6 of 7	0.4	na	62000	232816		582040.8	0.320			YES	C-T
1,2,4-Trichlorobenzene (d)	TO-14	1 of 7	0.009	na	37	273	J	30371.9	0.017			YES	C-T
1,2,4-Trimethylbenzene	TO-14	5 of 7	na	na	500	2449						YES	NT
1,3,5-Trimethylbenzene	TO-14	6 of 7	na	na	870	4261	J					YES	NT
1,1,1-Trichloroethane (d)	TO-14	3 of 7	1	na	1900	10314	J	10314.3	0.006			NO	C-T
Trichloroethene	TO-14	5 of 7	na	1.7E-06	5700	30478				0.052	0.029	YES	C-T
Trichlorofluoromethane (d)	TO-14	4 of 7	0.7	na	250	1398	J	1997.1	0.001			NO	C-T

TABLE E - 7
SELECTION OF CHEMICALS OF CONCERN FOR LANDFILL GAS/SOIL VAPOR
ROSE HILL REGIONAL LANDFILL

ANALYTE	ANALYTICAL METHOD	FREQUENCY OF HITS	RfC (mg/m^3) (T)	INHALATION UNIT RISK (ug/m^3)(T)	MAXIMUM (PPBV) (C)	MAXIMUM (ug/m^3)(a) (C)	FLAG	NON-CARC. RISK FACTOR (b) (R)	RATIO (c)	CARC. RISK FACTOR (b) (R)	RATIO (c)	SELECT	REASON
Vinyl Chloride	TO-14	6 of 7	na	8.4E-05	1200000	3085714				259.200	HF	YES	C-T
o-Xylene	TO-14	5 of 7	0.7	na	2500	10816		15451.9	0.008			NO	C-T
m,p-Xylene	TO-14	5 of 7	0.3	na	9400.00	40669		135564.6	0.075			YES	C-T
Sum of Columns								1818481.7	1.000	1.8	1.000		

Notes:

(a) - Maximum concentrations (ug/m^3)=[Max.(PPBV) x molecular weight/24.5].

(b) - Risk factor (R) = C x T, where C = maximum concentration of chemical and T = toxicity value of chemical.
(for carcinogenic compounds, T = inhalation unit risk factor; for noncarcinogens T = 1/chronic RfC).

(c) - Risk factor ratio calculated by R/SUM(R); no R or Ratio reported if RfC or inhalation unit risk factor is not available.

(d) - Chronic RfC taken from either HEAST 92 or HEAST 93 alternative methods.

na - Toxicity value data not available.

J - Value is approximate.

C-T - Chemical either included or excluded based on the carcinogenic and non-carcinogenic risk ratios: included if either ratio>0.01; excluded if both ratios < 0.01.

NT - Chemical was included due to lack of toxicity data.

GN - Chemical is generally not toxic and is therefore not included.

HF - Very high relative risk factor; not included in the summation of risks to avoid skewing ratios. Analyte still included as a COC based on its risk ratio.

TABLE E - 8 CHEMICALS OF CONCERN AT THE ROSE HILL REGIONAL LANDFILL SITE

CHEMICAL NAME	Groundwater	Residential Wells	Leachate	Surface Water	Sediment	Surface Soils	Landfill Gas	Residential Ambient Air ***
VOLATILE ORGANICS								
Acetone						x	x	
Benzene	x	x					x	x
Carbon Disulfide							x	
Chloroethane	x	x	x					
1,1 Dichloroethane	x						x	
1,1 Dichloroethene							x	
cis-1,2-Dichloroethene *	x		x				x	
trans-1,2-Dichloroethene							x	
Dichlorodifluoromethane							x	
Ethylbenzene							x	x
4-Methyl-2-pentanone							x	
Methylene Chloride							x	x
1,1,2,2-Tetrachloroethane								x
Toluene							x	x
1,2,4-Trichlorobenzene							x	
1,1,1-Trichloroethane								x
Trichloroethene		x					x	
1,2,4-Trimethylbenzene							x	
1,3,5-Trimethylbenzene							x	
Vinyl chloride **	x					x	x	x
m,p-Xylene							x	x
o-Xylene								x
SEMIVOLATILE ORGANICS								
2- Methylnaphthalene	x							
Benzo (a) anthracene						x		
Benzo (a) pyrene						x		
Benzo (b) fluoranthene						x		
Benzo (k) fluoranthene						x		
Chrysene						x		
Indeno (1,2,3 - c,d) pyrene						x		

TABLE E - 8 CHEMICALS OF CONCERN AT THE ROSE HILL REGIONAL LANDFILL SITE

CHEMICAL NAME	Groundwater	Residential Wells	Leachate	Surface Water	Sediment	Surface Soils	Landfill Gas	Residential Ambient Air ***
Bis (2-ethylhexyl) phthalate	x		x					
4-Chloro-3-methylphenol	x							
4-Methyl phenol		x						
Pentachlorophenol	x							
Acrylamide	x			x				
N N dimethylformamide	x	x		x				
PESTICIDES								
Dieldrin		x						
METALS								
Aluminum	x	x	x	x	x	x		
Antimony	x			x				
Arsenic	x		x		x	x		
Barium	x	x	x	x	x	x		
Beryllium	x		x		x	x		
Cadmium	x							
Chromium *	x		x		x	x		
Cobalt	x		x		x	x		
Copper	x	x	x		x	x		
Lead	x		x		x	x		
Manganese	x	x	x	x	x	x		
Mercury		x				x		
Nickel	x				x			
Selenium					x			
Thallium						x		
Vanadium	x		x		x	x		
Zinc	x	x			x			
INORGANICS								
Ammonia	x		x	x	x			
Sulfide	x	x		x	x			

* Laboratory reported 1,2-dichloroethene (total) in all media except soil gas; this was conservatively assumed to be cis-1,2-dichloroethane. Laboratory reported [total] chromium; this was conservatively assumed to be chromium VI.

** Vinyl chloride was the only chemical of concern used to evaluate potential future risk from indoor air exposure at nearby residences.

*** All chemicals detected in ambient air at nearby residences were included as chemicals of concern, except for those rejected during data validation.

TABLE E-9. WEIGHT OF EVIDENCE CLASSIFICATION

Group	Description
A	Human carcinogen
B1 or B2	Probable human carcinogen
B1 indicates that limited human data are available	
B2 indicates sufficient evidence in animals and inadequate or no evidence in humans	
C	Possible human carcinogen
D	Not classifiable as to human carcinogenicity
E	Evidence of noncarcinogenicity for humans

Source: U.S. EPA. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A) Interim Final, 1989.

TABLE E-10
POTENTIAL RISK FROM INGESTION OF SAUGATUCKET RIVER FISH
MAXIMUM CONCENTRATIONS USED FOR AN ADULT EXPOSURE

ANALYTE	Maximum Concentration in Water (ug/L)	Bioconcentration Factor (a) (L/kg)	Maximum Concentration in Fish (ug/kg)	Exposure Dose Chronic (b) (mg/kg/day)	Reference Dose (mg/kg/day)	Hazard Quotient (c)		Exposure Dose Lifetime (b) (mg/kg/day)	Slope Factor /(mg/kg/day)	Cancer Risk (d)
Carbon disulfide	14	na	---	---	0.1	---		---	na	---
Toluene	2	10.7	21.4	1.6E-05	0.2	7.9E-05		6.8E-06	na	---
Total xylenes	9	10.7 (e)	96.3	7.1E-05	2	3.6E-05		3.1E-05	na	---
										---
4,4'-DDT	0.0047	54000	253.8	1.9E-04	na	---		8.0E-05	0.24	1.9E-05
Methoxychlor	0.014	na	---	---	0.005	---		---	na	---
Dimethylphthalate	1	117 (e)	117	8.7E-05	10	8.7E-06		3.7E-05	na	---
										---
Aluminum	424	na	---	---	na	---		---	na	---
Antimony	25	1	25	1.8E-05	0.0004	4.6E-02		7.9E-06	na	---
Arsenic	4.1	44	180.4 (f)	1.3E-04	0.0003	4.4E-01		5.7E-05	1.75 (f)	1.0E-04
Barium	279	na	---	---	0.07	---		---	na	---
Calcium	27100	na	---	---	na	---		---	na	---
Copper	11.6	200	2320	1.7E-03	na	---		7.4E-04	na	---
Iron	34600	na	---	---	na	---		---	na	---
Magnesium	12900	na	---	---	na	---		---	na	---
Manganese	2030	na	---	---	0.005	---		---	na	---
Potassium	45000	na	---	---	na	---		---	na	---
Sodium	59900	na	---	---	na	---		---	na	---
Zinc	8.2	47	385.4	2.9E-04	0.3	9.5E-04		1.2E-04	na	---
Ammonia	1430	na	---	---	na	---		---	na	---
Sulfide	2200	na	---	---	na	---		---	na	---
Cyanide	10.2	na	---	---	0.02	---		---	na	---
				Total Hazard Index =		4.9E-01		Total Risk =		1.2E-04

NOTES:

(a) Bioconcentration factors were obtained from the "Superfund Public Health Evaluation Manual," EPA 540/1-86/060/

(b) Calculation for exposure dose :

INGESTION = EXPOSURE DOSE	Concentration in Water	x Bioconcentration Factor	x Fish Ingestion Rate	x Exposure Frequency	x Exposure Duration	x R.A.F.	/ Body Weight	x Averaging Time	x	Conversion Factors
	Concentration	B.C.F.	54	350	30	1	70	(g)	365 x	1E+06
	ug/L	L/kg	g/day	days/yr	years		kg	years	days/year	g-ug/mg-kg

(c) Hazard quotient = chronic exposere dose / RfD

(d) Cancer Risk = lifetime exposure dose x slope factor

(e) Due to limited availablility of BCFs, toluene BCF was used fo total xylenes,
DDT BCF was used for 4,4'-DDT, and diethylphthalate BCF was used for dimethylphthalate.

(f) Arsenic in fish is normally present in the form of low toxicity organo-arsenic complexes.

(g) Averaging times of 30 years for chronic doses and 70 years for lifetime doses were used.

nd = chemical not detected

na = BCF or toxicity value not available

--- = not calculated due to absence of data

TABLE E - 11

ROSE HILL SOLID WASTE LANDFILL VERSION: MAY-04-93
GAS GENERATION RATE CALCULATION
METHOD 1: SCHOLL CANYON MODEL

.MULA: Q = 2 * [k * L * R [exp(-k*(t-lag))]

WHERE:
Q = landfill gas generation rate @ time t (ft^3)
L = potential gas generation capacity of refuse (ft^3/ton)
R = annual refuse acceptance rate in landfill (tons/yr)
k = gas generation rate, or refuse decay rate (1/yr)
t = time since refuse placement (yr)
lag = time to reach anaerobic conditions (yr)

INPUT PARAMETERS:

L =	7400	Year closed =	1982	Avg. refuse 1967-1970:	18667
k =	0.08	Current year =	1993	Avg. refuse 1970-1976:	10889
lag =	2	Time since closure =	11	Avg. refuse 1976-1977:	24000
				Avg. refuse 1978-1982:	20400

YEAR	TIME SINCE REFUSE PLACEMENT	GENERATION RATE 1993
1968	25	3.51E+06
1969	24	3.80E+06
1970	23	4.12E+06
1971	22	2.60E+06
1972	21	2.82E+06
1973	20	3.05E+06
1974	19	3.31E+06
1975	18	3.58E+06
1976	17	8.56E+06
1977	16	9.27E+06
1978	15	8.54E+06
1979	14	9.25E+06
1980	13	1.00E+07
1981	12	1.09E+07
1982	11	1.18E+07
1983	-	0.00E+00
1984	-	0.00E+00
1985	-	0.00E+00
1986	-	0.00E+00
1987	-	0.00E+00
1988	-	0.00E+00
1989	-	0.00E+00
1990	-	0.00E+00
1991	-	0.00E+00
1992	-	0.00E+00
1993	-	0.00E+00
TOTAL ANNUAL CURRENT PRODUCTION		9.50E+07 ft^3/yr
		8.54E+04 cm^3/s

180 cfm

m^3/sec = 180 ft^3/min x 1 m^3/35.28 ft^3 x 1 min./60 sec.
= 0.085034 m^3/sec

TABLE E - 12

ROSE HILL BULKY WASTE LANDFILL
GAS GENERATION RATE CALCULATION
METHOD 1: SCHOLL CANYON MODEL (REVISED)

FORMULA: $Q = 2 * [k * L * R [\exp(-k*(t-lag))]]$

WHERE:
- Q = landfill gas generation rate @ time t (ft^3)
- L = potential methane gas generation capacity of refuse (ft^3/ton)
- R = annual refuse acceptance rate in landfill (tons/yr)
- k = methane production rate (1/yr)
- t = time since refuse placement (yr)
- lag = time to reach conditions suitable for methane production (yr)

INPUT PARAMETERS:

L =	7400	Year closed =	1984
k =	0.08	Current year =	1993
lag =	2	Time since closure =	9

YEAR	REFUSE ACCEPTED	TIME SINCE PLACEMENT	PRODUCTION
1982	11900	11	6,858,145 cf/yr
1983	17000	10	10,613,342 cf/yr
			17,471,486 cf/yr
			33.2 cfm

m^3/sec = 33 ft^3/min x 1 m^3/35.28 ft^3 x 1 min./60 sec.
= 0.0155895 m^3/sec

TABLE E-13. ROSE HILL - SEWAGE SLUDGE GAS EMISSION CALCULATION DFFUSIONAL FLUX

Chemical Name	Selected Soil Gas Conc. RME Case (mg/m^3)	Avg. Case (mg/m^3)	Diffusion Coefficient @30C,1atm (cm^2/s)	Diffusion Coefficient @Field TP (cm^2/s)	Diffusional Flux RME Case (mg/m^2*s)	Diffusional Flux Avg. Case (mg/m^2*s)	Emission Rate RME Case (mg/s)	Emission Rate Avg. Case (mg/s)
Acetone	0.081	0.081	0.11	0.10	-2.95E-07	-2.95E-07	-0.0107	-0.0107
Benzene	0	0	0.09	0.09	0	0	0	0
Carbon Disulfide	0	0	0.09	0.09	0	0	0	0
Chloroethane	0	0	0.11	0.10	0	0	0	0
Dichlorodifluoromethane	0	0	0.09	0.08	0	0	0	0
1,1-Dichloroethane	0	0	0.10	0.09	0	0	0	0
1,1-Dichloroethene	0	0	0.10	0.09	0	0	0	0
cis-1,2-Dichloroethene	0	0	0.08	0.08	0	0	0	0
trans-1,2-Dichloroethene	0	0	0.08	0.08	0	0	0	0
Ethylbenzene	0.01	0.01	0.07	0.07	-2.36E-08	-2.36E-08	-0.0009	-0.0009
Methylene Chloride	0.002	0.002	0.12	0.11	-8.09E-09	-8.09E-09	-0.0003	-0.0003
4-Methyl-2-pentanone	0	0	0.08	0.07	0	0	0	0
Toluene	0	0	0.08	0.08	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0.07	0.07	0	0	0	0
Trichloroethene	0	0	0.09	0.08	0	0	0	0
1,2,4-Trimethylbenzene	0.005	0.005	0.09	0.08	-1.53E-08	-1.53E-08	-0.0006	-0.0006
1,3,5-Trimethylbenzene	0.003	0.003	0.09	0.08	-9.18E-09	-9.18E-09	-0.0003	-0.0003
Vinyl Chloride	0	0	0.11	0.10	0	0	0	0
m,p-Xylene	0.02	0.02	0.08	0.07	-5.07E-08	-5.07E-08	-0.0018	-0.0018

FIXED VALUES:

Air-filled porosity, phi	0.4
Tortuosity, theta	0.737031377
Depth of measurement, d	1.5
Temperature of soil gas	16
Pressure of soil gas	0
Cross-sectional area	36118

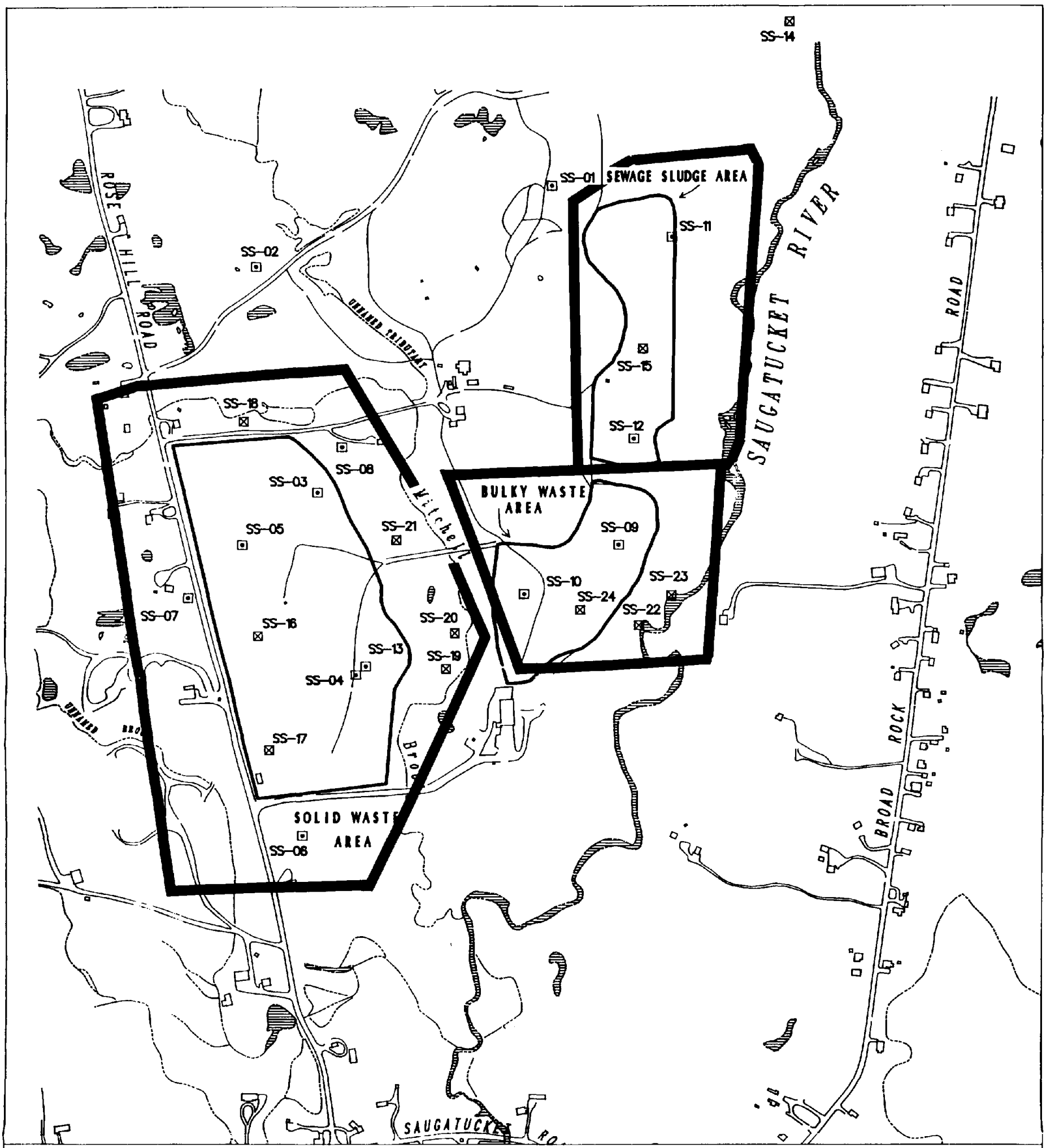
TABLE E-14. ROSE HILL - SEWAGE SLUDGE GAS EMISSION CALCULATION PRESSURE FLUX

Chemical Name	Selected Soil Gas Conc. RME Case (mg/m^3)	Avg. Case (mg/m^3)	Mean Gas Velocity (cm/sec)	Pressure Induced Flux RME Case (mg/m^2*s)	Pressure Induced Flux Avg. Case (mg/m^2*s)	Emission Rate RME Case (mg/s)	Emission Rate Avg. Case (mg/s)
Acetone	0.081	0.081	-1.19E-03	-9.63E-07	-9.63E-07	-0.0348	-0.0348
Benzene	0	0	-1.19E-03	0	0	0	0
Carbon Disulfide	0	0	-1.19E-03	0	0	0	0
Chloroethane	0	0	-1.19E-03	0	0	0	0
Dichlorodifluoromethane	0	0	-1.19E-03	0	0	0	0
1,1-Dichloroethane	0	0	-1.19E-03	0	0	0	0
1,1-Dichloroethene	0	0	-1.19E-03	0	0	0	0
cis-1,2-Dichloroethene	0	0	-1.19E-03	0	0	0	0
trans-1,2-Dichloroethene	0	0	-1.19E-03	0	0	0	0
Ethylbenzene	0.01	0.01	-1.19E-03	-1.19E-07	-1.19E-07	-0.0043	-0.0043
Methylene Chloride	0.002	0.002	-1.19E-03	-2.38E-08	-2.38E-08	-0.0009	-0.0009
4-Methyl-2-pentanone	0	0	-1.19E-03	0	0	0	0
Toluene	0	0	-1.19E-03	0	0	0	0
1,2,4-Trichlorobenzene	0	0	-1.19E-03	0	0	0	0
Trichloroethene	0	0	-1.19E-03	0	0	0	0
1,2,4-Trimethylbenzene	0.005	0.005	-1.19E-03	-5.94E-08	-5.94E-08	-0.0021	-0.0021
1,3,5-Trimethylbenzene	0.003	0.003	-1.19E-03	-3.57E-08	-3.57E-08	-0.0013	-0.0013
Vinyl Chloride	0	0	-1.19E-03	0	0	0	0
m,p-Xylene	0.02	0.02	-1.19E-03	-2.38E-07	-2.38E-07	-0.0086	-0.0086

FIXED VALUES:

Air-filled porosity, phi	0.4
Soil permeabilty (hyd.)	9.420E-07
Soil permeability (gas)	4.754E-06
Specific Weight LFG@NTP	13.2
Viscosity LFG@NTP	1.210E-05
Specific Weight H2O@NTP	9805
Viscosity H2O@NTP	1.781E-03
Depth of measurement, d	1.5
Temperature of soil gas	17
Pressure of soil gas	3
Cross-sectional area	36118

E-7 FIGURES REFERENCED IN SECTIONS E-1 THROUGH E-5



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Surface Soils, 0-6" Sampling Depth

