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REMEDIAL INVESTIGATION REPORT
Text and Tables
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Prepared for
Tyco Healthcare Group, LP

Prepared by
Sanborn, Head & Associates, Inc.

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ABBREVIATION AND ACRONYM LIST

%	Percent
AMS	Applied Marine Sciences, Inc.
AMSL	Above Mean Sea Level
AOC	Area of Containment
Aquatec	Aquatec Biological Sciences, Inc.
ARARs	Applicable and Relevant and Appropriate Requirements
AST	Above Ground Storage Tank
ASTM	American Society of Testing Materials
AVOCs	Aromatic Volatile Organic Compounds
AVS	Acid Volatile Sulfides
Axiom	Axiom Partners, Inc
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
Bryant	Bryant & Associates, Inc.
BT	Benzene And Toluene
BTEX	Benzene, Toluene, Ethylbenzene, and (m,p,o) Xylenes
^{o}C	Degrees Centigrade
Canonie	Canonie Environmental Services, Inc.
CCCI	Camin Cargo Control, Inc.
cfs	Cubic Feet Per Second
CGI	Combustible Gas Indicator
cm^2	Square Centimeters
C-O-C	Chain-Of-Custody
COPC	Chemical Of Potential Concern
COPEC	Chemical Of Potential Ecological Concern
CV	Coefficient Of Variation
CWM	Chemical Waste Management, Inc.
DAPL	Dense Aqueous Phase Liquid
DO	Dissolved Oxygen
DQIs	Data Quality Indicators
DUR	Data Usability Report
EAI	Eastern Analytical Laboratories, Inc.
EDI	Environmental Drilling, Inc.
EDRA	Existing Data Review And Analysis Report
FD	Field Duplicate
FSP	Field Sampling Plan
ft	Feet
ft/day	Feet Per Day
ft/ft	Feet Per Foot
ft/yr	Feet Per Year

ABBREVIATION AND ACRONYM LIST
(continued)

ft^2	Square Feet
ft^2/day	Square Feet Per Day
ft^3	Cubic Feet
ft^3/day	Cubic Feet Per Day
g/cm^3	Grams Per Cubic Centimeter
GLWQI	Great Lakes Water Quality Initiative
GPR	Ground Penetrating Radar
HASP	Health and Safety Plan
HQ	Hazard Quotient
HRGI	Hager-Richter Geosciences, Inc.
IATL	International Asbestos Testing Laboratory, Inc.
IDW	Investigation Derived Waste
in/yr	Inches Per Year
ISC	Initial Site Characterization
Kendall	The Kendall Company
lb/ft^3	Pounds Per Cubic Foot
LOAELs	Lowest Observed Adverse Effects Level
M&E	Metcalf & Eddy, Inc.
MADEP	Massachusetts Department of Environmental Protection
Maher	D.L. Maher, Inc.
MCA	Menzie, Cura & Associates, Inc.
meq/L	Milli Equivalents Per Liter
MFL	Million Fibers Per Liter
mg/kg	Milligrams Per Kilogram
mg/L	Milligrams Per Liter
MPC	Method Performance Criteria
MTBE	Methyl Tertiary Butyl Ether
mV	Millivolts
NaCl	Sodium Chloride
NAI	Normandeau Associates, Inc.
NEH	New Environmental Horizons, Inc.
NGVD	National Geodetic Vertical Datum
NOAELs	No Observed Adverse Effects Levels
Norfolk	Norfolk Services, Inc.
NSR	No Significant Risk
Order	Administrative Order by Consent
ORNL	Oak Ridge National Laboratory
ORP	Oxidation Reduction Potential
PAHs	Polycyclic Aromatic Hydrocarbons
PALs	Project Action Levels
PCB	Polychlorinated Biphenols
pE	Redox Potential

ABBREVIATION AND ACRONYM LIST
(continued)

Phase 1B-1 Work Plan	Phase 1B-1 Remedial Investigation Work Plan
Phase 1B-2 Work Plan	Phase 1B-2 Remedial Investigation Work Plan
PID	Photo Ionization Potential
PLM	Polarized Light Microscopy
PPAs	Potentially Productive Aquifers
PQL	Project Quantitation Limit
PQOs	Project Quality Objectives
PRGs	Preliminary Remediation Goals
QA/QC	Quality Assurance / Quality Control
QAPP	Quality Assurance Project Plan
RA	Removal Action
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RPD	Relative Percent Difference
s.u.	Standard Units
SAP	Sampling And Analysis Plan
SDG	Sample Delivery Group
SEM	Simultaneously Extractable Metals
SHA	Sanborn, Head & Associates, Inc.
Shaffers	The Shaffer Realty Nominee Trust and BIM Corporation
SIM	Select Ion Monitoring
Site	Blackburn & Union Privileges Superfund Site
SOPs	Standard Operating Procedures
SOW	Scope of Work
SVOCs	Semi Volatile Organic Compounds
SWQC	Surface Water Quality Criteria
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leachate Procedure
TDS	Total Dissolved Solids
TEM	Transmission Electron Microscopy
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TWA	Time Weighted Average
Tyco	Tyco Healthcare Group, LP
µg/kg	Micrograms Per Kilogram
µg/L	Micrograms Per Liter
µmol/g	Micromoles Per Gram
µS/cm	Microsiemens Per Centimeter
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
VPH/EPH	Volatile Petroleum Hydrocarbons/Extractable Petroleum

ABBREVIATION AND ACRONYM LIST
(continued)

	Hydrocarbons
WAD	Weak Acid Dissociable
WHGEL	Woods Hole Group Environmental Laboratory
Work Plan	Work Plan For The Phase IA Remedial Investigation for the Blackburn and Union Privileges Superfund Site, Walpole, Massachusetts

DISCLAIMER: THIS DOCUMENT IS A DRAFT DOCUMENT PREPARED BY THE RESPONDENT PURSUANT TO A GOVERNMENT ADMINISTRATIVE ORDER WHICH HAS NOT RECEIVED FINAL ACCEPTANCE FROM THE U.S. ENVIRONMENTAL PROTECTION AGENCY. THE OPINIONS, FINDINGS, AND CONCLUSIONS EXPRESSED IN THIS DRAFT DOCUMENT ARE THOSE OF THE AUTHORS AND NOT THOSE OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY.

1.0 INTRODUCTION

This report summarizes the results of the Remedial Investigation (RI) completed by Sanborn, Head & Associates, Inc. (SHA) at the Blackburn & Union Privileges Superfund Site in Walpole, Massachusetts (Site) in accordance with the "Work Plan for the Phase IA Remedial Investigation for the Blackburn and Union Privileges Superfund Site, Walpole, Massachusetts" (Work Plan) finalized in November 2000 (SHA, 2000a); the Phase 1B-1 Remedial Investigation Work Plan (Phase 1B-1 Work Plan) finalized on December 12, 2002 (SHA, 2002a); the Phase 1B-2 Remedial Investigation Work Plan (Phase 1B-2 Work Plan) finalized on June 30, 2003 (SHA, 2003a); and Addendum No. 1 to the Phase 1B-2 Work Plan finalized on October 21, 2003 (SHA, 2003b). The RI was completed in accordance with Sections 3 and 4 of the Statement of Work (SOW), Attachment A to the Administrative Order by Consent (Order), for the Remedial Investigation/Feasibility Study (RI/FS) and at the direction of Tyco Healthcare Group, LP (Tyco), sole Respondent to the Order.

This Report is subject to the Limitations presented in Appendix A.

1.1 RI Objectives

Section 5.1.2 of the Quality Assurance Project Plan[1] (QAPP) identified principal study questions for the RI:

1. Do concentrations of contaminants detected at the Site exceed the contaminants of potential concern (COPC) or contaminants of potential ecological concern (COPEC) screening levels included in Tables 11a through 19 which were established based on SHA's letter to the United States Environmental Protection Agency (USEPA) dated June 10, 2004[2] regarding revision of the applicable or relevant and appropriate requirements (ARARs)? Chemicals that exceed the COPC or COPEC screening levels were considered in the human health and ecological risk assessments.

2. Under existing and future Site and environmental conditions, is there a risk to either human or ecological health from Site-related contamination? How large is the risk from Site-related contamination? How large is the cumulative risk from all contaminants? Which Site COPCs contribute most significantly to risk? Where are the COPCs located?

[1] The QAPP is a component of the Work Plan finalized in November 2000.

[2] The study question posed in Section 5.1.2 of the QAPP related to exceedances of action levels asked the question " Do concentrations of contaminants exceed the Project Action Levels (PALs)?" However, as indicated in SHA's letter to USEPA dated June 10, 2004, the PALs will no longer be used as benchmarks of comparison for the RI Report. Rather, the COPC and COPEC screening levels, will be used as benchmarks of comparison to facilitate consistency between the site characterization/contaminant distribution assessment and the human health and ecological risk assessment portions of this Report.

3. What is the appropriate remedial action for Site contamination? What are the choices of available technologies, which are applicable to the Site, and what are estimated costs and cleanup time frames for applicable technologies?