Surface Soils, 0-12" Sampling Depth

SCALE IN FEET

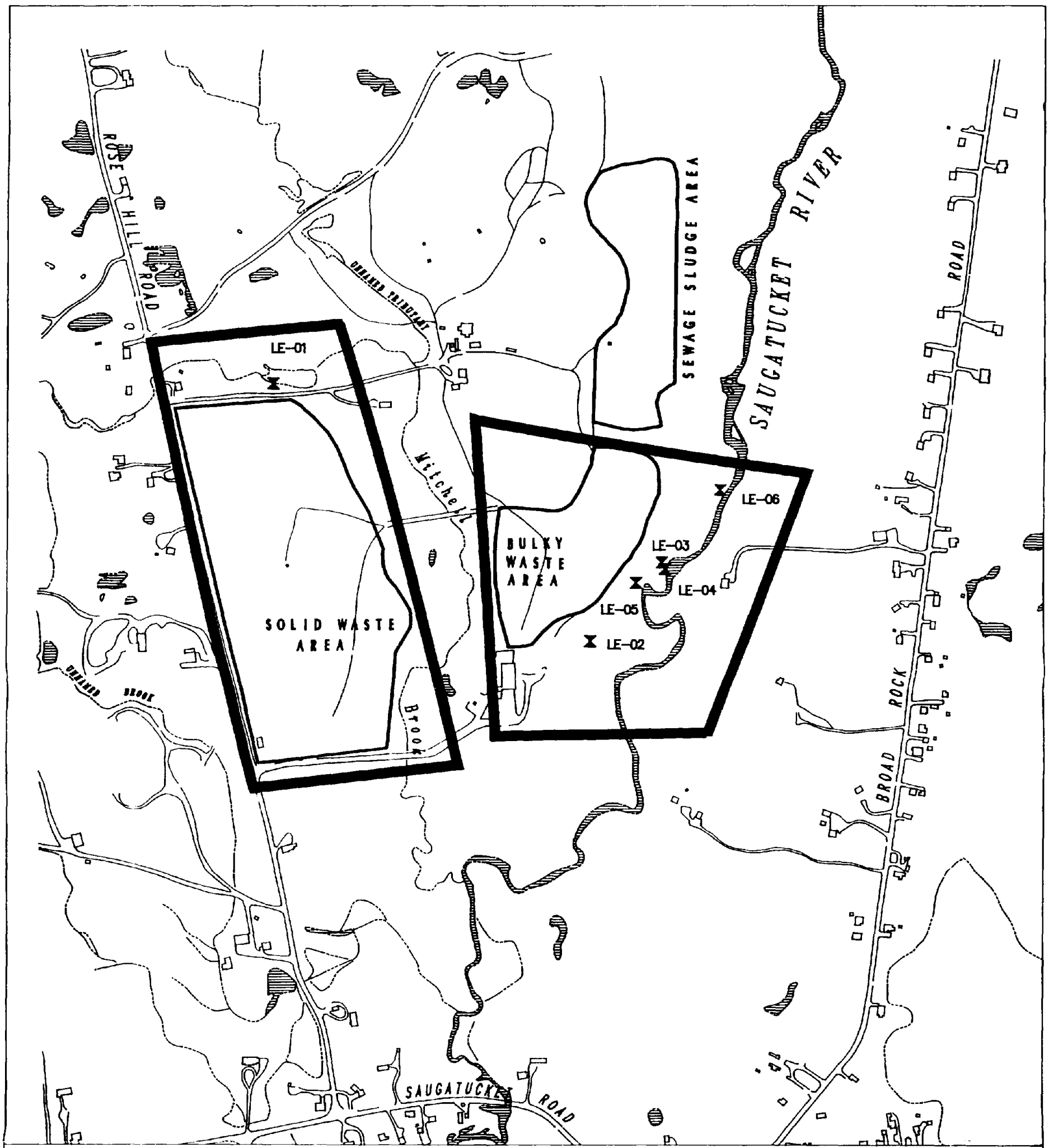
500 0 100 500

FIGURE E-1.
SURFACE SOIL SAMPLING LOCATIONS BY LANDFILL AREA

ROSE HILL REGIONAL LANDFILL

SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Leachate Sampling Location

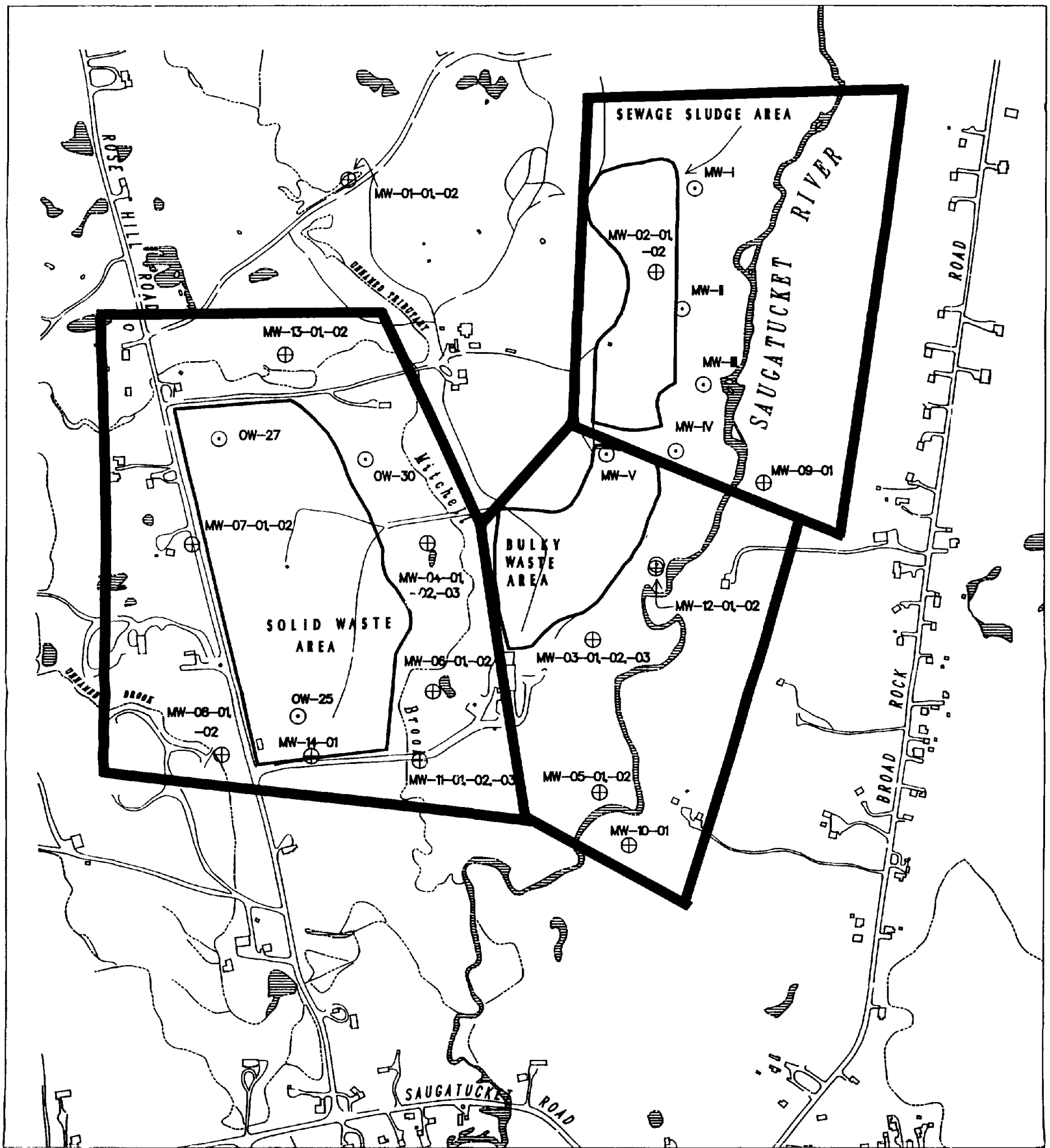
SCALE IN FEET

500 0 100 500

FIGURE E-2.
LEACHATE SAMPLING LOCATIONS BY LANDFILL AREA

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Primary Road
Secondary Road
Stream or Brook
Landfill Area
Lake, Pond, or River
Existing Monitoring Well
New Monitoring Well

SCALE IN FEET
500 0 100 500

FIGURE E-3.
ON-SITE MONITORING WELL SAMPLING LOCATIONS BY LANDFILL AREA

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

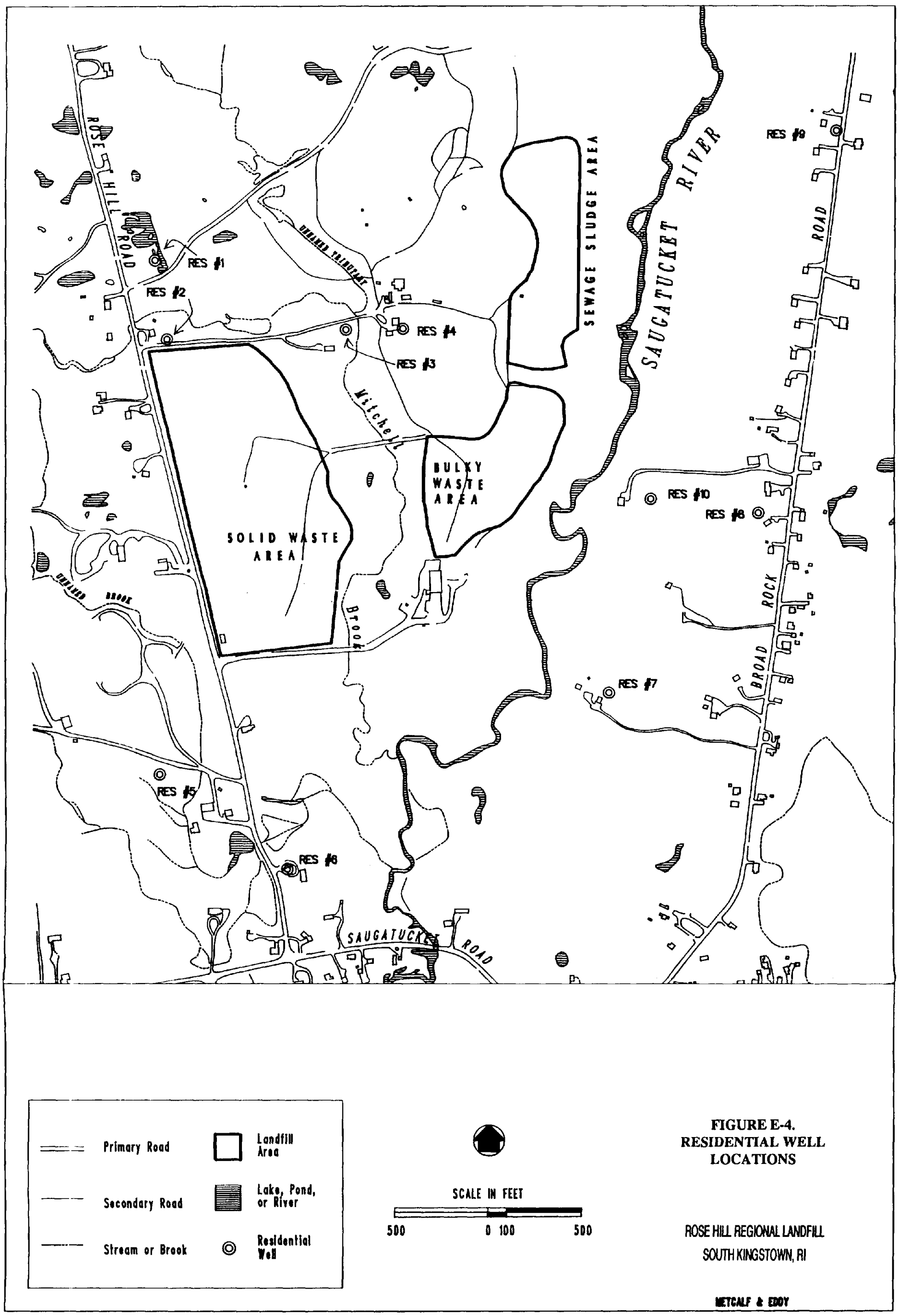


FIGURE E-4.
RESIDENTIAL WELL LOCATIONS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

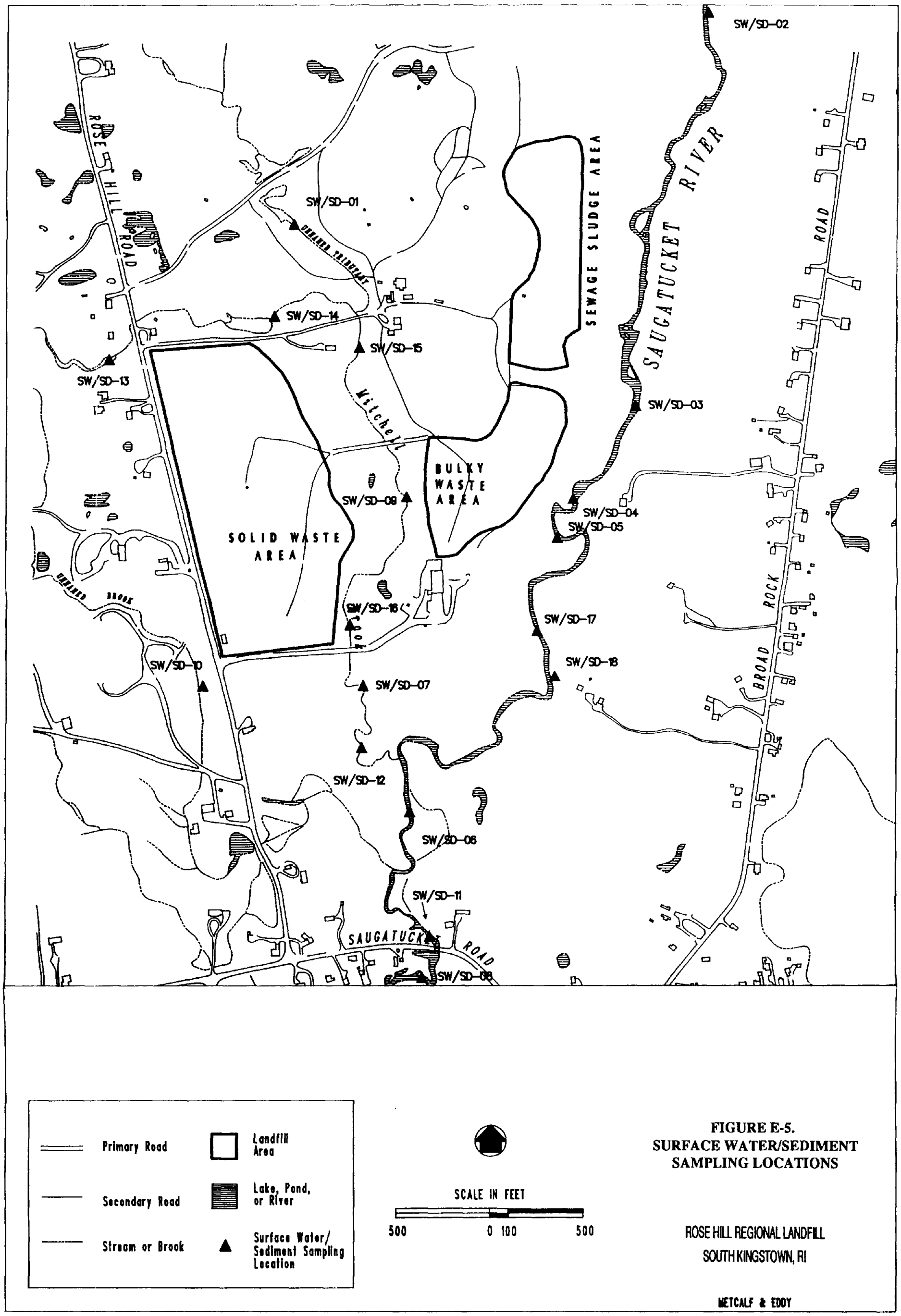
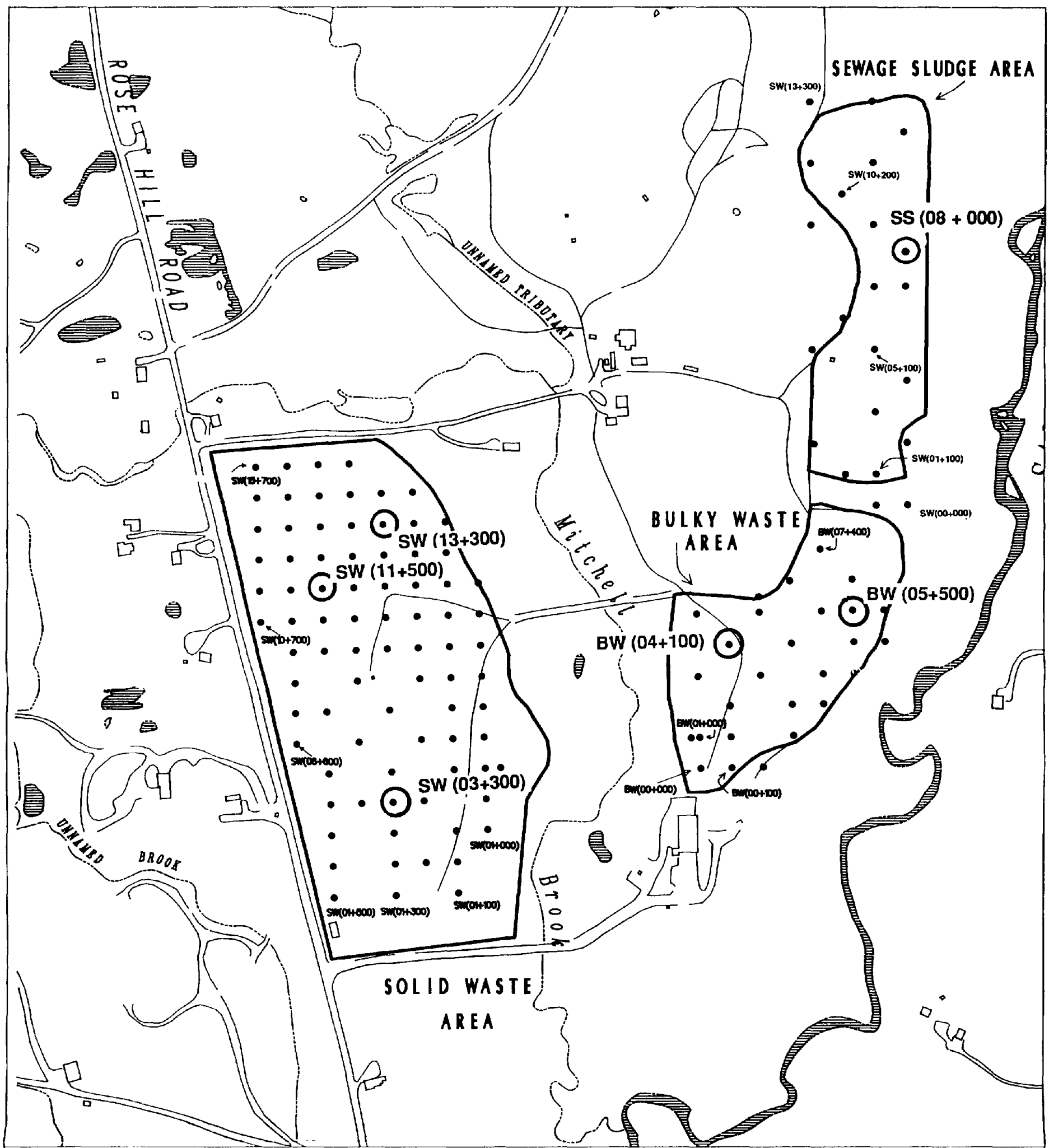


FIGURE E-5.
SURFACE WATER/SEDIMENT SAMPLING LOCATIONS



Note: Not all points are labeled due to limitations in the available space.
Sampling locations were approximately based on a 100-foot-by-100-foot grid.