Of these, the first two are elements of the RI, while the third is a separate work element, to be conducted in a subsequent phase of work. Therefore, the first two comprise the principal study questions for the RI and will provide the basis for determining what course of action should be taken at the Site.

In addition, in accordance with Section 5.1.2.4 of the QAPP, the following decision resolution sequence was followed in the RI:

- Are contaminants present at the Site?
- What is the distribution of contaminants at the Site?
- What is the fate of contaminants at the Site?
- Do contaminant concentrations currently exceed, or are the concentrations anticipated to exceed in the future, human health or ecological COPC screening levels?
- Which media are affected?
- What are the potential receptors to Site contaminants?
- Are there unacceptable risks?

All of these items have been addressed in the RI.

1.2 Site Background

A general Site description and history are provided below in brief summary format. For additional information regarding the Site and Site history, the reader is referred to SHA's "Existing Data Review and Analysis Report" (EDRA [SHA, 2000b]). It is assumed that the reader is familiar with the EDRA; therefore, much of the information contained in the EDRA is not repeated herein.

1.2.1 Site Description

As shown on Figure 1, the Site is located just south of the intersection of South Street and Common Street, approximately one-half mile south-southeast of the center of Walpole, Massachusetts. As depicted on Figure 2, South Street bisects the Site in a generally north-south direction, and the Neponset River bisects the Site in a generally east-west direction.

The Site, as defined in the Order, includes 21 parcels of land[3] over an area of approximately 22 acres. As defined in the Order, the Site consists of both On-Facility properties, and Off-Facility properties, and such other places where contamination has come to be located. The On-Facility properties are currently owned by various Shaffer interests, including Shaffer Realty Nominee Trust and the BIM Investment Corporation (collectively, the Shaffers). These properties, consisting of the following Walpole Tax Map parcels, have been the locus of various industrial activities spanning several hundred years:

- On-Facility parcels located east of South Street currently occupied by the Cosmec, Inc. (Cosmec): Lots 33-126, 33-127, and 33-128 (formerly known as Lots 1235-2A, 1235-2B, and 1235-3, respectively)[4]; and

- On-Facility parcels located west of South Street including: Lots 33-172, 33-173, 33-174, and the northeastern portions of Lots 33-165-3, 33-165-10, 33-165-11, and 33-165-14 (formerly Lots 1235-4, 1235-8, 1235-1, and the northeastern portion of 1249, respectively).

- Off-Facility parcels, which have historically been undeveloped or residential and are owned by various entities, including Off-Facility parcels located east of South Street:

    - Lots 33-119, 33-120, and 33-121 (formerly Lot 1275-5), which make up the railroad right-of-way (ROW);
    - Lots 33-122, 33-123, 33-124, and 33-125 (formerly Lots 1232-1A, 1232-1B, 1232-1, 1232-2, 1232-3, and 1232-4), located along Gleason Court; and
    - Lots 33-129, 33-130, 33-137, and 33-138 (formerly Lots 1235-5, 1235-7, 1235-6, and 1235-6); and

- Off-Facility parcels located west of South Street:

    - Lots 33-208 and 33-209, located within the wetland/former mill tailrace area (formerly Lots 1240-13 and 1240-14); and
    - The Orlando property, located on Lot 33-259 (formerly Lots 1245-8 and 1245-9).

A Site Vicinity Plan is provided as Figure 2; a General Site Features Plan, including updated topography and Site features locations is included as Figure 3. Key site features which may be discussed in further detail in this RI Report include:

[3] For purposes of this Report, current Walpole Tax Map information is referenced. The current Walpole Tax Map indicates that 23 parcels are included in the definition of the Site.
[4] For purposes of this Report, current Walpole Tax Map parcel numbers are referenced. These are not the same as those lot numbers referenced in the Order. Table G-1, included in Appendix G provides new and old Walpole Tax Map parcel numbers, for reference.

- The **Neponset River** was the site of the earliest industrial development in the Town of Walpole. In 1811, the **Blackburn Privilege** was reportedly established on the upstream portion of the Site, east of **South Street**, and in approximately 1812 the **Union** or **Union Factory Privilege** was established on the downstream portion of the Site, west of South Street. The term privilege refers to a grant enabling commercial usage of the Neponset River for water supply and power. Today, the Neponset River bisects the Site in a generally east-west direction.