⊙ **Locations with SUMMA Canister Data**

Primary Road	Landfill Area
Secondary Road	Lake, Pond, or River
Stream or Brook	Landfill Gas Sampling Location

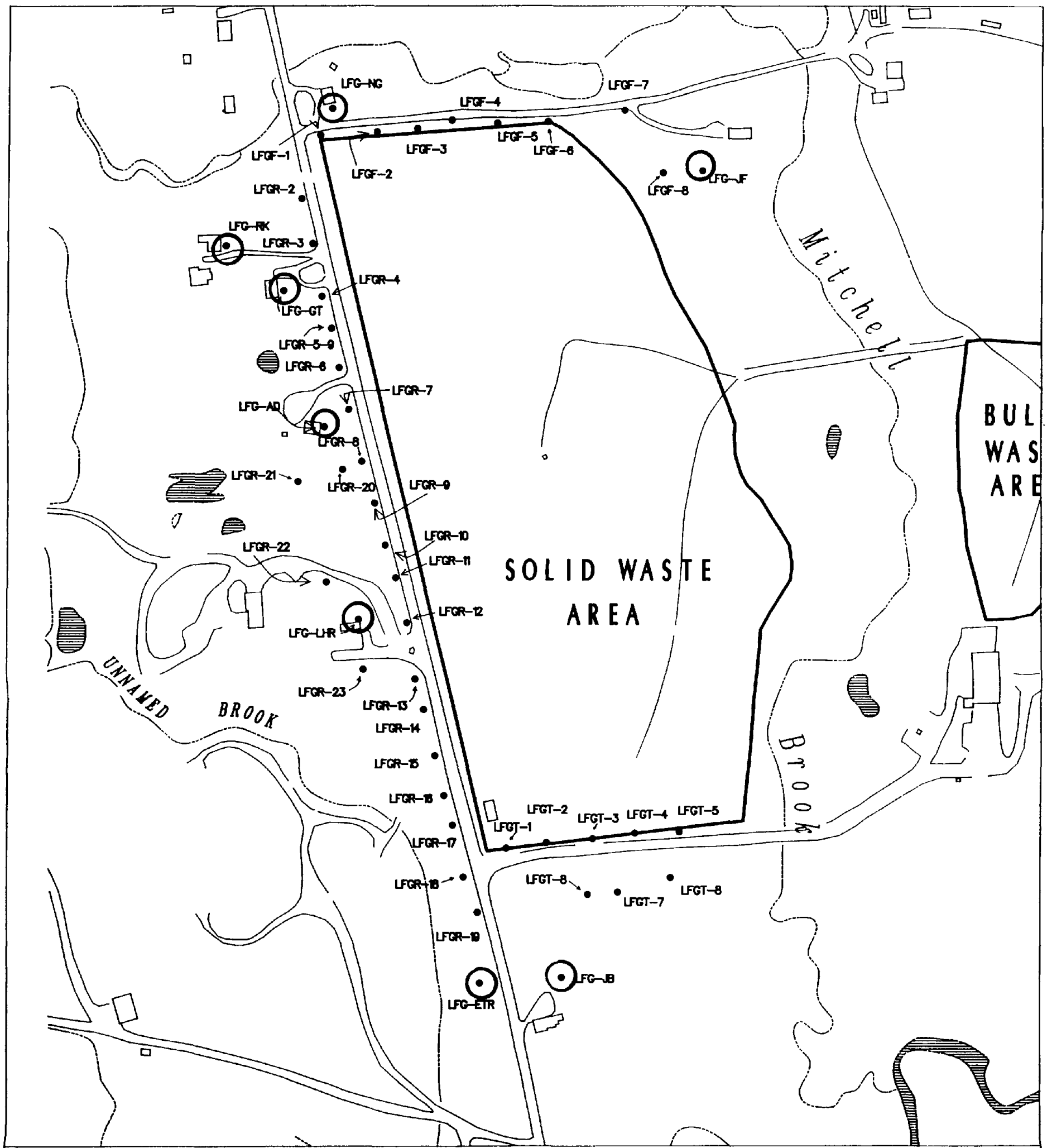
SCALE IN FEET

350 0 100 350

FIGURE E-6.
TEMPORARY LANDFILL GAS SAMPLING LOCATIONS SAMPLED IN JUNE 1991

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY



Residential Monitoring Points

Primary Road

Secondary Road

Stream or Brook

Landfill Area

Lake, Pond, or River

Permanent Sampling Location

SCALE IN FEET

250 0 100 250

FIGURE E-7.
RESIDENTIAL LANDFILL GAS MONITORING POINTS

ROSE HILL REGIONAL LANDFILL
SOUTH KINGSTOWN, RI

METCALF & EDDY

Appendix F

APPENDIX F
ECOLOGICAL EVALUATION

F-1 Leachate Toxicity Test

F-2 Sediment Toxicity Test

F-3 Iron Precipitation/Flocculation in the Sediments of the Lower Saugatucket River

F-1 LEACHATE TOXICITY TEST

Environmental Services Assistance Team
U.S. EPA REGION I
EPA Contract 68-D1-1058

Toxicant Testing
Rose Hill Landfill Site
Leachate Samples
Pimephales promelas
Ceriodaphnia dubia

TID No. 01-9204-45

Submitted to:

ESAT Regional Project Officer
Environmental Services Division
U. S. EPA Region I
60 Westview St.
Lexington, Massachusetts 02173

Submitted by:

ESAT Region I
Lockheed Engineering and Sciences Company
19B Crosby Drive
Bedford, Massachusetts 01730

April 23, 1992

INTRODUCTION

As part of the Remedial Investigation of the Rose Hill Landfill Site, toxicity tests were performed, during the month of April, on two freshwater organisms. These organisms, the fathead minnow, Pimephales promelas and the cladoceran, Ceriodaphnia dubia, are routinely used for toxicity testing at the EPA/ESD, Biology Section Laboratory in Lexington, Massachusetts.

Test methods utilized included the 48 hour acute test and the 7 day chronic static renewal test. The young of P. promelas and C. dubia were exposed to various concentrations of the leachate sample. The tests are performed to assess the sensitivity and response of these organisms to the leachate. For the acute test, the statistical endpoints determined from the data include: median lethal concentration (LC50) and no observed acute effect level (NOAEL). For the chronic testing, the endpoints are determined for survival and growth/reproduction. These include, inhibition concentration levels (IC25 and IC50), and 7 day LC50s, and no and lowest observed effect concentration (NOEC and LOEC).

MATERIALS AND METHODS

The method procedures used follow those outlined in the EPA manual, Short-Term Methods For Estimating The Chronic Toxicity Of Effluents and Receiving Waters To Freshwater Organisms, 2nd Edition, (Methods 1000.0 and 1002.0), EPA/600/489/001. The sample concentrations used were, 0(control), 3.125%, 6.25%, 12.5%, 25%, 50%, and 100% for both acute and chronic tests. For C. dubia tests, there were 10 replicates per concentration initially. During the C. dubia chronic test one replicate was lost in the 3.125% concentration. For the P. promelas there were 4 replicates per concentration. All organisms were maintained at 25 degrees Celsius +/- 1 degree and 16:8 hour light/dark cycle. Measurement endpoints were monitored every 24 hours and recorded on standard lab data sheets. Initial and final chemistry on the test dilutions included, pH, alkalinity, conductivity, temperature, DO and hardness.

Fresh samples were received at several times during the week. All tests were initiated with a sample received on 4-07-92. The chronic tests were renewed daily. Fresh samples for renewals were received on 4-8-92 and 4-10-92.

Statistical analyses were then performed on the accumulated data. For P. promelas and C. dubia acute test endpoints were calculated for the LC50 and NOAEL(where less than 10% mortality occurred) and trimmed Spearman-Karber method, respectively.

MATERIALS AND METHODS (cont'd)

Statistics were performed on chronic testing data for both organisms. For P. promelas test results, survival data went through a non-parametric statistical test to determine the LC50 using the trimmed Spearman-Karber method. Another set of tests were done, namely, Shapiro-Wilk's Test for normality, the Bartlett's Test for variance, and finally the Dunnett's, to determine the NOEC and LOEC. The growth data endpoints were determined, using chronic data (mean dry weight), to calculate the IC25 via the ICP program, a point estimation technique, and again the NOEC and LOEC through the Shapiro-Wilk's, Bartlett's and Dunnett's Tests. Statistical analysis was also performed on the data gathered from the C. dubia 7-day chronic test. The data was run through the Wilcoxon Rank Sum Test with Bonferroni Adjustment, to determine the concentration of toxicant significant, relative to the control, and ultimately the NOEC and the LOEC.

RESULTS

All raw data and statistical information generated relating to both P. promelas and C. dubia testing are contained in the following appendices and tables. Appendix I includes the data summary sheets for all tests, and the statistical information on the C. dubia acute test. Appendix II contains the statistical program print-outs and the laboratory data sheets. Figures 1 and 2 below summarize the statistical findings of these tests.

Table 1 presents acute test raw data for the C. dubia acute test. Table 2 presents the statistical results. In Table 2 Spearman-Karber results were used to illustrate an LC50 of 67.8% with 101% and 45.5% as the 95% confidence limits. A visual analysis indicated a NOAEL of 25%. Table 3 presents the acute test raw data for P. promelas. A visual analysis of this data indicates an NOAEL of 50%. No LC50 was evident from this test.

Table 4 lists the raw data for the C. dubia chronic test. For this test the statistical information is found in appendix II. An LC50 could not be determined from this test. There was no statistically significant effect on survival. The Wilcoxon Rank Sum Test with Bonferroni Adjustment indicated a reproduction NOEC of 50% and an LOEC of 100%.

Tables 5 and 6 list the raw data and dry weights for the P. promelas chronic test. The statistical results are found in Appendix II. A 7-day LC50 of 58.1% was determined using the Spearman-Karber analysis, with 95% confidence limits of 71.7% and 47.1%. The Dunnett's Test shows survival NOEC and LOEC values of 50% and 100%, respectively.

RESULTS (cont'd)

Using growth data (mean weight) and the Bootstrap Procedure, an IC25 of 33.8% and an IC50 of 56.8% were determined. Utilizing the same data and the Dunnett's Test, significance was determined and a NOEC of 25% and an LOEC of 50% were identified.

DISCUSSION

The C. dubia acute test indicated an acute effect from this leachate sample, with an LC50 of 67.8%. The chronic test data for C. dubia do not indicate a statistically significant effect on survival for the sample. While this may appear to be contradictory, it should be noted that there are procedural differences to be considered i.e. feeding and renewal in the chronic test, which may account for some of this discrepancy. Reproductive effects were indicated, with an LOEC of 100% and an NOEC of 50%, based on the Wilcoxon Rank Sum Test with Bonferroni Adjustment.

Acute test data for P. promelas indicate a visual NOAEL of 50%. No LC50 could be determined from this test, because there was no concentration which resulted in the death of 50% of the organisms. The chronic test 7-day survival data indicated an LC50 of 58.1% based on the Spearman-Karber analysis. The Dunnetts test run with the chronic survival data, indicated an NOEC of 50% and an LOEC of 100%. Statistical analysis of the growth data for P. promelas indicate an IC25 of 33.8% and an IC50 of 56.8%. The Dunnetts test run on the same data indicated a NOEC of 25% and an LOEC of 50%.

The leachate samples were rust-colored on arrival at the laboratory. When the dilutions were in preparation a precipitate was noticable and tended to floc in the containers used for testing. The fathead minnows occasionally seemed to get caught up in the floc as it settled. From these observations, it would appear that, the effects observed may be due to a combination of chemical toxicity and physical stress on the test organisms.

Figure 1
C. dubia Test Summary

C. dubia Acute Test	Comments
SPEARMAN-KARBER 48 hour LC50 = 67.8%	95% CONFIDENCE LIMITS 101.0% and 45.5%
NOAEL = 25%	visual analysis
C. dubia Chronic Test	
Survival NOEC, LOEC	None found
Reproduction NOEC = 50% LOEC = 100%	Wilcoxon Rank Sum Test With Bonferroni Adjustment
7-day LC50	None found

Figure 2
P. promelas Test Summary

P. promelas Acute Test	
LC50	None evident from this test
NOAEL = 50%	Visual Analysis
P. promelas Chronic Test	
7-day LC50 = 58.1% Spearman-Karber analysis	95% confidence limits 71.7% and 47.1%
Survival data NOEC = 50% LOEC = 100%	Dunnett's Test
7-day IC25 - Growth= 33.8% 7-day IC50 - Growth= 56.8%	Bootstrap Procedure
Growth Data NOEC = 25% LOEC = 50%	Dunnett's Test

Appendix I

TABLE 1

****

Tested site: Rose Hill Landfill Site
Location: Leachate
Sample ID:
Sample Number:
Type Test: Acute Toxicity
Organism: Ceriodaphnia dubia
Date Test Started: April 7, 1992
Time Started: 15:00 hours
No. Replicates: 10
No. Organisms/Replicate: 2
Data analysis: Spearman-Karber

Concentration	No. Dead-24 hrs.	No. Dead-48 hrs.
Control	0	0
3.125%	0	0
6.25%	0	0
12.5%	1	1
25%	0	1
50%	1	6
100%	1	15

LC50 = 67.83

95% Confidence Interval
upper limit= 101.0 lower limit= 45.5

NOAEL = 25%

Remarks:

Table 2

Test Start Date: 04-07-92 Duration: 48 Hours
Sample: Rose Hill Leachate Species: Ceriodaphnia dubia

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM:	25.00%
LC50:	67.830
95% LOWER CONFIDENCE:	45.544
95% UPPER CONFIDENCE:	101.022

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
3.13	20.	0.	.00	.9537D-04
6.25	20.	0.	.00	.9537D-04
12.50	20.	1.	5.00	.2003D-02
25.00	20.	1.	5.00	.2003D-02
50.00	20.	6.	30.00	.5766D+01
100.00	20.	15.	75.00	.2069D+01

THE BINOMIAL TEST SHOWS THAT 25.00 AND 100.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 97.9285 PERCENT.
AN APPROXIMATE LC50 FOR THIS DATA SET IS 67.853

RESULTS USING MOVING AVERAGE

SPAN	G	LC50	95% CONFIDENCE LIMIT	
2	.159	67.41	52.99	96.03

****** RESULTS CALCULATED BY PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT
6	.168	1.00	.57

SLOPE = 3.02
95% CONFIDENCE LIMITS: 1.78 AND 4.26

LC50= 67.13
95% CONFIDENCE LIMITS: 51.61 AND 98.01

LC1 = 11.37
95% CONFIDENCE LIMITS: 3.82 AND 18.52

METHOD	LC50	CONFIDENCE LIMITS LOWER	UPPER	SPAN
BINOMIAL	67.853	25.000	100.000	75.000
MAA	67.412	52.993	96.030	43.036
PROBIT	67.130	51.607	98.012	46.405
SPEARMAN	67.830	45.544	101.022	55.477

**** = LIMIT DOES NOT EXIST

TABLE 3

****

Tested site: Rose Hill Landfill
Location: Leachate
Sample ID:
Sample Number:
Type Test: Acute Toxicity
Organism: Pimephales promelas
Date Test Started: April 8, 1992
Time Started: 1500 hours
No. Replicates: 3
No. Organisms/Replicate: 10
Data analysis: Visual

Concentration	No. Dead-24 hrs.	No. Dead-48 hrs.
Control	0	0
3.125%	0	0
6.25%	0	0
12.5%	1	1
25%	0	0
50%	0	0
100%	2	5

No LC50 exists based on this test.
NOAEL = 50%

Remarks:

TABLE 4

****

Site tested: Rose Hill Leachate
Location: S. Kingston, RI
Type test: Survival and Reproduction Test
Organism: Ceriodaphnia dubia
Test start Date: April 07, 1992
Time start: 1430 hours
No. Replicates: 10
No. Organisms/Rep: 1
Data Analysis: Fisher's test to analyze mortality data first, transforming survival data to arc sine values. Reproduction data analyzed using Dunnett's or Steel's test.

Concentration	Avg Young Ea Female	Replicate Number 1	2	3	4	5	6	7	8	9	10
		TOTAL NO. YOUNG									
Control	21.3	20	20	26	15	12	27	34	20	17	22
3.125 %	14.7	24	D	25	21	D	19	19	D	24	T
6.25 %	17.3	25	0	D	21	0	26	27	22	D	D
12.5 %	13.4	22	14	0	24	20	24	12	18	0	D
25.0 %	11.8	22	0	0	0	18	10	17	0	18	22
50.0 %	18.0	18	19	20	12	10	1	18	25	21	18
100 %	6.4	0	2	0	12	0	9	9	6	0	7

*Survival significantly different than control based on Fisher's Exact Test (P = .05)

NOTE-T denotes C. dubia lost in transfer

Concentration	Percent Survival day 2	day 7
Control	100%	100%
3.125 %	100%	90%
6.25 %	80%	80%
12.5 %	90%	90%
25.0 %	80%	80%
50.0 %	70%	60%
100 %	0%	0%

TABLE 5

****

Tested site: Rose Hill Leachate
Location: S. Kingston, RI
Type test: 7-Day Larval Growth and Survival
Organism: Pimephales promelas
Test start date: April 08, 1992
Time start: 15:00 hours
No. Replicates: 4
No. Organisms/Rep: 10
Data analysis: MINNOW program (under EPISTAT) or analyze survival data with Dunnett's or Steel's Many-One Rank Test, transforming data to arc sine values. Growth data may be analyzed using Dunnett's test.

SURVIVAL DATA	Number Alive				Percent
Concentration	Rep 1	Rep 2	Rep 3	Rep 4	Mean Survival
Control	7	10	9	7	82.5%
3.125 %	7	9	7	9	80.0%
6.25 %	8	9	9	8	85.0%
12.5 %	10	9	8	6	82.5%
25.0 %	8	9	9	6	80.0%
50.0 %	9	10	6	4	72.5 %
100.0 %	0	0	1	0	2.5 %

GROWTH DATA	weight in mg.				Mean weight
conc.(rep1-4)	Rep1	Rep 2	Rep 3	Rep 4	per fish (mg)
Control (g,n,o,v)	0.40	0.43	0.34	0.44	0.40
3.125 % (b,f,k,z)	0.41	0.50	0.38	0.40	0.43
6.25 % (c,d,h,q)	0.39	0.32	0.49	0.44	0.41
12.50 % (aa,m,p,s)	0.38	0.38	0.44	0.40	0.40
25.0 % (a,j,r,x)	0.32	0.37	0.41	0.31	0.35
50.0 % (bb,l,u,y)	0.23	0.25	0.23	0.25	0.24
100 % (i)	0				0

TABLE 6 FATHEAD MINNOW SURVIVAL & GROWTH TEST

****

Tested site: Rose Hill Landfill Leachate
Location: Kingston, RI
Type test: 7-Day Larval Growth and Survival
Organism: Pimephales promelas
Test start date: 04-07-92
Time start: 1400 hours
No. Replicates: 4
No. Organisms/Rep: 10
Data analysis: Survival data analyzed with Dunnett's or Steel's Many One Rank Test. Growth Data is analyzed using Dunnett's Test or Bonferroni's T test.

GROWTH DATA weight in gm.

(%)/ ID	Tray No.	No. Live Fish	Tray Wt	Final Wt	Total Fish Wt	Mean Fish Wt for Conc.
Control/G	14	7	1.5524	1.5252	0.003	
Control/N	7	7	1.5571	1.5601	0.003	
Control/O	17	9	1.5862	1.5893	0.0031	
Control/V	8	10	1.5845	1.5889	0.0044	0.00041
3.125/B	19	9	1.537	1.5407	0.0037	
3.125/F	18	7	1.5462	1.5497	0.0035	
3.125/K	6	9	1.5598	1.5632	0.0034	
3.125/Z	3	7	1.5781	1.5808	0.0027	0.0042
6.25/C	11	8	1.5807	1.5838	0.0031	
6.25/D	15	9	1.5585	1.5614	0.0029	
6.25/H	12	9	1.5041	1.5085	0.0044	
6.25/Q	16	8	1.5573	1.5608	0.0035	0.00041
12.5/AA	26	9	1.604	1.6074	0.0034	
12.5/M	24	6	1.5728	1.5751	0.0023	
12.5/P	13	10	1.4876	1.492	0.0044	
12.5/S	23	8	1.5766	1.5798	0.0032	0.0004

TABLE 6-PAGE 2

FATHEAD MINNOW SURVIVAL & GROWTH TEST

****

Tested site: Rose Hill Landfill Leachate
Location: Kingston, RI
Type test: 7-Day Larval Growth and Survival
Organism: Pimephales promelas
Test start date: 04-07-92
Time start: 1400 hours
No. Replicates: 4
No. Organisms/Rep: 10
Data analysis: Survival data analyzed with Dunnett's or Steel's Many One Rank Test. Growth Data is analyzed using Dunnett's Test or Bonferroni's T test.

GROWTH DATA weight in gm.

(%)/ ID	Tray No.	No. Live Fish	Tray Wt	Final Wt	Total Fish Wt	Mean Fish Wt for Conc.
25.0/A	22	9	1.572	1.5749	0.0029	
25.0/J	21	9	1.5189	1.5222	0.0033	
25.0/R	25	4	1.6033	1.6044	0.0011	
25.0/X	20	8	1.4988	1.5013	0.0025	0.00033
50.0/BB	4	4	1.5797	1.5806	0.0009	
50.0/L	1	6	1.5036	1.5051	0.0015	
50.0/U	2	9	1.4856	1.4877	0.0021	
50.0/Y	5	10	1.5758	1.5783	0.0025	0.00058
100.0/I	10	1	1.5338	1.5338	0	

Appendix II

Reproduction decreased in 100%.

ROSE HILL CERIODAPHNIA REPRODUCTION
File: rhcerrep Transform: NO TRANSFORMATION

-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.623	16.698	26.358	16.698	4.623
OBSERVED	1	25	15	26	2

Calculated Chi-Square goodness of fit test statistic = 18.5314
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

TITLE: ROSE HILL CERIODAPHNIA REPRODUCTION
FILE: rhcerrep
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 7

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Control	1	20.0000	20.0000
1	Control	2	20.0000	20.0000
1	Control	3	26.0000	26.0000
1	Control	4	15.0000	15.0000

1	Control	7	34.0000		34.0000
1	Control	8	20.0000		20.0000
1	Control	9	17.0000		17.0000
1	Control	10	22.0000		22.0000
2	3.125%	1	24.0000		24.0000
2	3.125%	2	[redacted]	dead	0.0000
2	3.125%	3	25.0000		25.0000
2	3.125%	4	21.0000		21.0000
2	3.125%	5	[redacted]	dead	0.0000
2	3.125%	6	19.0000		19.0000
2	3.125%	7	19.0000		19.0000
2	3.125%	8	[redacted]	dead	0.0000
2	3.125%	9	24.0000		24.0000
3	6.25%	1	25.0000		25.0000
3	6.25%	2	[redacted]	dead	0.0000
3	6.25%	3	[redacted]	dead	0.0000
3	6.25%	4	21.0000		21.0000
3	6.25%	5	[redacted]	dead	0.0000
3	6.25%	6	26.0000		26.0000
3	6.25%	7	27.0000		27.0000
3	6.25%	8	22.0000		22.0000
3	6.25%	9	[redacted]	alive	0.0000
3	6.25%	10	[redacted]	alive	0.0000
4	12.5%	1	22.0000		22.0000
4	12.5%	2	14.0000		14.0000
4	12.5%	3	[redacted]	dead	0.0000
4	12.5%	4	24.0000		24.0000
4	12.5%	5	20.0000		20.0000
4	12.5%	6	24.0000		24.0000
4	12.5%	7	12.0000		12.0000
4	12.5%	8	18.0000		18.0000
4	12.5%	9	[redacted]	dead	0.0000
4	12.5%	10	[redacted]	alive	0.0000
5	25%	1	22.0000		22.0000
5	25%	2	[redacted]	dead	0.0000
5	25%	3	[redacted]	alive	0.0000
5	25%	4	[redacted]	alive	0.0000
5	25%	5	18.0000		18.0000
5	25%	6	10.0000		10.0000
5	25%	7	17.0000		17.0000
5	25%	8	[redacted]	alive	0.0000
5	25%	9	18.0000		18.0000
5	25%	10	22.0000		22.0000
6	50%	1	18.0000		18.0000
6	50%	2	19.0000		19.0000
6	50%	3	20.0000		20.0000
6	50%	4	12.0000		12.0000
6	50%	5	10.0000		10.0000
6	50%	6	1.0000		1.0000
6	50%	7	18.0000		18.0000
6	50%	8	25.0000		25.0000
6	50%	9	21.0000		21.0000
6	50%	10	18.0000		18.0000
7	100%	1	0 [redacted]	dead	0.0000
7	100%	2	2.0000		2.0000
7	100%	3	[redacted]	dead	0.0000
7	100%	4	12.0000		12.0000
7	100%	5	[redacted]	dead	0.0000
7	100%	6	9.0000		9.0000
7	100%	7	9.0000		9.0000
7	100%	8	6.0000		6.0000
7	100%	9	[redacted]	alive	0.0000
7	100%	10	7.0000		7.0000

do the 0 represent males?

non-producing ♀ dams should be saved to see if they are alive or not

ROSE HILL CERIODAPHNIA REPRODUCTION
File: rhcerrep Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	10	12.000	34.000	21.300
2	3.125%	9	0.000	25.000	14.667
3	6.25%	10	0.000	27.000	12.100
4	12.5%	10	0.000	24.000	13.400
5	25%	10	0.000	22.000	10.700
6	50%	10	1.000	25.000	16.200
7	100%	10	0.000	12.000	4.500

ROSE HILL CERIODAPHNIA REPRODUCTION
File: rhcerrep Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Control	40.678	6.378	2.017
2	3.125%	125.500	11.203	3.734
3	6.25%	165.656	12.871	4.070
4	12.5%	100.489	10.024	3.170
5	25%	95.567	9.776	3.091
	50%	46.622	6.828	2.159
	100%	21.389	4.625	1.462

ROSE HILL CERIODAPHNIA REPRODUCTION
File: rhcerrep Transform: NO TRANSFORMATION

WILCOXON RANK SUM TEST W/ BONFERRONI ADJUSTMENT - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	REPS	SIG
1	Control	21.300				
2	3.125%	14.667	78.00	60.00	9	
3	6.25%	12.100	90.50	73.00	10	
4	12.5%	13.400	84.50	73.00	10	
5	25%	10.700	76.50	73.00	10	
6	-50%	16.200	85.00	73.00	10	
7	100%	4.500	55.50	73.00	10	*

Critical values use k = 6, are 1 tailed, and alpha = 0.05

SPEARMAN-KARBER

TRIM:	17.50%
LC50:	58.117
95% LOWER CONFIDENCE:	47.097
95% UPPER CONFIDENCE:	71.716

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.
HIT RETURN TO CONTINUE.

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
3.13	40.	8.	20.00	.9108D-02
6.25	40.	6.	15.00	.4182D-03
12.50	40.	7.	17.50	.2114D-02
25.00	40.	8.	20.00	.9108D-02
50.00	40.	11.	27.50	.3213D+00
100.00	40.	39.	97.50	.3729D-08

THE BINOMIAL TEST SHOWS THAT 50.00 AND 100.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.6787 PERCENT.
AN APPROXIMATE LC50 FOR THIS DATA SET IS 60.552

HIT RETURN TO CONTINUE

RESULTS USING MOVING AVERAGE

SPAN	G	LC50	95% CONFIDENCE LIMIT	
3	.054	47.99	40.01	59.61

HIT RETURN TO CONTINUE

****** RESULTS CALCULATED BY PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT
5	1.916	10.45	.00

A PROBABILITY OF 0 MEANS LESS THAN 0.001

SLOPE = 1.22
95% CONFIDENCE LIMITS: -.47 AND 2.90

LC50= 46.48
95% CONFIDENCE LIMITS: 0 AND + INFINITY

LC1 = .57
95% CONFIDENCE LIMITS: 0 AND 6.11

HIT RETURN TO CONTINUE.

DATE: April 8, 1992 TEST NUMBER: 1 DURATION: 7 days

SAMPLE: R hill FH SPECIES: P. promelas

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	60.552	50.000	100.000	50.000
MAA	47.995	40.011	59.607	19.596
PROBIT	46.479	*******	*******	*******
SPEARMAN	58.117	47.097	71.716	24.619

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

**** = LIMIT DOES NOT EXIST

WOULD YOU LIKE TO CONTINUE (Y/N)?

Rose hill leachate FH S
File: RHL.FHS Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.876	6.776	10.696	6.776	1.876
OBSERVED	0	9	8	11	0

Calculated Chi-Square goodness of fit test statistic = 7.7946
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Rose hill leachate FH S
File: RHL.FHS Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 0.500

W = 0.979

Critical W (P = 0.05) (n = 28) = 0.924
Critical W (P = 0.01) (n = 28) = 0.896

Data PASS normality test at P=0.01 level. Continue analysis.

Rose hill leachate FH S
File: RHL.FHS Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 30.33
Closest, conservative, Table H statistic = 216.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 7, df (# reps-1) = 3
Actual values ==> R (# groups) = 7, df (# avg reps-1) = 3.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

Rose hill leachate FH S

File: RHL.FHS Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance

Calculated B statistic = 9.77
ıble Chi-square value = 16.81 (alpha = 0.01)
ıble Chi-square value = 12.59 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 6

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

Rose hill leachate FH S
File: RHL.FHS Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.876	6.776	10.696	6.776	1.876
OBSERVED	0	10	7	11	0

Calculated Chi-Square goodness of fit test statistic = 9.1963
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Rose hill leachate FH S
File: RHL.FHS Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro Wilks test for normality

D = 0.803

W = 0.982

Critical W (P = 0.05) (n = 28) = 0.924
Critical W (P = 0.01) (n = 28) = 0.896

Data PASS normality test at P=0.01 level. Continue analysis.

Rose hill leachate FH S
File: RHL.FHS Transform: ARC SINE(SQUARE ROOT(Y))

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 16.60
Closest, conservative, Table H statistic = 216.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 7, df (# reps-1) = 3
Actual values ==> R (# groups) = 7, df (# avg reps-1) = 3.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

Rose hill leachate FH S

File: RHL.FHS Transform: ARC SINE(SQUARE ROOT(Y))

Bartletts test for homogeneity of variance

Calculated B statistic = 7.63
ble Chi-square value = 16.81 (alpha = 0.01)
able Chi-square value = 12.59 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 6

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

Rose hill leachate FH S
File: RHL.FHS Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	3.032	0.505	13.289
Within (Error)	21	0.803	0.038	
Total	27	3.835		

Critical F value = 2.57 (0.05,6,21)
Since F > Critical F REJECT Ho:All groups equal

Rose hill leachate FH S
File: RHL.FHS Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.161	0.825		
2	3.125	1.120	0.800	0.296	
3	6.25	1.178	0.850	-0.125	
4	12.5	1.164	0.825	-0.020	
5	25	1.123	0.800	0.276	
6	50	1.058	0.725	0.746	
7	100	0.200	0.025	6.974	*

Dunnett table value = 2.46 (1 Tailed Value, P=0.05, df=20,6)

Rose hill leachate FH S
File: RHL.FHS Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	4			
2	3.125	4	0.305	36.9	0.025
3	6.25	4	0.305	36.9	-0.025
4	12.5	4	0.305	36.9	0.000
5	25	4	0.305	36.9	0.025
6	50	4	0.305	36.9	0.100
7	100	4	0.305	36.9	0.800

*** LISTING OF GROUP CONCENTRATIONS (% EFF.) AND RESPONSE MEANS ***

CONC. (%EFF)	RESPONSE MEAN	MEAN AFTER POOLING
.000	.400	.415
3.125	.430	.415
6.250	.410	.410
12.500	.400	.400
25.000	.350	.350
50.000	.240	.240
100.000	.000	.000

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS 33.8068.

50.000	.240	.240
100.000	.000	.000

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS 33.8068.

```
*************************************************************
*        BOOTSTRAP PROCEDURE TO ESTIMATE VARIABILITY        *
*                    OF THE ESTIMATED ICp                   *
*************************************************************
```

THE MEAN OF THE BOOTSTRAP ESTIMATES IS 33.8068.

THE STANDARD DEVIATION OF THE BOOTSTRAP ESTIMATES IS .0708.

AN EMPIRICAL 95.0% CONFIDENCE INTERVAL FOR THE
BOOTSTRAP ESTIMATE IS (33.8068, 33.8068).

ICSO

*** LISTING OF GROUP CONCENTRATIONS (% EFF.) AND RESPONSE MEANS ***

CONC. (%EFF)	RESPONSE MEAN	MEAN AFTER POOLING
.000	.400	.415
3.125	.430	.415
6.250	.410	.410
12.500	.400	.400
25.000	.350	.350
50.000	.240	.240
100.000	.000	.000

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS 56.7708.

50.000	.240	.240
100.000	.000	.000

THE LINEAR INTERPOLATION ESTIMATE OF THE TOTAL IMPACT CONCENTRATION
FROM THE INPUT SAMPLE IS 56.7708.

```
*************************************************************
*        BOOTSTRAP PROCEDURE TO ESTIMATE VARIABILITY        *
*                    OF THE ESTIMATED ICp                   *
*************************************************************
```

THE MEAN OF THE BOOTSTRAP ESTIMATES IS 56.7708.

THE STANDARD DEVIATION OF THE BOOTSTRAP ESTIMATES IS .0976.

AN EMPIRICAL 95.0% CONFIDENCE INTERVAL FOR THE
BOOTSTRAP ESTIMATE IS (56.7708, 56.7708).

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5

```
OBSERVED     0              9                    7                    8           0

-----------------------------------------------------------------------------
Calculated Chi-Square goodness of fit test statistic =   6.3102
Table Chi-Square value (alpha = 0.01) = 13.277

`ata PASS normality test. Continue analysis.


Rose Hill Leachate FH Growth
File: RSHLFHG        Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-----------------------------------------------------------------------------

D =    0.040

W =    0.981

Critical W (P = 0.05) (n = 24) = 0.916
Critical W (P = 0.01) (n = 24) = 0.884
-----------------------------------------------------------------------------

Data PASS normality test at P=0.01 level. Continue analysis.


Rose Hill Leachate FH Growth
File: RSHLFHG         Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   39.50
Closest, conservative, Table H statistic =  184.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =        3
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =   3.00

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Rose Hill Leachate FH Growth
File: RSHLFHG        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =    7.43
Table Chi-square value =   15.09  (alpha = 0.01)
 ıble Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   3.00
Used for Chi-square table value ==>   df (#groups-1) =   5
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.
```

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	9	7	8	0

Calculated Chi-Square goodness of fit test statistic = 6.3102
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro Wilks test for normality

D = 0.042

W = 0.981

Critical W (P = 0.05) (n = 24) = 0.916
Critical W (P = 0.01) (n = 24) = 0.884

Data PASS normality test at P=0.01 level. Continue analysis.

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 30.24
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, df (# avg reps-1) = 3.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

Rose Hill Leachate FH Growth

File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

Bartletts test for homogeneity of variance

Calculated B statistic = 6.77
ble Chi-square value = 15.09 (alpha = 0.01)
Table Chi-square value = 11.07 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 5

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.108	0.022	11.000
Within (Error)	18	0.042	0.002	
Total	23	0.150		

Critical F value = 2.77 (0.05,5,18)
Since F > Critical F REJECT Ho:All groups equal

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.687	0.403		
2	3.125%	0.707	0.423	-0.645	
3	6.25%	0.694	0.410	-0.227	
4	12.5	0.685	0.400	0.073	
5	25	0.635	0.352	1.637	
6	50	0.512	0.240	5.535	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	4			
2	3.125%	4	0.073	18.2	-0.020
3	6.25%	4	0.073	18.2	-0.008
4	12.5	4	0.073	18.2	0.003
5	25	4	0.073	18.2	0.050
6	50	4	0.073	18.2	0.163

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.108	0.022	11.000
Within (Error)	18	0.042	0.002	
Total	23	0.150		

Critical F value = 2.77 (0.05,5,18)
Since F > Critical F REJECT Ho:All groups equal

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.687	0.403		
2	3.125%	0.707	0.423	-0.645	
3	6.25%	0.694	0.410	-0.227	
4	12.5	0.685	0.400	0.073	
5	25	0.635	0.352	1.637	
6	50	0.512	0.240	5.535	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Rose Hill Leachate FH Growth
File: RSHLFHG Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	4			
2	3.125%	4	0.076	18.9	-0.020
3	6.25%	4	0.076	18.9	-0.008
4	12.5	4	0.076	18.9	0.003
5	25	4	0.076	18.9	0.050
6	50	4	0.076	18.9	0.163

Sample #/ID: _____

Station Location _____

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia ACUTE TOXICITY TEST

TEST: Rose Hill Regl Landfill leachate PAGE: 1 OF 4

START DATE: 7 April 1992 START TIME: 1500 hours

Column 1 on Rack

EXPOSURE	REPL.	DAY 1	DAY 2	% SURVIVAL	REMARKS
6.25%	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
6.25%	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓	100%	
	5	✓	✓		
50%	1	✓	1		
	2	✓	1		
	3	✓	1		
	4	✓	1		
	5	✓	✓		
12.5%	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
INITIALS*		JBH	JBH		

D = DEAD

** RECORD NO. DEAD AS RUNNING TOTAL**

NO. of REPS: 10

TYPE of FOOD: YCT + Selenastrum

BATCH HARDNESS: 60 mg/L

NO. of ORGS: 2/tube

FEEDING SCHEDULE: while holding before innoculation

CULTURE BATCH NO:

(PER REP.) 20 total

*Initials signify that you have counted AND fed the organisms.

QC'd 4/7/92 DM

QC'd 4/8/92 PLT

Sample #/10 _____
Station + Location _____

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia ACUTE TOXICITY TEST

TEST: Rose Hill Regl Landfill Leachate PAGE: 2 OF 4

START DATE: 7 April 1992 START TIME: _____

Column 2 on each

EXPOSURE	REPL.	DAY 1	DAY 2	% SURVIVAL	REMARKS
25%	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
50%	1	✓	✓		
	2	✓	1		
	3	✓	✓		
	4	✓	✓		
	5	1	1		
100%	1	1	1		
	2	✓	1		
	3	✓	2		
	4	✓	2		
	5	✓	1		
100%	1	✓	2		
	2	✓	2		
	3	✓	1		
	4	✓	1		
	5	✓	2		
INITIALS*		JBH	JBH		

D = DEAD

** RECORD NO. DEAD AS RUNNING TOTAL**

NO. of REPS: 10 TYPE of FOOD: _____ BATCH HARDNESS: _____

NO. of ORGS: 2/tube FEEDING SCHEDULE: _____ CULTURE BATCH NO: _____

(PER REP.) 20 total

*Initials signify that you have counted AND fed the organisms.

QC'd 4/7/92 [illegible]

QC'd - 4/8/92 PT

Sample #/ID

Station Location

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia ACUTE TOXICITY TEST

TEST: Rose Hill Regl Landfill leachate PAGE: 3 OF 4

START DATE: 7 April 1992 START TIME:

column 3 on rack

EXPOSURE	REPL.	DAY 1	DAY 2	% SURVIVAL	REMARKS
Lab ∅	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
25%	1	✓	1 m UP		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
125%	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	1	1		
	5	✓	✓	-1	
Lab ∅	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
INITIALS*		JBH	JBH		

D = DEAD

** RECORD NO. DEAD AS RUNNING TOTAL**

NO. of REPS: 10 TYPE of FOOD: YCT + Selenastrum BATCH HARDNESS: 60 mg/L

NO. of ORGS: 2/tube FEEDING SCHEDULE: while holding before innoculation CULTURE BATCH NO:

(PER REP.) 20 total

*Initials signify that you have counted AND fed the organisms.

QC'd 4/7/92 [illegible] QC'd 4/8/92 PLT

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia ACUTE TOXICITY TEST

TEST: Rose Hill Landfill PAGE: 4 OF 4

START DATE: 7 April 1992 START TIME:

EXPOSURE	REPL.	DAY 1	DAY 2	% SURVIVAL	REMARKS
3%	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
3%	1	✓	✓		
	2	✓	✓		
	3	✓	✓		
	4	✓	✓		
	5	✓	✓		
INITIALS*		SBH	SBH		

D = DEAD

** RECORD NO. DEAD AS RUNNING TOTAL**

NO. of REPS: 10 TYPE of FOOD: YCA before inoculation BATCH HARDNESS: 60 mg/L

NO. of ORGS: 2/tube FEEDING SCHEDULE: CULTURE BATCH NO:

(PER REP.)

*Initials signify that you have counted AND fed the organisms.

QC'd 4/7/92 [illegible] QC'd 4/8/92 PLT

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Rose Hill Regl. Landfill Leachate PAGE: 1 OF 4

START DATE: 7 April 1992 START TIME: 1400

	DAY	100/2 1	6/5 2	50/4 3	3/9 4	8/4 5	12/3 6	50/3 7	12/7 8	50/8 9	25/6 10	INITIALS*
EXPOSURE												
Beaker	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JBH
Beaker B	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	DM
	3	✓	✓	✓	✓	✓	✓	✓/5	✓/3	✓	✓	DM
	4	✓	✓	✓	✓/5	✓	✓	✓	✓	✓/3	✓/2	DJH
	5	✓	✓	✓/6	✓/9	✓/1	✓	✓/7	✓/5	✓/4	✓/7	JBH
	6	✓/2	✓	✓	✓/10	✓/4	✓	✓/8	JBH ✓/4	✓	D/1	JBH
	7	✓	✓	✓/6	✓	✓/10	✓	✓/10	✓/12	✓/18	↓	CPB
	8										↓	
TOTAL NO.		100 1/2	0	2/12	3/24	2/15	0	3/20	3/12	3/25	2/10	
MEAN NO.												
EXPOSURE		3/1	6/10	100/5	25/4	6/8	3/4	6/6	25/2	3/8	6/9	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	D	JBH
	2	✓	D	✓	✓	✓	✓	✓	✓	D	|	DM
	3	✓/4	|	D	✓	✓/3	✓	✓/3	✓	|	|	DM
	4	✓ JBH	|	|	✓	✓	✓	✓	✓	|	|	
	5	✓/9	|	|	✓	✓/8	✓/8	✓/8	✓	|	|	JBH
	6	✓/11	|	|	✓	✓/11	✓	✓/15	✓	|	|	JBH
	7	✓/14	|	|	✓	✓	✓/13	✓/15	✓	|	↓	CPB
	8		↓	↓						↓		
TOTAL NO.		3/24	0	0	0	3/22	2/21	3/26	0	0	0	
MEAN NO.												

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

NO. of REPS: 10 TYPE of FOOD: YCT + Selenastrum CULTURE BATCH NO: 60 mg/L

NO. of ORGS: (PER REP.) 1 FEEDING SCHEDULE: .1 mL each BATCH HARDNESS:

	Sample collected & used
Day 0	4/7/92
Day 1	4/7/92
Day 2	4/8/92
Day 3	4/8/92
Day 4	4/10/92
Day 5	4/10/92
Day 6	4/10/92

Samples to be used for Renewal

*Initials signify that you have counted AND fed the organisms.

QC'd + fed DM 4/13/92

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Rose Hill Regl Landfill Leachate PAGE: 2 OF 4

START DATE: 7 April 1992 START TIME:

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		25/3	25/9	12/10	100/9	3/5	6/3	∅/6	6/2	50/10	∅/2	
	1	✓	✓	✓	✓	✓	D	✓	✓	✓	✓	JBH
	2	✓	✓	✓	D	D		✓	✓	✓	✓	DM
	3	✓	✓/4	D				✓	✓	✓	✓/2	DJH
	4	✓	✓/8 JBH					✓	✓	✓/3	✓	DJH
	5	✓	✓/8					✓/8	✓	✓	✓/8	JBH
	6	✓	✓					✓/7	✓	✓/6	✓/10	JBH
	7	✓	✓/6					✓/12	✓	✓/9	✓/13	CPB
	8											
TOTAL NO.		0	3/18	0	0	0	0	3/27	0	3/18	3/20	
MEAN NO.												
EXPOSURE		∅/7	50/5	3/2	3/10	3/7	25/7	100/3	6/1	50/9	12/6	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JBH
	2	✓	✓	D	✓	✓	✓	✓	✓	✓	✓	DM
	3	✓	✓		✓/3	✓	✓/2	✓	✓	✓	✓/4	DH
	4	✓	✓		✓	✓	✓	✓	✓/6	✓/4	✓/1	DJH
	5	✓/10	✓/3		✓/10	✓	✓/8	✓	✓/9	✓/8	✓/7	JBH
	6	JBH ✓/8 10	✓		✓/10*	✓/7	✓/7	✓	✓/10	✓/9	✓/12	JBH
	7	✓/14	✓/7			✓/12	✓/12	✓	✓	✓	✓/15	CPB
	8											
TOTAL NO.		3/34	2/10	0	Voided	2/19	2/17	0	3/25	3/21	3/24	
MEAN NO.												

* lost in transfer

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

NO. of REPS: 10

NO. of ORGS: (PER REP.) 1

TYPE of FOOD: YAT + Selenastrum

FEEDING SCHEDULE: .1 mL ea. Daily

CULTURE BATCH NO: 60 mg/L

BATCH HARDNESS:

*Initials signify that you have counted AND fed the organisms.

QC'd & fed DM 4/9/92

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Rose Hill Regl. Land Fill Leachate PAGE: 3 OF 4

START DATE: 7 april 1992 START TIME:

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		3/3	50/2	100/6	100/10	Ø/10	12/9	25/10	12/5	Ø/3	50/1	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JBH
	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	[illegible]
	3	✓	✓/1	✓	✓	✓/3	✓	✓	✓	✓	✓	DJH
	4	✓/4	✓	✓	✓	✓	✓	✓/4	✓/4	✓	✓	DJH
	5	✓/9	✓/7	✓/2	✓/1	✓/8	✓	✓/6	✓/9	✓/7	✓	JBH
	6	✓/12	✓/4	✓/7	✓/1	✓/11	✓	✓/12	D/7	✓/7	✓/7	JBH
	7	✓	✓/10	✓	✓/5	✓/15	✓	✓	↓	✓/12	✓/11	
	8								✓			
TOTAL NO.		3/25	3/19	1/9	2/7	3/22	0	3/22	3/20	3/26	2/18	
MEAN NO.												
EXPOSURE		100/1	25/8	Ø/5	3/6	12/1	100/4	100/7	25/5	Ø/1	6/7	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JBH
	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	[illegible]
	3	|	✓	✓	✓/2	✓	✓	✓	✓	✓/4	✓/4	DJH
	4	|	✓	✓	✓	✓/3	✓	✓	✓/3	✓	✓	DJH
	5	|	✓	✓/5	✓/8	✓/6	✓/2	✓	✓	✓/6	✓/9	JBH
	6	|	✓	✓/7	✓/9	✓/13	✓/4	✓/4	✓/7	✓/10	✓/14	JBH
	7	|	✓	✓	✓/11	✓	✓/2	✓/5	✓/7	✓/8	✓/15	CPB
	8	↓										
TOTAL NO.		0	0	2/12	3/19	3/22	2/12	2/9	3/18	3/20	3/27	
MEAN NO.												

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

No. of REPS: 10

No. of ORGS: (PER REP.) 1

TYPE of FOOD: YAT + Selenastrum

FEEDING SCHEDULE: .1 ml each Daily

CULTURE BATCH NO: 60 mg/L

BATCH HARDNESS:

*Initials signify that you have counted AND fed the organisms.

QC'd + fed 4/9/92 [illegible]

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Rose Hill Regl Landfill Leachate PAGE: 4 OF 4

START DATE: 7 april 1992 START TIME:

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		12/2	Ø/8	Ø/9	25/1	12/8	50/6	6/4	100/8	50/7	12/4	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JBH
	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	DM
	3	✓	✓/1	✓/4	✓	✓/3	✓/1	✓	✓	✓/4	✓/2	DM
	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓/4	CPB
	5	✓/5	✓/8	✓/5	✓/3	✓/7	D	✓/7	✓/3	✓/4	✓/2	JBH
	6	✓	✓/11	✓/8	✓/6	✓/8	✓	✓/4	✓/3	✓/2	✓/3	JBH
	7	✓/9	✓/12	✓/12	✓/13	✓/14	✓	✓/10	✓	✓/8	✓/13	CPB
	8											
TOTAL NO.		2/14	3/30	3/17	3/22	3/18	1/1	3/21	2/6	3/18	3/24	
MEAN NO.												
EXPOSURE												
	1			# broods		# neonates		# Dead				
	2	Ø										
	3	3%										
	4	6%										
	5	12%										
	6	25%										
	7	50%										
	8	100%										
TOTAL NO.												
MEAN NO.												

√ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

NO. of REPS: 10

NO. of ORGS: (PER REP.) 1

TYPE of FOOD: YCT + Selenastrum

FEEDING SCHEDULE: 1 ml ea Daily

CULTURE BATCH NO: 60mg/L

BATCH HARDNESS:

*Initials signify that you have counted AND fed the organisms.

QC'd & fed 4/7/92 DM

Sample ID# _____
sample location _____

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Fathead Minnow SURVIVAL and ~~REPRODUCTION~~ Growth TEST

TEST: Rose Hill Regl. Landfill Leachate PAGE: 1 OF 2

START DATE: 7 April 1992 Cumulative # DEAD START TIME: 1519

EXPOSURE	DAY / REPL.	1	2	3	4	5	6	7	8	9	10	PAN # REMARKS
Lab Ø	N	2	2	3	3	3	3	3				7
	V	Ø	Ø	Ø	Ø	Ø	Ø	Ø				8
	O	Ø	Ø	1	1	1	1	1				17
	G	2	2	3	3	3	3	3				14
3.125%	Z	Ø	Ø	1	2	3	3	3				3
	K	Ø	Ø	Ø	Ø	1	~~1~~ 1	1				6
	F	1	2	3	3	3	~~1~~ 3	3				18
	B	1	1	1	1	1	1	1				19
6.25%	Q	Ø	0	2	2	2	2	2				16
	H	1	1	1	1	1	1	1				12
	D	1	1	1	1	1	1	1				15
	C	Ø	Ø	Ø	2	2	2	2				11
12.5%	P	Ø	Ø	Ø	Ø	Ø	Ø	Ø				13
	S	Ø	Ø	1	1	2	2	2				23
	AA	1	1	1	1	1	1	1				26
	M	Ø	Ø	5	4	4	4	4				24
25%	X	~~Ø~~ 2	3	~~5~~ 2	2	2	2	2				20
	J	Ø	Ø	1	1	1	1	1				21
	A	Ø	Ø	2	1	1	1	1				22
	R	5*	5	5	5	5	4	6				25
INITIALS*		DM	JBC	DM	CBB	CBB	DA					

** RECORD NO. DEAD AS RUNNING TOTAL**

* only 1 body

D = DEAD

NO. of REPS: 4

NO. of ORGS: 10
(PER REP.)

TYPE of FOOD: conc. Artemia 24 hr

FEEDING SCHEDULE: 2x day 0.1 ml ea.

CULTURE BATCH NO: 60 mg/L

BATCH HARDNESS:

*Initials signify that you have counted AND fed the organisms.

Sample ID/# _____
Sample location _____

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Fathead Minnow SURVIVAL and REPRODUCTION TEST

TEST: Rose Hill Regl Landfill leachate PAGE: 2 OF 2

START DATE: 7 April 1992 START TIME: 1519

	DAY	1	2	3	4	5	6	7	8	9	10	Pan # REMARKS
EXPOSURE	REPL.											
50%	U	Ø	Ø	Ø	Ø	Ø	Ø	1				2
	Y	Ø	Ø	Ø	Ø	Ø	Ø	Ø				5
	L	Ø	Ø	3	4	4	4	4				1
	BB	Ø	Ø	5	5	5	6	6				4
100%	T	1 Ø	4	6	8	8	9	10	→			DAY 6 - LAST ONE REALLY STRUGGLING
	W	5*	6	10	→							
	I	2	6	8	9	9	9	9				10
	E	1	3	7	9	10	→					
INITIALS*					CPB							

* only could see 5 * D = DEAD ** RECORD NO. DEAD AS RUNNING TOTAL**

NO. of REPS: 4 TYPE of FOOD: conc. Artemia < 24 hr. CULTURE BATCH NO: 60 mg/L

NO. of ORGS: (PER REP.) 10 FEEDING SCHEDULE: 2 x day 0.1 ml 2a. BATCH HARDNESS:

*Initials signify that you have counted AND fed the organisms.

F-2 SEDIMENT TOXICITY TEST

Environmental Services Assistance Team
U.S. EPA REGION I
EPA Contract 68-D1-1058

Rosehill Sediment Toxicity Testing
Pimephales promelas
Ceriodaphnia dubia
Hyallela azteca

TID No. 01-9204-108

Submitted to:

ESAT Regional Project Officer
Environmental Services Division
U. S. EPA Region I
60 Westview St.
Lexington, Massachusetts 02173

Submitted by:

ESAT Region I
Lockheed Engineering and Sciences Company
19B Crosby Drive
Bedford, Massachusetts 01730

July 9, 1992

INTRODUCTION

As part of the ecological risk assessment investigation of the Rose Hill Landfill site in S. Kingston, RI, sediment toxicity testing was performed during the first two weeks of June, 1992 on three freshwater organisms. C. dubia and P. promelas are normally used for water column testing, however, they have also been used in sediment toxicity tests due to the fact that they tend to graze on the sediment surface. H. azteca best represent infaunal benthic dwellers, which may best indicate true in situ effects.

The original scope of work called for the use of Chironomus tentans. Despite the large number of egg cases isolated for this test, the larvae took an extra week to hatch for undetermined reasons. Consequently, they were not useable for the test at the time of initiation. As a replacement the Biology Section obtained the amphipod Hyallela azteca from the EPA Research Laboratory in Cincinnati, Ohio. The additional freshwater organisms C. dubia and P. promelas were also utilized in testing.

Young organisms were exposed to sediment samples from eight sampling stations in the streams located in the study area. The tests were performed to assess the sensitivity and response of these organisms to the sediment. Comparison of sediments from the eight site stations and a reference sample were examined statistically for both survival and growth data. For C. dubia survival and reproduction data were evaluated. For P. promelas survival data at the 48 and 96 hour endpoints were evaluated. For H. azteca growth data were used to assess significant effects.

MATERIALS AND METHODS

Test procedures were followed according to: American Society for Testing and Materials, Standard Guide for Conducting Toxicity Tests with Freshwater Invertebrates, Designation E1383, 1990. The statistical procedures used followed those outlined in the EPA document, Short-Term Methods For Estimating The Chronic Toxicity Of Effluents and Receiving Waters To Freshwater Organisms, 2nd Edition, (Methods 1000.0 and 1002.0), EPA/600/489/001. Sediment samples received were designated as follows: SE2, SE4, SE5, SE6, SE7, SE9, SE11, SE12, with Lexington Pond as a reference sediment sample, and the laboratory's 60 mg/L as $CaCO_3$ culture water as an additional reference treatment.

MATERIALS AND METHODS (cont'd)

There were 4 replicates of each sample used during testing, except in the case of C. dubia which had ten replicates. All organisms were maintained at 25 degrees Celsius +/- 1 degree and 16:8 hour light/dark cycle.

Overlying water included 60 mg/L as CaCO3 hardness water for C. dubia and P. promelas and a water mixture of 25% Perrier mineral water and 75% 80 mg/L as CaCO3 hardness water for H. azteca.

Test Food: (see Test Methods referenced above)

-Selenastrum capricornutum

-Artemia

-YAT (yeast, alfalfa, trout chow mixture)

-Rabbit pellet solution

PROCEDURES

A. Initial Test Set-up

Sediments were homogenized for 1 minute using plastic scoops, and cleaned using a standard #10 sieve. Sediments, followed by overlying water, were added to the test vessels in the following quantities. For the C. dubia test, 10 ml of sediment with 20 ml overlying water were added to each 50 ml vessel. Likewise, 50 ml of sediment with 200 ml of overlying water were added to the 300 ml test vessel for the P. promelas test. For the H. azteca test, 200 ml of sediment was added to each 1000 ml beaker with approximately 800 ml of overlying water per replicate. Whenever water was added to a particular vessel, either in a renewal or to begin a particular test, a turbulence reducer was utilized to reduce the amount of sediment resuspension into the water column.

B. Organism Introduction

Prior to introduction of H. azteca, the sediments were allowed to settle overnight. For C. dubia and P. promelas, organisms were introduced subsequent to sediment and overlying water addition.

PROCEDURES (cont'd)

C. Feeding

A feeding regimen was established as follows: P. promelas, 3 drops of concentrated Artemia twice daily per vessel; C. dubia, .2 ml daily each of S. capricornutum and the YAT mixture per test tube; H. azteca, .3 mls of the rabbit pellet shake per beaker.

TEST CHEMISTRY

Initial chemistry was performed on the overlying water and monitored every 24 hours. All chemistry results were recorded on standard lab data sheets and a log book. Initial chemistry included the following: pH, conductivity, temperature and dissolved oxygen (DO), alkalinity and hardness. Daily monitored chemistry included pH, DO and temperature. Environmental chamber temperature was also monitored on a daily basis.

TEST DESIGN

See appropriate Biology Section SOP for sediment toxicity testing unless stated below.

For the H. azteca sediment test, the air lines in the walk-in growth chamber were modified to produce sufficient air for each station. The design included four lines that branched off of a main manifold with each line splintering to four gang valves.

An additional modification to the sediment test included aeration to the P. promelas vessels after detection of low DO on Day 4.

RESULTS

Originally, the P. promelas test was designed to be a chronic test. However, due to a mortality rate greater than 20% in the Lexington Pond reference sample, only survival at 48 and 96 hour intervals was examined. For C. dubia and H. azteca, 7- and 10-day chronic static renewal tests were performed, respectively.

The data from the C. dubia test was analyzed statistically for survival using Fisher's Exact Test. Each station was compared against the control to ascertain any significant difference in survival from the control (p=0.05). There was no statistically significant difference in survival between the control and any sample.

RESULTS (cont'd)

Reproduction data was also statistically analyzed to determine if significant differences existed between site samples and reference sediment. Due to non-normal distribution, analysis was performed using the Steel's Many-One Rank Test. The total number of neonates for each sample was compared. No significant difference was found when statistical comparison was made.

Separate statistical analyses were run on the P. promelas results using survival data at 48 and 96 hours. Dunnett's Test was used to evaluate statistically significant differences in survival between the mean of the control and the mean of the sample replicates. No significant difference was found in survival between the control and any sample at 48 hours or 96 hours.

The Hyallela azteca growth data were analyzed using Dunnett's Test. This test was used to examine the data for significant differences in growth between the mean weight of surviving organisms for each station against the mean weight of the surviving organisms in the Lexington Pond reference sample. No statistically significant differences in growth were found.

See attached raw data and tables for summary statistics

DISCUSSION

A. Hyallela azteca

The H. azteca test produced some anomalous final counts, which prevented statistical analysis of survival data. However, on a qualitative basis, there appeared to be markedly lower survival in sediments taken from station SE-7. Dunnett's Test was used to evaluate differences in growth of organisms between sampling and reference stations. There was variability in growth among samples, but no statistically significant difference in growth was found.

B. Ceriodaphnia dubia

During the first two days of the C. dubia test, the C. dubia neonates were exceedingly difficult to see due to their small size, and interference from a floating layer of sediment particles on the surface of the overlying water. In the third day of the test and beyond, however, the organisms were much easier to spot and the renewals and counts went more smoothly.

DISCUSSION (cont'd)

B. Ceriodaphnia dubia (cont'd)

There was 30% mortality in the Lexington Pond sediment samples. This prevented the use of this sample as a control for the statistical analysis. Instead, the laboratory controls containing 60 mg/L as $CaCO_3$ culture water were used for the statistical analysis. Mortality in all the site samples was less than 20%. The 30% mortality appears to be specific to the Lexington Pond sample and does not indicate the nullification of the test as a whole. As a result it is felt that the statistical results provided are acceptable.

C. Pimephales promelas

Test protocols for this species recommend against aeration of the overlying water because this might cause loss of volatile compounds from the sample. For this reason the test was initiated without aeration. On day 4 it was discovered that the dissolved oxygen had rapidly declined from concentrations of the preceding three days, and aeration was initiated. It was felt that mortality may be attributed to low DO so only 48 and 96 hr survival was used.

During the first three days of the test it was very difficult to count the organisms due to turbidity of the water, and the tendency of the young minnows to lie still in the upper layer of sediment. It was decided that definitive counts would be taken corresponding to commonly used statistical endpoints, i.e., 48, 96 and 7 days.

SUMMARY

From the statistical results of these tests, it does not appear that there is a significant difference caused by chemical toxicity between the reference and study area samples.

TABLE A

****

Tested site: Rose Hill Landfill
Location: S. Kingston, RI
Type test: 10 Day Sediment Toxicity Test
Organism: Hyallela azteca
Test start date: June 4, 1992
Time start: 15:00 hours
No. Replicates: 4
No. Organisms/Rep: 20
Data analysis: Shapiro-Wilks for normality, Bartlett's for homogeneity, Dunnett's Test

GROWTH DATA	weight in mg. Rep A	Rep B	Rep C	Rep D	Mean weight per organism (mg)
Lexington Pond	0.130	0.113	0.118	0.068	0.107
Reference Water	0.089	0.133	0.050	0.040	0.078
SE-2	0.133	0.089	0.150	0.144	0.129
SE-4	0.100	0.094	0.078	0.138	0.103
SE-5	0.125	0.076	0.077	0.072	0.086
SE-6	0.060	0.070	0.083	0.071	0.071
SE-7	0.133	0.046	0.043	0.075	0.074
SE-9	0.063	0.070	0.185	0.085	0.101
SE-11	0.139	0.182	0.130	0.070	0.130
SE-12	0.086	0.100	0.067	0.065	0.080

TABLE B

****

Site tested: Rose Hill Landfill
Location: S. Kingston, RI
Type test: 7 Day Sediment Toxicity Test
Organism: Ceriodaphnia dubia
Test start Date: June 03, 1992
Time start: 1500 hours
No. Replicates: 10
No. Organisms/Rep: 1
Data Analysis: Fisher's test to analyze survival data, reproduction data analyzed using or Steel's test.

STATIONS	Avg Young Ea Female	A	B	C	D	E	F	G	H	I	J
		Replicate Number									
		TOTAL NO. YOUNG									
CULTURE WATER	22.4	22	24	11	35	25	27	21	22	21	16
LEXINGTON POND	27.0	26	D	15	32	26	17	41	D	32	D
SE-2	27.1	D	27	21	21	23	38	32	22	D	33
SE-4	28.7	33	20	41	20	26	23	34	30	26	34
SE-5	26.7	37	24	D	24	30	33	32	34	34	30
SE-6	22.5	30	27	8	22	D	24	23	24	D	22
SE-7	20.3	21	18	14	D	23	33	15	20	20	19
SE-9	21.2	23	30	29	29	29	17	D	1	2	31
SE-11	23.4	17	27	17	24	D	33	18*	29	29	17
SE-12	26.7	28	26	21	29	31	D	36	25	25	20

*Survival significantly different than control based on Fisher's Exact Test (P = .05)

Concentration	Percent Survival day 2	day 7
CULTURE WATER	100%	100%
LEXINGTON POND	100%	70%
SE-2	100%	80%
SE-4	100%	100%
SE-5	90%	90%
SE-6	90%	80%
SE-7	100%	90%
SE-9	90%	80%
SE-11	90%	90%
SE-12	90%	90%

TABLE C

****

Tested site: Rose Hill Landfill
Location: S. Kingston, RI
Type Test: 7 Day Sediment Toxicity Test
Organism: Pimephales promelas
Date Test Started: June 4, 1992
Time Started: 1500 hours
No. Replicates: 4
No. Organisms/Replicate: 10
Data analysis: Shapiro Wilks for normality, Bartlett's for homogeneity, and Dunnett's Test

Stations	No. Dead 48 hrs.	No. Dead 96 hrs.
Lexington Pond	5	6
SE-2	8	14
SE-4	1	4
SE-5	1	3
SE-6	5	6
SE-7	4	6
SE-9	1	3
SE-11	0	0
SE-12	4	10

INVERTEBRATE SEDIMENT TOXICITY TEST

Hyallela azteca Site Rosehill Landfill Date 6/4/92 Introduced 1600

Beaker #/Conc.	H20 Cond 6/5/92 organisms	Sed Surface	Animals #Live	Retrieved #Dead	Notes pan #
SE-2-A	✓		21 Δ		37
SE-2-B	✓	71	18		18
SE-2-C	✓		16		40
SE-2-D	✓		16		22
SE-4-A	✓		18	2	29
SE-4-B	✓	59	16		35
SE-4-C	✓		16	1	28
SE-4-D	✓		9		28
SE-5-A	✓		16		77
SE-5-B	✓		18		26
SE-5-C	✓	72	20		19
SE-5-D	✓		18		37
SE-6-A	✓		18	0	3
SE-6-B	✓		16	1	30
SE-6-C	✓		18	1	8
SE-6-D	✓		16	2	13
SE-7-A	✓		2		36
SE-7-B	✓		10	0	24
SE-7-C	✓		7	0	5
SE-7-D	✓		3	0	19
SE-8-A	✓		18	1	23
SE-8-B	✓		16	1	9
SE-8-C	✓		14		17
SE-9-[illegible]	✓		18		34
SE-1-A	✓		18		27
SE-1-B	✓		21	0	12
SE-1-C	✓		20	0	4
SE-1-D	✓		27	1	32
SE-12-A	✓		20	0	2
SE-12-B	✓		20	0	11
SE-12-C	✓	77	17	1	7
SE-12-D	✓		21	1	25
REF-A	2 [illegible]		20	0	6
REF-B	✓		18		33
REF-C	2 [illegible]	70	19	1	15
REF-D	1 [illegible]		16	0	20
LEX A	✓		20	0	10
LEX A	✓		2	0	1
LEX C	✓		38		21
LEX D	✓		22 Δ	0	16

20 recounts/

ROSE HILL H. azteca sed. tox. growth
File: RHSED.HA Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.680	9.680	15.280	9.680	2.680
OBSERVED	0	14	15	11	0

Calculated Chi-Square goodness of fit test statistic = 7.4731
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

ROSE HILL H. azteca sed. tox. growth
File: RHSED.HA Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 0.036

W = 0.969

Critical W (P = 0.05) (n = 40) = 0.940
Critical W (P = 0.01) (n = 40) = 0.919

Data PASS normality test at P=0.01 level. Continue analysis.

ROSE HILL H. azteca sed. tox. growth
File: RHSED.HA Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 36.53
Closest, conservative, Table H statistic = 310.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 10, df (# reps-1) = 3
Actual values ==> R (# groups) = 10, df (# avg reps-1) = 3.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

ROSE HILL H. azteca sed. tox. growth
File: RHSED.HA Transform: NO TRANSFORMATION

```
-----------------------------------------------------------------------------

Calculated B statistic =   10.33
Table Chi-square value =   21.67  (alpha = 0.01)
Table Chi-square value =   16.92  (alpha = 0.05)

Average df used in calculation ==>   df (avg n - 1) =   3.00
Used for Chi-square table value ==>   df (#groups-1) =   9
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).
```

ROSE HILL H. azteca sed. tox. growth
File: RHSED.HA Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	9	0.017	0.002	2.000
Within (Error)	30	0.036	0.001	
Total	39	0.053		

Critical F value = 2.21 (0.05,9,30)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

ROSE HILL H. azteca sed. tox. growth
File: RHSED.HA Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Lex Reference	0.107	0.107		
2	SE-2	0.129	0.129	-0.973	
3	SE-4	0.103	0.103	0.212	
4	SE-5	0.088	0.088	0.883	
5	SE-6	0.071	0.071	1.621	
6	SE-7	0.074	0.074	1.476	
7	SE-9	0.101	0.101	0.291	
8	SE-11	0.130	0.130	-1.029	
9	SE-12	0.080	0.080	1.241	
10	Lab Reference	0.078	0.078	1.308	

Dunnett table value = 2.54 (1 Tailed Value, P=0.05, df=30,9)

ROSE HILL H. azteca sed. tox. growth
File: RHSED.HA Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Lex Reference	4			
2	SE-2	4	0.057	53.0	-0.022
3	SE-4	4	0.057	53.0	0.005
4	SE-5	4	0.057	53.0	0.020
5	SE-6	4	0.057	53.0	0.036
6	SE-7	4	0.057	53.0	0.033
7	SE-9	4	0.057	53.0	0.007
8	SE-11	4	0.057	53.0	-0.023
9	SE-12	4	0.057	53.0	0.028
10	Lab Reference	4	0.057	53.0	0.029

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Fathead Minnow SURVIVAL and REPRODUCTION TEST

TEST: Rosehill Landfill PAGE: 1 OF 2

START DATE: 6/4/92 START TIME: 1500

	DAY	1	2	3	4	5	6	7	8	9	10	Pan # REMARKS
EXPOSURE	REPL.											
SE-2	A	4	6		7 F	✓	✓	9				63
	B	4	(1)?		2	✓	✓	5				61
	C	4	0		2	✓	✓	3				62
	D	4	2		3 F	1 Dead ✓	✓	3				56
SE-4	A	2	10°		0 F	✓	✓	0				70
	B	3	(1)?		1	✓	✓	3				69
	C	5	0		3	✓	✓	3				68
	D	3	0		0 F	✓	✓	0				67
SE-5	A	2	0		1 F	✓	✓	1				47
	B	1	0		1 0	✓	✓	0				50
	C	1	0		1 F	✓	✓	1				41
	D	2	1		2 1	✓	✓	1				6/5 - one dead body 49
SE-6	A	3	2)6		2 0F			0				58
	B	4	(2)?		3 F	✓	✓	4				57
	C	1	2 1		1	✓	✓	1				59
	D	2	2		2 F	✓	✓	2				60
SE-7	A	3	(1)?		0 F	✓	✓	1				42
	B	4	(1)?		3 F	✓	✓	4				43
	C	2	(2)?		3 F	✓	✓	4				45
	D	2	(2)?c		1 F	✓	✓	0				44
INITIALS*		PLT	AMN	DMN	APB	[illegible]		[illegible]				

Red = corrected count based on final count

D = DEAD ** RECORD NO. DEAD AS RUNNING TOTAL**

NO. of REPS: 4 TYPE of FOOD: Artemia CULTURE BATCH NO:

NO. of ORGS: (PER REP.) 10 FEEDING SCHEDULE: Daily 15 m BATCH HARDNESS: 60

*Initials signify that you have counted AND fed the organisms.

F- fungus observed (F or [illegible] observed)

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Fathead Minnow SURVIVAL and REPRODUCTION TEST

TEST: Rosehill Landfill

START DATE: 6/4/92 ** ** ** ** START TIME: 1500

	DAY	1	2	3	4	5	6	7	8	9	10	REMARKS
EXPOSURE	REPL.											
SE-9	A	4	1?		1	✓	✓	3				54
	B	2	0		1	✓	✓	1				73
	C	4	0		1	✓	✓	2				72
	D	3	0		1 0	✓	✓	0				53
SE-11	A	2	0		0	✓	✓	1				76
	B	3	1		0	✓	✓	1				71
	C	2	0		0	✓	✓	1				80
	D	3	1 0		0 F	✓	✓	1				b/5 - observed 1 dead 75
SE-12	A	3	2		2	✓	✓	2				46
	B	2	2		2	✓	✓	2				45
	C	6	0		4 *		✓	4				51
	D	2	0		2		✓	3				52
LEX	A	2	5		6 F	✓	✓	5				b/5 - obs 1 dead only 66
	B	3	2 0		0 F	✓	✓	[illegible]				55
	C	3	0		0 F	✓	✓	[illegible]				[illegible]
	D	2	0		0 F	✓	✓	1				15
INITIALS*		PLT			CPM			[illegible]				

D = DEAD

** RECORD NO. DEAD AS RUNNING TOTAL**

NO. of REPS: [ ] TYPE of FOOD: [ ] CULTURE BATCH NO: [ ]

NO. of ORGS: (PER REP.) [ ] FEEDING SCHEDULE: [ ] BATCH HARDNESS: [ ]

*Initials signify that you have counted AND fed the organisms.

F - fungus

ROSE HILL P.PROMELAS SEDTOX 48
File: RHSED.FH48 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	8	0.231	0.029	1.000
Within (Error)	27	0.790	0.029	
Total	35	1.021		

Critical F value = 2.31 (0.05,8,27)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

ROSE HILL P.PROMELAS SEDTOX 48
File: RHSED.FH48 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	LEX REFERENCE	1.255	0.875		
2	SE-2	1.138	0.800	0.971	
3	SE-4	1.371	0.975	-0.963	
4	SE-5	1.371	0.975	-0.963	
5	SE-6	1.219	0.875	0.303	
6	SE-7	1.254	0.900	0.009	
7	SE-9	1.371	0.975	-0.963	
8	SE-11	1.371	0.975	-0.963	
9	SE-12	1.260	0.900	-0.035	

Dunnett table value = 2.53 (1 Tailed Value, P=0.05, df=24,8)

ROSE HILL P.PROMELAS SEDTOX 48
File: RHSED.FH48 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	LEX REFERENCE	4			
2	SE-2	4	0.241	27.6	0.075
3	SE-4	4	0.241	27.6	-0.100
4	SE-5	4	0.241	27.6	-0.100
5	SE-6	4	0.241	27.6	0.000
6	SE-7	4	0.241	27.6	-0.025
7	SE-9	4	0.241	27.6	-0.100
8	SE-11	4	0.241	27.6	-0.100
9	SE-12	4	0.241	27.6	-0.025

ROSE HILL P.PROMELAS SEDTOX 48
File: RHSED.FH48 Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro Wilks test for normality

D = 0.790

W = 0.908

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

ROSE HILL P.PROMELAS SEDTOX 48
File: RHSED.FH48 Transform: ARC SINE(SQUARE ROOT(Y))

Bartletts test for homogeneity of variance

Calculated B statistic = 12.65
Table Chi-square value = 20.09 (alpha = 0.01)
Table Chi-square value = 15.51 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 8

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

ROSE HILL P.PROMELAS SEDTOX 96
File: RHSED.FH96 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	8	0.520	0.065	1.711
Within (Error)	27	1.023	0.038	
Total	35	1.543		

Critical F value = 2.31 (0.05,8,27)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

ROSE HILL P.PROMELAS SEDTOX 96
File: RHSED.FH96 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	LEX REFERENCE	1.230	0.850		
	SE-2	0.946	0.650	2.060	
3	SE-4	1.266	0.900	-0.260	
4	SE-5	1.214	0.875	0.121	
5	SE-6	1.190	0.850	0.293	
6	SE-7	1.161	0.825	0.503	
7	SE-9	1.290	0.925	-0.432	
8	SE-11	1.371	0.975	-1.024	
9	SE-12	1.052	0.750	1.294	

Dunnett table value = 2.53 (1 Tailed Value, P=0.05. df=24,8)

ROSE HILL P.PROMELAS SEDTOX 96
File: RHSED.FH96 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	LEX REFERENCE	4			
2	SE-2	4	0.293	34.5	0.200
3	SE-4	4	0.293	34.5	-0.050
4	SE-5	4	0.293	34.5	-0.025
5	SE-6	4	0.293	34.5	0.000
6	SE-7	4	0.293	34.5	0.025
7	SE-9	4	0.293	34.5	-0.075
8	SE-11	4	0.293	34.5	-0.125
9	SE-12	4	0.293	34.5	0.100

```
.OSE HILL P.PROMELAS SEDTOX 96
'ile: RHSED.FH96        Transform: ARC SINE(SQUARE ROOT(Y))

'hapiro Wilks test for normality
-----------------------------------------------------------------------------

) =     1.023

V =     0.917

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912
-----------------------------------------------------------------------------

Data PASS normality test at P=0.01 level. Continue analysis.


ROSE HILL P.PROMELAS SEDTOX 96
File: RHSED.FH96        Transform: ARC SINE(SQUARE ROOT(Y))

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =   12.95
Table Chi-square value =   20.09  (alpha = 0.01)
Table Chi-square value =   15.51  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   3.00
Used for Chi-square table value ==>   df (#groups-1) =   8
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).
```

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Roehill Sediment / Culture Water PAGE: ____ OF ____

START DATE: 6/3/92 START TIME: 1500

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		LEX/B	LEX/C	LEX/E	LEX/G	LEX/I	LEX/A	LEX/D	LEX/F	LEX/H	LEX/J	
	1	?	✓	✓	✓	✓	✓	?	✓	✓	✓	DH
	2	?	✓	✓	✓	✓	✓	✓	✓	✓	✓	JB
	3	?	✓	✓	✓	✓	✓	✓	✓	✓	?	DH
	4	?	✓/4	✓/1	✓/4	✓/3	✓/4	✓/3	✓/1	?	?	DH
	5	D	✓/2	✓/14	✓/1	✓/13	✓/12	✓/3	✓/9	D	D	JBH
	6	↓	✓/6	✓	✓/8	✓	✓	✓/9	✓	↓	↓	DH
	7	↓	✓/3	✓/11	✓/28	✓/16	✓/10	✓/17	✓/7	↓	↓	DH
	8											
TOTAL NO.		D	15	26	41	32	26	32	17	D	D	
MEAN NO.												
EXPOSURE		SE-11/I	SE-11/G	SE-11/E	SE-11/C	SE-11/A	SE-11/J	SE-11/H	SE-11/F	SE-11/D	SE-11/B	
	1	✓	✓	?	✓	✓	✓	✓	✓	✓	✓	CTB
	2	✓	✓	?	✓	✓	✓	✓	✓	✓	✓	DJH
	3	✓	✓	?	✓	✓	✓	✓	✓	✓	✓	KT
	4	✓/1	✓/3	?	✓/2	✓	✓/1	✓/5	✓/11	✓/2	✓/3	JBH
	5	✓/9	✓	D	✓/5	✓/7	✓	✓	✓	✓/6	✓/5	DH
	6	✓/11	✓/10	↓	✓	✓/5	✓/9	✓/12	✓/9	✓/5	✓/3	DH
	7	✓/[illegible]	✓/5	↓	✓/10	✓/5	✓/7	✓/12	✓/13	✓/11	✓/12	KT
	8			↓								
TOTAL NO.		38	18	D	17	17	17	29	33	24	29	
MEAN NO.												

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

NO. of REPS: 10 TYPE of FOOD: YAT/Sed CULTURE BATCH NO: ____

NO. of ORGS: (PER REP.) 1 FEEDING SCHEDULE: .1 ml/Day BATCH HARDNESS: 6.6

*Initials signify that you have counted AND fed the organisms.

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Rosehill Sediment/Culture Water PAGE: ____ OF ____

START DATE: 6/3/92 START TIME: 1500

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		SE5/J	SE5/I	SE5/D	SE5/E	SE5/F	SE5/B	SE5/A	SE5/H	SE5/C	SE5/G	
	1	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	JBH
	2	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	JBH
	3	✓	✓	✓	✓	✓	✓	✓	✓	?	✓/1	DH
	4	✓/8	✓/4	✓/6	✓/4	✓/6	✓/5	✓/6	✓/6	?	✓/6	PLT
	5	✓/10	✓/1	✓	✓/13	✓	✓/1	✓	✓	D	✓/10	JBH
	6	✓	✓/8	✓/5	✓	✓/13	✓/6	✓/13	✓/9		✓/1	DH
	7	✓/12	✓/21	✓/13	✓/13	✓/14	✓/12	✓/18	✓/19		✓/14	DH
	8											
TOTAL NO.		30	34	24	30	33	24	37	34	D	32	
MEAN NO.												
EXPOSURE		SE12/B	SE12/C	SE12/E	SE12/G	SE12/I	SE12/A	SE12/D	SE12/F	SER/H	SE12/J	
	1	✓	✓	✓	✓	✓	?	✓	?	✓	✓	DH
	2	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	JBH
	3	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	DH
	4	✓/4	✓/4	✓/6	✓/3	✓/4	✓/3	✓/4	?	✓/4	✓/5	PLT
	5	✓	✓	✓	✓/1	✓/1	✓/2	✓	D	✓	✓	JBH
	6	✓/9	✓/4	✓/8	✓/12	✓/8	✓/10	✓/10		✓/8	✓/4	DH
	7	✓/11	✓/13	✓/17	✓/20	✓/12	✓/13	✓/15		✓/13	✓/1	DH
	8											
TOTAL NO.		24	21	31	36	25	28	29	D	25	20	
MEAN NO.												

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

NO. of REPS: ____ TYPE of FOOD: ____ CULTURE BATCH NO: ____

NO. of ORGS: (PER REP.) ____ FEEDING SCHEDULE: ____ BATCH HARDNESS: ____

*Initials signify that you have counted AND fed the organisms.

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Rosehill Sediment / Culture Water PAGE: ____ OF ____

START DATE: 6/3/92 START TIME: 1500

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		SE4/A	SE4/I	SE4/J	SE4/B	SE4/F	SE4/E	SE4/D	SE4/H	SE4/G	SE4/C	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CPB
	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	JBH
	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	DH
	4	✓/4	✓/4	✓/4	✓/3	✓/5	✓/7	✓/5	✓/9	✓/9	✓/5	PLT
	5	✓	✓	✓	✓/9	✓	✓	✓/16	✓	✓	✓	JBH
	6	✓/10	✓/16	✓/16	✓	✓/6	✓/8	✓	✓/3	✓/12	✓/15	DJH
	7	✓/19	✓/12	✓/20	✓/8	✓/12	✓/11	✓/5	✓/18	✓/13	✓/21	DH
	8											
TOTAL NO.		33	26	34	20	33	26	20	30	34	41	
MEAN NO.												
EXPOSURE		SE2/A	SE2/C	SE2/F	SE2/I	SE2/G	SE2/B	SE2/D	SE2/H	SE2/E	SE2/J	
	1	?	✓	✓	✓	✓	✓	✓	✓	✓	✓	CPB
	2	?	✓	✓	✓	✓	✓	✓	✓	✓	✓	JBH
	3	?	✓	✓	✓	✓	✓	✓	✓	✓	✓	DH
	4	?	✓/4	✓/6	?/?	✓/5	✓/2	✓/4	✓/3	✓/4	✓/3	PLT
	5	D	✓/11	✓	?/?	✓/1	✓	✓	✓	✓/7	✓/11	JBH
	6	↓	✓	✓/16	D	✓/9	✓/12	✓/7	✓/3	✓	✓/2	DJH
	7		✓/6	✓/22	↓	✓/17	✓/13	✓/10	✓/16	✓/12	✓/17	DH
	8	↓			↓							
TOTAL NO.		D	21	38	D	32	27	21	22	23	33	
MEAN NO.												

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

No. of REPS: 10 TYPE of FOOD: YAT/Selenastrum CULTURE BATCH NO: 6-C mg/L

No. of ORGS: (PER REP.) 1 FEEDING SCHEDULE: 1 mL ~~per~~ Day BATCH HARDNESS:

*Initials signify that you have counted AND fed the organisms.

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Roselvill Sediment / Culture Water PAGE: ____ OF ____

START DATE: 6/3/92 START TIME: 1500

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		REF/A	REF/C	REF/E	REF/G	REF/I	REF/B	REF/D	REF/F	REF/H	REF/J	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CPB
	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	DH
	3	✓	✓	✓	✓	✓	✓	✓	✓	✓/5	✓	KT
	4	✓/2	✓/2	✓/5	✓/6	✓/5	✓/7	✓/6	✓/9	✓/3	✓/2	JBH
	5	✓/7	✓	✓/6	✓	✓	✓	✓	✓	✓/4	✓/3	DJH
	6	✓	✓	✓/11	✓/8	✓/2	✓/5	✓/13	✓/6	✓/I	✓/11	KT
	7	13	✓/9	✓/3	✓/7	✓/14	✓/12	✓/16	✓/12	✓/9	✓	
	8											
TOTAL NO.		22	11	25	21	21	24	35	27	22	16	
MEAN NO.												
EXPOSURE		SED/B	SED/D	SED/E	SED/G	SED/I	SED/A	SED/C	SED/F	SED/H	SED/J	
	1	✓	✓	✓	?	✓	✓	✓	✓	✓	✓	CPB
	2	✓	✓	✓	?	✓	✓	✓	✓	✓	✓	DH
	3	✓	✓	✓	?	✓	✓	✓	✓	✓	✓	KT
	4	✓/4	✓/2	✓/3	?	?/1	✓/7	✓/1	✓/1	✓	✓/5	JBH
	5	✓	✓	✓	D	✓	✓	✓/9	✓	✓	✓/5	DH
	6	✓/10	✓/12	✓/11	↓	D/1	✓/12	✓/3	✓/9	✓/1	✓/3	KT
	7	✓/16	✓/15	✓/5	↓	?	✓/9	✓/16	✓/7	.	✓/15	KT
	8				↓							
TOTAL NO.		30	29	29	D	1	23	29	19	1	31	
MEAN NO.												

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

NO. of REPS: 10 TYPE of FOOD: YAT/Sel CULTURE BATCH NO: ____

NO. of ORGS: (PER REP.) 1 FEEDING SCHEDULE: 1 ml each / DAY BATCH HARDNESS: 60 m

*Initials signify that you have counted AND fed the organisms.

U. S. EPA REGION I LABORATORY
LEXINGTON, MA
Ceriodaphnia SURVIVAL and REPRODUCTION TEST

TEST: Rosehill Sediment / Culture Water PAGE: OF

START DATE: 6/3/92 START TIME: 1500

	DAY	1	2	3	4	5	6	7	8	9	10	INITIALS*
EXPOSURE		SE7/A	SE7/C	SE7/E	SE7/G	SE7/I	SE7/B	SE7/D	SE7/F	SE7/H	SE7/J	
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CPB/JBH
	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	DH
	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	?	CPB
	4	✓/2	✓	✓/5	✓/2	✓/1	✓/1	?	✓/3	✓/1	✓/1	JBH
	5	✓	✓	✓/5	✓	D	✓/4	D	✓/1	✓/1	✓/4	DJH
	6	✓/9	✓/6	✓/4	✓/7	✓/8	✓/5		✓/13	✓/9	✓/11	KT
	7	✓/10	✓/5	✓/9	✓/6	✓/10	✓/8		✓/10	✓/10	✓/3	KT
	8											
TOTAL NO.		21	14	23	15	22	18	D	33	20	19	
MEAN NO.												
EXPOSURE		SE6/A	SE6/C	SE6/E	SE6/G	SE6/I	SE6/B	SE6/D	SE6/F	SE6/H	SE6/J	
	1	✓	✓	?	✓	?	✓	✓	?	✓	✓	JBH
	2	✓	✓	?	✓	✓	✓	✓	✓	?	✓	DH
	3	✓	✓	?	✓	✓	✓/1	✓	✓	✓	✓	CPB
	4	✓/5	✓/2	?	✓/9	?	✓/6	✓/5	✓/3	✓/3	✓/1	JBH
	5	✓	✓	D	✓/5	D	✓/4	✓/4	✓/9	✓/8	✓/7	DJH
	6	✓/14	✓	?	✓/2		✓	✓/3	✓/3	✓/3	✓/2	KT
	7	✓/11	✓/6	?	✓/7		✓/6	✓/10	✓/9	✓/10	✓/12	KT
	8											
TOTAL NO.		30	8	D	23	D	27	22	24	24	22	
MEAN NO.												

✓ = ADULT ALIVE D = ADULT DEAD M = ADULT MALE

NO. of REPS: 10 TYPE of FOOD: YAT / Sel CULTURE BATCH NO:

NO. of ORGS: (PER REP.) 1 FEEDING SCHEDULE: 1 mL / Day BATCH HARDNESS: 6.0 mg/L

*Initials signify that you have counted AND fed the organisms.

ROSE HILL C. dubia SED TOX
File: C:\TOXSTAT3\RHSED.CD Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	6.030	21.780	34.380	21.780	6.030
OBSERVED	3	9	42	27	3

Calculated Chi-Square goodness of fit test statistic = 13.4244
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

ROSE HILL C. dubia SED TOX
File: C:\TOXSTAT3\RHSED.CD Transform: NO TRANSFORMATION

Shapiro-Wilks test for normality

******** Shapiro-Wilks Test is aborted ********

This test can not be performed because total number of replicates is greater than 50.

Total number of replicates = 90

ROSE HILL C. dubia SED TOX
File: C:\TOXSTAT3\RHSED.CD Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 4.28
Closest, conservative, Table H statistic = 14.7 (alpha = 0.01)

Use for Table H ==> R (# groups) = 9, df (# reps-1) = 9
Actual values ==> R (# groups) = 9, df (# avg reps-1) = 9.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

Transform: NO TRANSFORMATION

Bartlett test for homogeneity of variance

Calculated B statistic = 8.26
Table Chi-square value = 20.09 (alpha = 0.01)
Table Chi-square value = 15.51 (alpha = 0.05)

Average n used in calculation ==> df (avg n - 1) = 9.00
Used for Chi-square table value ==> df (#groups-1) = 8

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

ROSE HILL C. dubia SED TOX
File: C:\TOXSTAT3\RHSED.CD Transform: NO TRANSFORM

STEELS MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	REFERENCE (H20)	22.400				
2	SE-2	21.700	108.50	73.00	10.00	
3	SE-4	28.700	127.00	73.00	10.00	
4	SE-5	27.800	132.00	73.00	10.00	
5	SE-6	18.000	101.50	73.00	10.00	
6	SE-7	18.300	83.00	73.00	10.00	
7	SE-9	19.100	108.00	73.00	10.00	
8	SE-11	21.100	105.00	73.00	10.00	
9	SE-12	24.100	120.00	73.00	10.00	

Critical values use k = 8, are 1 tailed, and alpha = 0.05

ROSE HILL C. dubia SED TOX
File: C:\TOXSTAT3\RHSED.CD Transform: NO TRANSFORM

STEELS MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	REFERENCE (H20)	22.400				
2	SE-2	21.700	108.50	73.00	10.00	
3	SE-4	28.700	127.00	73.00	10.00	
4	SE-5	27.800	132.00	73.00	10.00	
5	SE-6	18.000	101.50	73.00	10.00	
6	SE-7	18.300	83.00	73.00	10.00	
7	SE-9	19.100	108.00	73.00	10.00	
8	SE-11	21.100	105.00	73.00	10.00	
9	SE-12	24.100	120.00	73.00	10.00	

Critical values use k = 8, are 1 tailed, and alpha = 0.05

ROSE HILL C. dubia SED TOX
File: RHSED.CD Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	6.030	21.780	34.380	21.780	6.030
OBSERVED	9	9	42	27	3

Calculated Chi-Square goodness of fit test statistic = 13.4244
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

ROSE HILL C. dubia SED TOX
File: RHSED.CD Transform: NO TRANSFORMATION

Shapiro-Wilks test for normality

******** Shapiro-Wilks Test is aborted ********

This test can not be performed because total number of replicates is greater than 50.

Total number of replicates = 90

File: RHSED.CD Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 4.28
Closest, conservative, Table H statistic = 14.7 (alpha = 0.01)

Used for Table H ==> R (# groups) = 9, df (# reps-1) = 9
Actual values ==> R (# groups) = 9, df (# avg reps-1) = 9.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

ROSE HILL C. dubia SED TOX
File: RHSED.CD Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance

Calculated B statistic = 8.26
Table Chi-square value = 20.09 (alpha = 0.01)
Table Chi-square value = 15.51 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 9.00
sed for Chi-square table value ==> df (#groups-1) = 8

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	NUMBER OF TOTAL ANIMALS
CONTROL	10	0	10
LEX REF	7	3	10
TOTAL	17	3	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 7.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	NUMBER OF TOTAL ANIMALS
CONTROL	10	0	10
SE-2	8	2	10
TOTAL	18	2	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 8.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	NUMBER OF TOTAL ANIMALS
CONTROL	10	0	10
SE-4	10	0	10
TOTAL	20	0	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
SE-5	9	1	10
TOTAL	19	1	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
SE-6	8	2	10
TOTAL	18	2	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 8.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
SE-7	9	1	10

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	NUMBER OF TOTAL ANIMALS
CONTROL	10	0	10
SE-9	9	1	10
TOTAL	19	1	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	NUMBER OF TOTAL ANIMALS
CONTROL	10	0	10
SE-11	9	1	10
TOTAL	19	1	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHERS EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	NUMBER OF TOTAL ANIMALS
CONTROL	10	0	10

SE-12	9	1	[illegible]
TOTAL	19	1	20

CRITICAL FISHERS VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
Since b is greater than 6 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHERS EXACT TESTS

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG (P=.05)
	CONTROL	10	0	
1	LEX REF	10	3	
2	SE-2	10	2	
3	SE-4	10	0	
4	SE-5	10	1	
5	SE-6	10	2	
6	SE-7	10	1	
7	SE-9	10	1	
8	SE-11	10	1	
9	SE-12	10	1	

F-3 IRON PRECIPITATION/FLOCCULATION IN THE SEDIMENTS OF THE LOWER SAUGATUCKET RIVER

APPENDIX F-3. IRON PRECIPITATION/FLOCCULATION IN THE SEDIMENTS OF THE LOWER SAUGATUCKET RIVER

Iron concentrations in sediment and the potential formation of flocculents are of concern because of the potential for adverse effects to fish, mainly the possibility of mortality to developing fish eggs and larvae of alewives (*Alosa pseudoharengus*) and blueback herring (*Alosa aestiralis*) in portions of the Saugatucket River downstream of the landfill (specifically Saugatucket Pond). To address this concern, iron in the river was evaluated in more detail in relationship to surface water and sediment iron concentrations than is discussed in section 4.2. The further evaluation consisted of reviewing naturally-occurring iron levels, further assessment of whether the disposal areas facilitated the elevated iron concentrations observed in the lower Saugatucket River, and modeling the potential for iron precipitation based on measured iron concentrations in the surface water. The results of the evaluation are discussed below.

Naturally-Occurring Iron Levels. There is strong evidence that elevated iron concentrations naturally occur in the vicinity of the site study area and specifically in the watershed that is drained by the Saugatucket River near the Rose Hill Landfill. The geologic formations in the immediate vicinity are granites and schists containing appreciable quantities of iron-rich minerals (Hermes and Zartman, 1985; Zartman et al., 1988). Electromagnetic geophysical surveys conducted in the site study area found that the native soils displayed electrical conductivity properties that are indicative of high iron content. Baseline geophysical data from background locations within the site study area were compared to data collected within the immediate vicinity of the area. The comparison confirmed the high iron levels found within the site study area. Additionally, elevated iron concentrations were found in groundwater from the two background wells: MW-01-01 - the shallow overburden well and MW-01-02 - the bedrock well. Background iron concentrations for unfiltered groundwater samples ranged from 13,700 to 30,900 μg/L in the bedrock well and from 12,100 to 71,000 μg/L in the overburden well. For filtered samples, iron concentrations from bedrock groundwater ranged from nondetected to 45.7 μg/L and overburden groundwater concentrations ranged from nondetected to 3,150 μg/L. Given that stream-flow budgets (section 3.3) indicate the overburden discharges to the

Saugatucket River, the variable iron concentrations exhibited in this zone are suggestive of the potential for naturally higher iron concentrations to occur than was exhibited by SW/SD-02.

In the nature and extent section of the report (section 4.2), iron concentrations for all surface water and sediment locations in the Saugatucket River were compared with concentrations detected at the background location (SW/SD-02), which was located about 1,000 feet upstream of the disposal areas. Iron concentrations in both surface water and sediment at SW/SD-02 were consistently lower than any of the downstream locations throughout the study period.

However, elevated iron concentrations found in tributaries that converge with the Saugatucket River below SW/SD-02 suggest that the iron concentrations at SW/SD-02 may not be entirely representative of natural surface water/sediment iron conditions for the study area. Iron-enriched groundwater discharging to the river, as well as iron-enriched surface water and sediment from upstream tributaries needs to be considered as a contributing source for the higher iron concentrations found in the lower reaches of the river. To further assess this, iron concentrations from SW/SD-02 were compared with concentrations at sampling locations on the unnamed tributary (SW/SD-01) and unnamed brook (SW/SD-10). Although SW/SD-10 is believe to have been affected by nearby sand and gravel operations, neither of these tributary locations have been shown to be impacted by the disposal areas. The unnamed tributary is considered a background location for Mitchell Brook and both the unnamed brook and Mitchell Brook converge with the Saugatucket River downstream of the disposal areas.

For comparison with the Saugatucket River background location (SW/SD-02), the concentrations at SW/SD-01 and SW/SD-10 are listed on Table F-1. The iron concentrations seen at these locations were found to be substantially greater than concentrations detected at SW/SD-02 as well as either of the two most downstream sampling locations (SW/SD-08 and SW/SD-11), suggesting that the tributaries can supply a substantial source of iron to the river. The inherently high iron levels exhibited in the tributaries would, therefore, be expected to contribute, to some extent, to higher iron concentrations in the lower reaches of the river.

Elevated Iron Concentrations Attributable to the Disposal Areas. As discussed in section 4.2, the disposal areas have impacted the surface water and sediment quality in regards to iron, as well as other metals, in portions of both the Saugatucket River and Mitchell Brook. This is evidenced by the substantial increase in iron concentrations in both surface water and sediment and the flocculent cover along the streambed immediately downstream of the disposal areas on both bodies of water. Although concentrations still remain elevated to some extent, iron concentrations in the Saugatucket River sediment are substantially attenuated downstream of the large leachate seeps. Below the confluence with Mitchell Brook, iron concentrations in sediment sharply increase again at SW/SD-06, which is believed to largely reflect the higher iron concentrations in Mitchell Brook. In a similar way, elevated iron concentrations exhibited by sediment in Mitchell Brook immediately below the Transfer Station Road at SW/SD-07, are quickly dissipated downstream (SW/SD-12) to levels that are comparable to the background concentrations for the unnamed tributary (SW/SD-01). This indicates that by the time Mitchell Brook discharges into the Saugatucket River, iron concentrations in sediment are representative of natural levels for this brook. The rather rapid decreases in iron concentrations in both the Saugatucket River and Mitchell Brook (SW/SD-06) most likely result from dispersion of flocculent and contaminated surface sediments during high flow periods. The increase in iron concentrations below the confluence of the Saugatucket River and Mitchell brook are temporary, as iron concentrations from locations further downstream (SW/SD-11 and SW/SD-08) are again lower.

While groundwater discharge to both water bodies occurs via the overburden, groundwater flow direction in both the overburden and bedrock zones is predominantly orientated toward the east-southeast based on groundwater levels (section 3.3). This indicates that the southern extent of contaminated groundwater discharge is north of the confluence and towards the areas of the river and brook where the elevated iron concentrations discussed above exist. Groundwater impacted by the disposal areas is not expected to affect surface water or sediment below the confluence of Mitchell Brook and the Saugatucket River.

Modeling. In order to better understand the degree to which elevated iron concentrations in sediment in the lower Saugatucket River could result from elevated concentrations in the upper portions of the river, a modeling approach was undertaken to evaluate mechanisms that most likely influence iron precipitation/flocculation. The mechanisms considered to be the most important in understanding flocculent potential in the site study area are sediment/flocculent transport and iron precipitation from the surface water. Physical data on flocculent (i.e., density, mass, etc.) as well as stream velocity (flow rates), particularly during high flow events, are among the necessary variables that are used in transport models. It should be noted, however, that flocculent was not visually observed at either of the sampling locations in the lower portions of the river (SW/SD-08 and SW/SD-11) during sample collection except for one occasion when a very fine coating of orange precipitate was noted at SW/SD-08.

Although a full assessment of sediment/flocculent transport is limited based on available RI data, a chemical equilibrium model was used to provide insight into potential flocculent formation at SW-08 and SW-11 based on surface water conditions at these locations. This process is important since iron concentrations at these locations were not substantially different than concentrations exhibited in upstream surface water directly impacted by the disposal areas.

The modeling approach that was used to evaluate the potential for iron to precipitate from surface water in the lower Saugatucket River applies the thermodynamic properties of chemical species in order in relation to chemical equilibrium conditions at SW-08 and SW-11. Precipitation (of a solid phase) was estimated using equilibrium constants for different chemical species and assuming surface water had attained equilibrium. The thermodynamic principle of Gibb's Free Energy was the basis for determining whether the system was in chemical equilibrium or whether the system was supersaturated or undersaturated in respect to a specific solid phase. A supersaturated condition implies that precipitation of iron is likely.

The chemical equilibrium program, MINEQL$^+$ (Schecher and McAvoy, 1991), in association with the thermodynamic database MINETQA1 (Brown and Allison, 1987), was used to perform

the chemical equilibrium calculations for modeling the systems. Given the complexity of modeling the inorganic systems of surface water, the following assumptions were made:

- Iron concentrations measured in surface water are representative of ferrous (Fe^{2+}) iron for the following reasons:
  - while groundwater is generally under reducing conditions because of higher CO_2 concentrations, transformation of Fe^{2+} to Fe^{3+} is favored under oxidizing conditions, but is limited to the surface water-groundwater interface because the reaction is thermodynamically rapid resulting in instantaneous precipitation directly at the interface
  - at the *p*H ranges of natural waters (5 to 8), Fe^{2+} is more soluble than Fe^{3+}
- Redox reactions are negligible since the Saugatucket River is free-flowing and oxygen levels are sufficient to sustain an aerobic environment
- The system was chemically electroneutral
- The system was in mass balance

Given the data that were available, a simple system was selected for modeling. A three-component system was considered: iron, carbonate, and water. The presence of carbonate was in the system results from surface water being in equilibrium with open atmosphere and assuming a partial pressure of CO_2 equal to $10^{-3.5}$ moles/liter. A better estimate of carbonate could be derived from alkalinity, however, alkalinity data was not available. Given the geochemical composition of the bedrock formations for the area it is reasonable to assume that carbonate concentrations in groundwater are low and approximately in equilibrium with the partial pressure of CO_2. It was also assumed that the system was in equilibrium with three solid phases that could form based on the three-component system: $Fe(OH)_2$ (s), $FeCO_3$ (siderite), and wustite.

The analytical data that was used to model the system is shown in Table F-2. The model was initially run using dissolved (filtered) concentrations. The filtered concentrations represent the

soluble (or dissolved) forms of iron, although colloidal particles such as organic acids (humic and fulvic) and extremely small biological organisms (i.e., algae, viruses) can also be present (Vik and Eikebrokk, 1989). Suffet and MacCarthy (1989) state that dissolved organic carbon (DOC), represents organic acids smaller than 0.45 μm in diameter and that in natural waters colloidal organic matter is approximately 10% of DOC. The amount of DOC, estimated as 90% of the TOC (Vik and Eikebrokk, 1989), at SW-08 and SW-11 ranges from 0.45 to 0.79 mg C/L. The amount of colloidal particulates that are present in the river and attributable to organic acids is then estimated at about 0.045 to 0.079 mg C/L. In relation to dissolved iron concentrations, this is only an appreciable fraction. On the other hand, organic acids can form soluble iron complexes with Fe^{2+} (Wetzel, 1975), thereby enhancing the solubility of dissolved iron. In systems where carbonate concentrations are low, higher concentrations of Fe^{2+} are attainable (Wetzel, 1975).

Comparisons of total (unfiltered) and dissolved iron concentrations indicate that at SW-08 the soluble fraction accounted for almost 50% of the total iron concentrations in the water column and at SW-11 the soluble fraction was more prevalent during January and April then during other sampling periods. In consideration of these conditions the model was also run using total (unfiltered) concentrations to provide the most conservative situation.

The modeling results are presented on Table F-3. Based on the three-component system that was modeled, precipitation of iron from solution (given the iron concentrations, pHs, and temperatures measured in the lower Saugatucket River) was not thermodynamically supported under the present conditions at either SW-08 or SW-11. The results also indicate that the Fe^{2+} ion is the dominant species in the system. As can be seen in Table F-4, iron precipitation would not occur under the above conditions until the pH of the river approaches 8. This assumes that Fe^{2+} concentrations are equal to the highest total (unfiltered) iron concentrations reported, although for lower concentrations (i.e., dissolved) precipitation was also estimated to generally occur between pHs of 8 and 9. The maximum pH observed in the river (at any sampling locations) was 6.5.

Summary and Conclusions. Evidence suggests that higher iron concentrations than observed at the background sampling location on the Saugatucket River are naturally occurring in other parts of the study area. This is supported by the chemical composition of the geologic formations in the vicinity of the site study area and elevated iron concentrations in overburden groundwater as well as in surface water and sediment for two tributaries (Mitchell Brook and the unnamed brook) that discharge into the river below the disposal areas. The two primary mechanisms that could facilitate higher iron concentrations in downstream portions of the river are considered to be sediment/flocculent transport and chemical precipitation. While transport is expected to occur to some extent, elevated iron concentrations in sediment that were associated with disposal areas were largely attenuated prior to the rivers confluence with Mitchell Brook. The general absence of flocculent in the lower reaches also indicate that flocculent is not necessarily prevalent throughout the length of the river. Potential precipitation (i.e., flocculation) of iron from surface water was also evaluated and was not found to be a contributing factor based on the water quality conditions that existed. In consideration of this information, it does not appear that unusually different or higher iron concentrations (or flocculent) in sediments are occurring to any appreciable extent in the lower reaches of the Saugatucket River.

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TABLE F-1. IRON CONCENTRATIONS AT SELECTED SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS

Date Sampled	Surface Water - Unfiltered Samples (µg/L)				
	Saugatucket River			unnamed tributary	unnamed brook
	(background) SW-02	SW-11	SW-08	SW-01 *	SW-10
6/91	250	--	1,810	3,250	5,140
9/91	233 U	1,400	1,825	1,360	6,160
1/92	--	595	--	--	6,500
4/92	108 U	861	--	--	--
5/92	234	1,420	--	--	--

Date Sampled	Surface Water - Filtered Samples (µg/L)				
	Saugatucket River			unnamed tributary	unnamed brook
	(background) SW-02	SW-11	SW-08	SW-01 *	SW-10
6/91	132 U	--	791	787	3,620
9/91	162 U	762	586	440	3,260
1/92	--	473	--	--	473
4/92	93 U	606 U	--	--	--
5/92	172 U	830	--	--	--

Date Sampled	Sediment (µg/kg)				
	Saugatucket River			unnamed tributary	unnamed brook
	(background) SD-02	SD-11	SD-08	SD-01 *	SD-10
6/91	780	--	4,020	7,530	113,500
9/91	1,020	2,530	2,795	10,500	85,550
1/92	--	--	--	--	--
4/92	--	--	--	--	--
5/92	885	586	--	--	--

U - Value reported is the sample detection limit

* - background location for Mitchell Brook

TABLE F-2. CHEMICAL MODEL INPUT PARAMETERS FOR SAUGATUCKET RIVER SURFACE WATER

Date Sampled	Total (Unfiltered) Fe			Dissolved (Filtered) Fe			pH	Temp (degree C)	Dissolved Oxygen (DO)		TOC* mg-C/L
	µg/L	mol/L	-log (C)	µg/L	mol/L	-log (C)			mg/L	(mol/L)	
SW/SD-08 (most downstream location)											
6/91	1,810	3.23E-05	4.49	708	1.26E-05	4.90	6.0	17.7	6.6	2.00E-04	ND
9-10/91	1,825	3.26E-05	4.49	512	9.10E-06	5.04	6.0	16	8.8	3.00E-04	4.5
1-2/92	—	—	—	—	—	—	—	—	—	—	—
4/92	—	—	—	—	—	—	—	—	—	—	—
5/92	—	—	—	—	—	—	—	—	—	—	—
SW/SD-11 (2nd to most downstream location)											
6/91	—	—	—	—	—	—	—	—	—	—	—
9-10/91	1,400	2.50E-05	4.6	762	1.36E-05	4.87	6.2	14.3	7.7	2.00E-04	5.7
1-2/92	595	1.06E-05	4.97	473	8.40E-06	5.08	6.4	2.5	—	—	7.0
4/92	861	1.54E-05	4.81	606	1.08E-05	4.97	6.1	9.9	11	3.00E-04	7.9
5/92	1,420	2.54E-05	4.6	830	1.48E-05	4.83	6.4	14.8	9.1	3.00E-04	—

* - Total Organic Carbon in mg Carbon/L

ND - Not Detected

TABLE F-3. CALCULATED IRON DISTRIBUTION IN THE LOWER SAUGATUCKET RIVER

SW/SD Location	Date Sampled	Input Parameters: Fe Concentratio (mol/L)	pH	Temp (deg C)	Soluble Ions: Fe(2+)	Soluble Ions: Fe(OH)3-	Aqueous Complexes: Fe(OH)2	Aqueous Complexes: FeOH+	Solids: Wustite	Solids: Fe(OH)2	Solids: Siderite
					% of Total Fe (2) Concentration in the System						
					Based on Dissolved (Filtered) Fe Concentrations						
SW-08	6/91	1.26E-05	6	17.7	100	0	0	0	0	0	0
SW-08	9-10/91	9.10E-06	6	16	100	0	0	0	0	0	0
SW-11	9-10/91	1.36E-05	6.2	14.3	100	0	0	0	0	0	0
SW-11	1-2/92	8.40E-06	6.4	2.5	100	0	0	0	0	0	0
SW-11	4/92	1.08E-05	6.1	9.9	100	0	0	0	0	0	0
SW-11	5/92	1.48E-05	6.4	14.8	100	0	0	0	0	0	0
					Based on Total (Unfiltered) Fe Concentrations						
SW-08	6/91	3.23E-05	6	17.7	100	0	0	0	0	0	0
SW-08	9-10/91	3.26E-05	6	16	100	0	0	0	0	0	0
SW-11	9-10/91	2.50E-05	6.2	14.3	100	0	0	0	0	0	0
SW-11	1-2/92	1.06E-05	6.4	2.5	100	0	0	0	0	0	0
SW-11	4/92	1.54E-05	6.1	9.9	100	0	0	0	0	0	0
SW-11	5/92	2.54E-05	6.4	14.8	100	0	0	0	0	0	0

NOTES:

1. Calculated using the chemical equilibrium model ALCHEMI (Schecher and McAvoy, 1991)
2. Assumes all soluble iron is present as Fe2+

TABLE F-4. CALCULATED IRON DISTRIBUTION UNDER VARIABLE CONDITIONS (1,2)

pH	Soluble Ions		Aqueous Complexes		Solids		
	Fe(2+)	Fe(OH)3-	Fe(OH)2	FeOH+	Wustite	Fe(OH)2	Siderite
	% of Total Fe (3) Concentration						
Simulation: Fe Concentration = 3.26x10-5 mol/L (1,825 μg/L); Temperature = 2.5 deg C							
4.2	100	0	0	0	0	0	0
4.4	100	0	0	0	0	0	0
4.6	100	0	0	0	0	0	0
4.8	100	0	0	0	0	0	0
5.1	100	0	0	0	0	0	0
5.3	100	0	0	0	0	0	0
5.5	100	0	0	0	0	0	0
5.7	100	0	0	0	0	0	0
5.9	100	0	0	0	0	0	0
6.1	100	0	0	0	0	0	0
6.3	100	0	0	0	0	0	0
6.5	100	0	0	0	0	0	0
6.7	100	0	0	0	0	0	0
6.9	100	0	0	0	0	0	0
7.2	100	0	0	0	0	0	0
7.4	100	0	0	0	0	0	0
7.6	100	0	0	0	0	0	0
7.8	100	0	0	0	0	0	0
8.0	89	0	0	0	0	0	11
Simulation: Fe Concentration = 3.26x10-5 mol/L (1,825 μg/L); Temperature = 17.7 deg C							
4.2	100	0	0	0	0	0	0
4.4	100	0	0	0	0	0	0
4.6	100	0	0	0	0	0	0
4.8	100	0	0	0	0	0	0
5.1	100	0	0	0	0	0	0
5.3	100	0	0	0	0	0	0
5.5	100	0	0	0	0	0	0
5.7	100	0	0	0	0	0	0
5.9	100	0	0	0	0	0	0
6.1	100	0	0	0	0	0	0
6.3	100	0	0	0	0	0	0
6.5	100	0	0	0	0	0	0
6.7	100	0	0	0	0	0	0
6.9	100	0	0	0	0	0	0
7.2	100	0	0	0	0	0	0
7.4	100	0	0	0	0	0	0
7.6	99	0	0	1	0	0	0
7.8	99	0	0	1	0	0	0
8.0	51	0	0	1	0	0	48

NOTES:

1. Fe concentrations selected are representative of highest and lowest levels detected at SW-08 and SW-11 (regardless of form - filtered/unfiltered)
2. Calcluated using the chemical equilibrium model ALCHEMI (Schecher and McAvoy, 1991)
3. Assumes all soluble iron is present as Fe2+

Appendix G

APPENDIX G
CALCULATIONS

G-1 Treatment of Analytical Data for Evaluation of the Nature and Extent of Contamination and the Risk Assessment

G-2 Treatment of Statistical Data

G-1 TREATMENT OF ANALYTICAL DATA FOR EVALUATION OF THE NATURE AND EXTENT OF CONTAMINATION AND THE RISK ASSESSMENT

APPENDIX G-1

TREATMENT OF ANALYTICAL DATA FOR EVALUATION OF THE NATURE AND EXTENT OF CONTAMINATION AND THE RISK ASSESSMENT

Analytical data generated during the RI field investigation is presented in Appendix D of this report. The following criteria was applied to the data in the RI report:

- If a value is not flagged, the value is used as reported (a detected value)
- If a value is flagged with "J", the value is used as reported (a detected value)
- If a value is flagged with "R" or "UR", the value is considered not to exist and will not be used (a rejected value)
- If the value is flagged with "U" or "UJ", the result is considered an undetected value

FIELD DUPLICATES

Prior to using analytical data for a primary sample with an associated field duplicate, the analytical values for the primary sample and the field duplicate were averaged together (USEPA 1989a and USEPA 1989b) to provide a single set of values for the field duplicate pair. The following conventions were used for averaging field duplicate samples together:

- If both samples have detected values (flagged with "J" or unflagged), both values are averaged together. If one value or both values are flagged with "J" prior to averaging, the resulting averaged value is flagged with "J".
- If both samples have undetected values (flagged with "U" or "UJ"), the lower value and its flag is used.
- If one sample has an undetected value (flagged with "U" or "UJ" and the other sample has a detected value (flagged with "J" or unflagged) the following is done:

- if the detected value is less than or equal to the undetected value, the detected value and its flag is used.

- if the detected value is greater than the undetected value, the detected value and 1/2 the undetected value is averaged together. The resulting averaged value is flagged with "J".

- If one sample has a nonrejected value (flagged with "J", "U", "UJ", or unflagged) and one sample has a rejected value (flagged with "R" or "UR"), the nonrejected value and its flag is used.

CHEMICAL SUMMARY TABLES

The information presented in each of the chemical summary tables in section 4 includes the range of detection limits, the frequency of detections, the arithmetic mean, the range of detected concentrations, and the location of the maximum concentration for each chemical or analyte that was detected in at least one sample for a specified media and sampling round. The following text further defines how the analytical data generated during the RI was used to determine the information for the summary tables.

Range of Detection Limits

The range of detection limits was determined based on the individual sample detection (quantitation) limit for each chemical or analyte. Because of sample dilution and/or sample weights, laboratory detection limits for individual samples can be higher than the contract required quantitation limits (CRQLs) which are method specific. Minimum and maximum detection limits were determined for each analyte using individual sample detection limits for all samples analyzed regardless of whether the chemical or analyte was detected in any particular sample.

Frequency of Detections

The frequency of detections is the number of samples with positive detections per the number of samples analyzed. The number of samples with positive detections was determined by totaling all samples with detected values (flagged with "J" or unflagged). The number of samples analyzed was determined by totaling all samples with detected or undetected values (flagged with "U", "UJ", "J", or unflagged). Rejected values (flagged with "R" or "UR") were not included in the total number of samples analyzed. Each field duplicate and corresponding sample was considered to be the same and was counted only once when determining the number of samples analyzed.

Arithmetic Mean Concentration

Arithmetic mean concentrations were calculated using all detected values (flagged with "J" or unflagged) and 1/2 of the sample detection limit for undetected values (flagged with "U" or "UJ"). If the average was greater than the maximum value, the maximum value was used to represent the mean. This situation occurs because of high or widely varying detection limits, or because a detected value was below the sample detection limit (flagged with "J" on the laboratory report). Detected values below the sample detection limit are estimated concentrations.

Range of Detected Concentrations

The range of detected concentrations is defined as the minimum and maximum values of all detected values (flagged with "J" or unflagged). Values flagged with "J" are indicated on the table.

Location of Maximum Concentrations

This is the location which has the highest detected value (flagged with "J" or unflagged) for a nonbackground sample. Other information about the location, such as the sample depth interval, is indicated when appropriate. If a background sample has a higher concentration than a nonbackground sample, this condition was indicated on the table.

OTHER CALCULATIONS

Hardness

Hardness was calculated using magnesium and calcium concentrations in the following equation:

$$\text{Hardness} = 2.497\ \text{Ca} + 4.118\ \text{Mg}$$ (reference needed)

where calcium and magnesium concentrations, and hardness are in mg/L

One-half of the sample detection limit was used as the magnesium or calcium concentration when the value is flagged with "UJ" or "U".

G-2 TREATMENT OF STATISTICAL DATA

APPENDIX G-2

STATISTICAL ANALYSIS OF METALS IN DIFFERENT ENVIRONMENTAL MEDIA

During the RI field investigation, analytical data were collected for different media, including surface and subsurface soil, leachate, groundwater, surface water, and sediment. These were analyzed for organic compounds, metals, and other soil and water quality parameters. The results of the analyses are presented in Appendix D of this report.

In section 4, Nature and Extent of Contamination, the occurrence and distribution of organic compounds, metals, and other inorganics detected in the site study area are discussed in relation to landfill operations and the three disposal areas (sewage sludge area, bulky waste area, and solid waste area), or other site activities or other portions of the site study area. In addition, the analytical data were also compared to background samples that were collected for all of the media except leachate (refer to section 4 for a complete discussion of the background samples). Since the site study area has had multiple uses and sustained a variety of activities, these comparisons were done to discern if any of the organic compounds, metals, or inorganics detected in the site study area were also detected in areas not known to have been affected by the landfill operations or disposal areas or if these may be related to activities or sources (including natural background) other than the landfill operations and disposal areas.

The evaluation of potential sources of metals is complex, since metals occur naturally in the environment and since it is difficult to distinguish whether or not the metals and concentrations of metals detected are natural or are related to anthropogenic sources (e.g., the three disposal areas). The evaluation of potential sources of organic compounds is fully discussed in section 4. Since the organic compounds detected do not generally occur naturally in environmental media (to a substantial amount), evaluation of the sources of these compounds was more straightforward and did not require statistical evaluation.

In section 4, differences in the types of metals and metal concentrations in background samples were compared with samples collected in the site study area. Furthermore, these comparisons were based on sample locations in relation to the disposal areas or other areas to help determine potential sources. Whenever possible, differences related to elevated concentrations in samples were presented in terms of order of magnitude or ranges of distribution. Discussing metal data in this manner provides insight as to the amount of variation in concentrations between background samples and specific sampling locations or groups of locations. To better understand if concentrations apparently elevated when compared to background samples are potentially related to the disposal areas or other portions of the site study area, statistical methods were applied to evaluate the extent to which inferences regarding the differences in metal concentrations could be supported by quantitative methods. However, it is important to note that the results of the statistical evaluations do not rule out the existence of metals from anthropogenic sources or draw definitive conclusions relative to background metals, but are only used to supplement information presented in section 4.

In addition to evaluating differences in metal concentrations in relation to background concentrations, statistical tests were conducted to assess whether concentrations of metals in one group of samples were significantly different than concentrations in a different group of samples. For example, concentrations of metals in wells in the overburden flow zone were compared to concentrations in wells in the bedrock flow zone because concentrations in the overburden flow zone were consistently found in higher concentrations than those in the bedrock flow zone throughout the site study area. The intent of this evaluation was to see if the differences are significant between the different flow zones. Similarly, concentrations of metals detected in leachate were compared to those detected in shallow overburden groundwater and surface water in the vicinity of the leachate seeps that were sampled. Since migration in leachate is an important mechanism through which contaminants can be transported to surface water and groundwater, the difference was evaluated to see if the concentrations in leachate were statistically higher than those in either groundwater or surface water. If concentrations in leachate were statistically higher, this would indicate that the

leachate can potentially affect concentrations in groundwater or surface water in the vicinity.

In summary, the two objectives of the statistical evaluations are:

- To evaluate if metal concentrations (by media) were statistically elevated when compared to background samples based on sample locations in relation to disposal areas or other areas (background evaluations).
- To ascertain whether or not differences that exist in metal data in certain groups of samples (e.g., leachate and surface water) are important in understanding the potential affect or interaction of one media with the other (nonbackground evaluations).

Conductivity (specific conductance), which is a tool for assessing metals in aqueous systems, was also statistically analyzed.

STATISTICAL METHODOLOGY

The methods used to perform the statistical evaluations were parametric and nonparametric analysis of variance (ANOVA) and student's T-test. These methods test whether the average concentration of one data set significantly exceeds the mean concentration of a background data set or another data set. The statistical tests used were chosen to evaluate the extent to which inferences regarding the presence of elevated concentrations can be supported BY quantitative methods. It should be noted that the results only indicate the strength of the nonquantitative conclusions that were inferred but do not rule out the presence of elevated concentrations.

The procedures applied and rationale used in determining the best statistical technique are discussed in *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities - Interim Final Guidance* (USEPA 1989). While this guidance was developed for groundwater, the procedures can be applied to other environmental media.

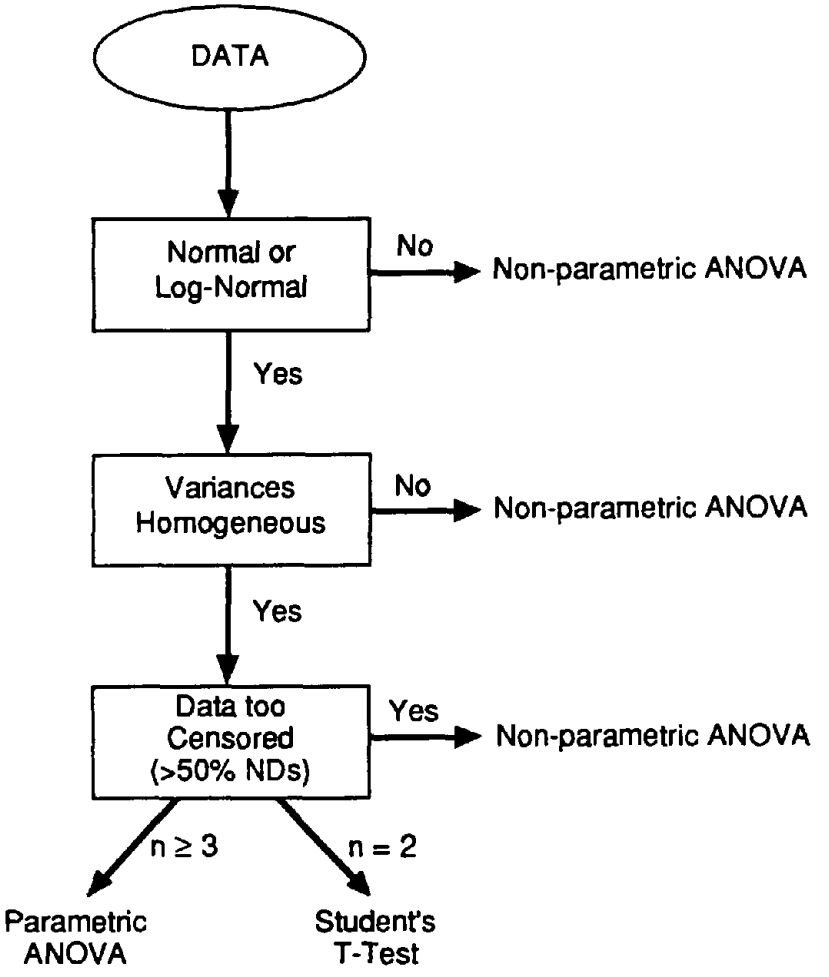
Given the size of the data sets (discussed below), parametric ANOVA was selected as the best technique to evaluate the differences between data sets for the background and nonbackground analyses. To use parametric ANOVA, however, several conditions must be met:

- The data must be normally distributed
- Homogeneity of variances for each data set must exist
- The data sets must contain less than 50% nondetects
- At least three data sets must be evaluated

The hierarchy for selecting a procedure was based on the conditions that were met. If any of the first four conditions were not met, then nonparametric ANOVA was used. Otherwise either parametric ANOVA or student's T-test was used depending on the number of data sets. If the first four conditions were met but the last condition was not, then student's T-test was used. Figure G-1 shows the flow chart for determining which statistical procedure to use.

Another condition that can affect the results of statistical tests is seasonal trends. To evaluate seasonal trends, the data were graphically reviewed by plotting individual metal data from different sampling rounds for each sampling location. In many cases, less than three data points were available. Although there were differences, no seasonal trends were apparent for any of the locations.

Following the order of statistical methods shown in Figure G-1, the data set was first tested to see if it followed a normal distribution. To do this, the Shapiro-Wilk Test was used to evaluate data sets with less than 50% nondetects. This test was performed using normal and log-normal transformed data, since environmental data commonly display log-normal distributions and the test is stronger than the Chi-squared test when the data sets are small.



n = Number of Data Sets
ND = Non Detect

FIGURE G-1. FLOW CHART FOR STATISTICAL TESTING

To test for equal variances, Levene's test, which is fairly insensitive to nonnorma used. If one or both of these conditions were not met, or if the data contained more th 50% nondetects, than the nonparametric ANOVA procedure Wilcoxon Rank-Sum Test used.

If the first three conditions were met, than either parametric ANOVA or student's T-tes two data sets, was used to evaluate the data. The results of the statistical analysis are presented on Table D-1. All of the statistical evaluations were conducted using confide levels of 95%. If a statistical difference was not found at a lower level than 95%, the l confidence level was reported on Table D-1.

DATA SETS USED FOR STATISTICAL ANALYSES

Data from the following media were evaluated:

- Surface soil
- Subsurface soil
- Shallow overburden groundwater (monitoring wells only)
- Bedrock groundwater (monitoring wells only)
- Surface water
- Sediment
- Leachate

The analytical data used in the statistical evaluations were treated according to the criteria and procedures outlined in Appendix G-1. For instance, if a metal was not detected, one-half the sample quantitation limit was used as the concentration for that metal. This is consistent with USEPA guidance (USEPA 1991, 1989). In addition, metal concentrations i unfiltered samples were evaluated statistically for groundwater and surface water.

Background Evaluations

When comparing site data to background data, averages of site samples were compared with average background samples. In the data sets, nondetected values (one-half sample quantitation limit) were averaged with detected values. Although higher values may be lost to some extent, the results of the statistical evaluations are being related over the entire area covered by the grouping of sample locations. A comparison of metal concentrations at individual locations as well as concentration "hot spots" or plumes that may not be represented as such in the statistical evaluations are discussed in section 4.

As described in section 4, background samples were collected for surface and subsurface soil, shallow overburden and bedrock groundwater, surface water, and sediment. Although data were collected for most media several times over the course of the investigation, only one or two data were collected at many of the locations. Consequently, statistical tests were conducted for each of the different media by grouping data from several sampling locations together into data sets for surface and subsurface soil and shallow overburden and bedrock groundwater. Individual locations were evaluated with background for surface water and sediment, where more data were available. Data from the following media were evaluated in comparison to background data:

- Surface soil
- Subsurface soil
- Shallow overburden groundwater (monitoring wells only)
- Bedrock groundwater (monitoring wells only)
- Surface water
- Sediment

Within each of the above media, data were grouped following the rationale used in the human health risk assessment (section 6 and appendix E-1). Locations included in a group were representative of conditions at one of the disposal areas when the locations are within the boundaries of the disposal areas, or are in close proximity to the disposal area, or are in the predominant hydrogeological downgradient of the disposal area, or are closer to one disposal area than to another. Surface water and sediment were considered separately for Mitchell Brook and the Saugatucket River, instead of by disposal area.

Surface Soil. Unlike the risk assessment (section 6 and appendix E-1), surface soils were grouped into four data sets, the fourth data set being nondisposal areas. This was done since surface soil locations in nondisposal areas may exhibit different metal concentrations because of sources other than those related to the disposal areas. However, two locations, SS-23 and SS-24, were grouped with the bulky waste area because they were collected near leachate seeps in the vicinity of this disposal area. For the same reason, SS-18 was grouped with the solid waste area. The data sets used for surface soils are:

Background Area	Sewage Sludge Area	Bulky Waste Area	Solid Waste Area	Nondisposal Area
SS-01	SS-11	SS-09	SS-03	SS-06
SS-02	SS-12	SS-10	SS-04	SS-07
SS-14	SS-15	SS-22	SS-05	SS-08
		SS-23	SS-13	SS-19
		SS-24	SS-16	SS-20
			SS-17	SS-21
			SS-18	

Subsurface Soil. Subsurface soils were grouped by the three disposal areas. In addition, in the sewage sludge area, separate groups were established for samples observed to have sludge material and samples with no visible material. The data sets used for subsurface soil were:

Background	Sewage Sludge Area (No Visible (Sludge)	Sewage Sludge Area (Visible Sludge)	Bulky Waste Area	Solid Waste Area
BH-05 (0-4 ft)	BH-02 (8-10 ft)	BH-01 (2-8 ft)	BH-06 (2-4 ft)	BH-07 (4-14 ft)
BH-05 (10-16 ft)	BH-02 (16-18 ft)	BH-01 (8-10 ft)	BH-06 (6-10 ft)	BH-07 (14-18 ft)
	BH-03 (2-4 ft)	BH-03 (16-20 ft)		
	BH-04 (4-6 ft)			
	BH-04 (8-10 ft)			

Groundwater. Groundwater was statistically tested by flow zone. The shallow overburden and bedrock were evaluated, but not the deep overburden because no background well in this flow zone existed. For both shallow overburden and bedrock groundwater, the background location was well cluster MW-01, in which data from MW-01-01 were used for shallow overburden and data from MW-01-02 were used for bedrock. For evaluating groundwater from either flow zone, data sets were established by grouping the well clusters according to predominant downgradient flowpaths in relation to the three disposal areas as shown in Figure 4-6. The well groupings for the shallow overburden flow zone are:

Background	Sewage Sludge Area	Bulky Waste Area	Solid Waste Area
MW-01-01	MW-I	MW-V	MW-04-01
	MW-II	MW-03-01	MW-06-01
	MW-III	MW-05-01	MW-11-01
	MW-IV	MW-12-01	MW-13-01
	MW-02-01		

The well groupings for the bedrock flow zone are:

Background	Sewage Sludge Area	Bulky Waste Area	Solid Waste Area
MW-01-02	MW-02-02	MW-03-03	MW-04-03
			MW-07-02
			MW-08-02
			MW-11-03

Surface Water and Sediment. As stated earlier, surface water and sediment locations were evaluated at individual locations. Since background samples were collected for both media on the Saugatucket River and Mitchell Brook, statistical tests were run separately for each of these water bodies. The location on the unnamed brook was not evaluated because there was no background location on this stream. In addition, SW/SD-16, SW/SD-17, and SW/SD-18 were not included because only one sample was collected at these locations. The surface water and sediment locations by water body are:

Saugatucket River	Mitchell Brook
SW/SD-02	SW/SD-01
SW/SD-03	SW/SD-07
SW/SD-04	SW/SD-09
SW/SD-05	SW/SD-12
SW/SD-06	SW/SD-13
SW/SD-08	SW/SD-14
SW/SD-11	

Nonbackground Evaluations

Statistical techniques were also used to help evaluate whether or not the differences in metal concentrations were statistically supported. Data sets for the following media were evaluated:

- Shallow overburden and bedrock groundwater
- Shallow overburden and leachate
- Leachate and surface water

Shallow Overburden Compared to Bedrock Groundwater. Large differences in metal concentrations were evident between the overburden and bedrock flow zones. The data sets used for this analysis were formed from grouping together all of the data from the shallow

overburden wells and bedrock wells listed above. The background wells were also grouped with the appropriate flow zone.

Shallow Overburden Compared to Leachate. Since leachate, which is generated as water passes through refuse material, can be an important mechanism for the transport of metals in subsurface media, an evaluation of leachate with shallow overburden groundwater was conducted. Five leachate locations were sampled along the western bank of the Saugatucket River, with the largest seeps occurring near the bulky waste area. Data from these leachate locations (LE-02, LE-03, LE-04, LE-05, and LE-06), which were collected in June 1991, were tested with data from shallow overburden wells in the bulky waste area as presented above.

Leachate Compared to Surface Water. The same leachate locations listed above were used in this evaluation. Since all the leachate seeps were found near the Saugatucket River, only data from the surface water locations (excluding the background location, which was upstream of the disposal areas) that were on this river, near the leachate seeps (SW-03 through SW-06), were grouped together for comparison.

STATISTICAL RESULTS

The results of the statistical evaluations are presented on Table D-1. As can be seen in the table, statistical evaluations were not conducted for all metals in the different media (as indicated by empty boxes). The reasons for this are 1) that the metal was not detected in either any of the background samples or any of the site samples, or 2) that the metal was detected so few times in either the background or site samples that a statistical evaluation was meaningless. Table D-1 shows that many of the average site concentrations in comparison to background concentrations were not statistically elevated when taken as an average, based on location groupings by area. In many cases, average concentrations by area were lower than average background concentrations.

Background Evaluations

The results of the statistical evaluations conducted in comparison to background samples are summarized below by media.

Surface Soil. Aluminum, arsenic, chromium, and vanadium were not statistically evaluated, as average background concentrations were higher than concentrations for each of the location groupings. The statistical evaluations indicated that several metals (barium, cobalt, iron, lead, magnesium, manganese, potassium, and zinc) with higher average concentrations than background were not found to have statistically different concentrations. The only metal found to be statistically higher in average concentration than in the background samples was copper in the samples collected from the sewage sludge area, where sludge material was observed.

Subsurface Soil. In this medium, no metals had average concentrations that were higher in statistical comparison to background samples. In many cases, average background concentrations were higher than average concentrations based on location groupings. For one metal, copper, the statistical result was not clear because of the small number of data points in the data set.

Surface Water. In both the Saugatucket River and Mitchell Brook, only a few metals were statistically evaluated. Calcium, magnesium, manganese, and sodium were found to be significantly elevated at several locations on the Saugatucket River (SW-05, SW-06, SW-08, SW-11) in comparison to the background location. In addition, conductivity was statistically elevated at SW-04. Similar results were found for the same metals as well as conductivity at two sampling locations that are south of the transfer station road on Mitchell Brook.

Sediment. In sediments, the locations on the Saugatucket River that had the most number of metals with average concentrations statistically higher than background were similar to the surface water locations (SW-05, SW-06, SW-08, and SW-11). In contrast, metals

concentrations in locations on Mitchell Brook were not found to be statistically elevated in comparison to the background location.

Nonbackground Evaluations

The results of the statistical evaluations conducted by sample groupings are summarized below.

Shallow Overburden Compared to Bedrock Groundwater. In all cases where data were statistically evaluated, average metal concentrations were significantly higher in the shallow overburden flow zone than in the bedrock flow zone.

Shallow Overburden Compared to Leachate. Statistical differences were found between average concentrations for some metals in leachate in comparison to average concentrations in the shallow overburden.

Leachate Compared to Surface Water. Lead, manganese, and conductivity were found to be statistically elevated in leachate samples in comparison to surface water samples collected nearby.

LIMITATIONS

There are a few limitations in evaluating the data statistically and in interpreting the results. The primary limitations are the small size of the background data sets as well as the data sets for many of the location groupings. Stronger and more robust results would be attained if the sample sizes were larger. Similarly the presence of numerous nondetects influences the results.

However, given these limitations, the results generated by the statistical tests provided useful information in understanding the extent of the differences seen in metal concentrations.