- **Lower Mill Pond** (also known as [a/k/a] Union Pond) which was created by a dam located at South Street (a/k/a the **Union Dam**) on the Neponset River and was a predominant site feature between approximately 1904 and 1958. Water was diverted from the dam through a canal constructed just north of the Neponset River, through a power house and then a tailrace before discharging back in the Neponset River west of the Site in the area referred to as the **former mill tailrace**. Information included in the EDRA (SHA, 2000b) indicates that the Union Dam failed in 1959. Information included as Figure 9 of the EDRA suggests that the headrace to the powerhouse and much of the tailrace were likely filled sometime between 1918 and 1926.

- Further upstream of the Site, the **Blackburn Pond** (south of Lot 33-137), created by the **Blackburn Dam** is present. The history of this Pond and dam are not well known, but are features referenced for their location.

- **Lewis Pond** (essentially a quiescent stretch of the Neponset River) is located approximately 0.7 miles northwest of the Site and is generally present as a result of the dam in the Neponset River at **West Street**.

- West of South Street, the **former mill building** is currently unoccupied. Formerly, this building was used for a number of industrial purposes, including by the Standard Woven Fabric Company, whose name was changed to Multibestos Corporation, a manufacturer of asbestos specialities; and The Kendall Company (Kendall), who operated a cotton mercerizing operation at the Site. The property is currently owned by the Shaffers.

- East of South Street, the five buildings on the industrial portion of the Site are occupied by **Cosmec Inc.**, which currently maintains foundry operations.

- During Kendall's occupation of the Site, wastewater discharges from on-Site operations were treated in a **neutralization tank** (a/k/a **mixing tank**) located at the southwest corner of Kendall's facility. Neutralized wastewater was then discharged to one of two settling basins (**Settling Basin Nos. 1 and 2**) prior to discharge to the Walpole sanitary sewer.

- As described below, during 1992 asbestos **Removal Action** (RA), asbestos-containing soil excavated from various areas of the Site was consolidated on-Site in an area located south of the former mill building. In addition, excavated asbestos-containing soil from the former mill tailrace was consolidated in a high density polyethylene (HDPE)-lined

containment cell constructed in former Settling Basin No. 2 west of the former mill building. These areas south and west of the former mill building, along with an existing area of asbestos-containing soil north of the former mill building have been designated the **Area of Containment** (AOC). South and west of the former mill building, the AOC is capped with six inches of clean topsoil, placed over 24 inches of clean sand; north of the mill building, the AOC is covered with an asphalt cap. The AOC is subject to deed restriction and its perimeter is surrounded by an eight-foot high barbed-wire security fence.

- In addition, during the 1992 RA, a plate arch **culvert** approximately 400 feet in length was installed along the original alignment of the Neponset River through the AOC to prevent potential future erosion of asbestos-containing soils from the banks of the Neponset River in this area.

1.2.2 Site History

As described in detail in the EDRA, On-Facility portions of the Site have been the locus of various industrial activities spanning several hundred years. From the mid-to late -seventeenth century to circa 1891, On-Facility portions of the Site were used for a variety of manufacturing purposes, including a sawmill, corn mill, snuff factory, forge, tan yard, and cloth manufacturing; processing of cotton and wool; and manufacturing of mattresses, cotton batting, lamp wicks, and carpet linings. Between circa 1891 and 1915, the Site was used for manufacture of tires, rubber goods, and insulating materials. The Site was used to manufacture asbestos clutch and brake linings between 1915 and 1935. Subsequently, the Site was again used for a variety of manufacturing purposes, including manufacturing of non-woven cotton products, dye flocking of cotton, manufacturing of instant coffee, and rag and paper recycling. On-Facility portions of the Site to the west of South Street are currently vacant. As noted above, Cosmec currently maintains foundry operations east of South Street. The EDRA Report contains a detailed description of the Site history, and includes historical timelines to help place the Site history into perspective.

In the EDRA Report and in the Work Plan, the Site was apportioned into a number of horizontally-stratified areas, with the probability of environmental impact noted qualitatively for each area on the basis of historical Site use. These areas are shown on Figure 2, and include the following:

Manufacturing Areas with Current Evidence of Chemical Impact - These include two areas at the Site. The first area is located *west* of South Street in the vicinity of the former mill building, and includes the AOC. The second area, located on the *east* side of South Street includes Lots 33-126 and 33-127. Both areas have an extensive industrial history, and data obtained as part of pre-RA investigations indicated the presence of chemical contamination within each of these areas. The area west of South Street is currently unoccupied; current and future land use in a substantial portion of this area is subject to deed restrictions to ensure that the protective soil-

and asphalt-caps and the culvert are not disturbed. The area east of South Street is currently used for manufacturing operations by Cosmec.

Lower Mill Pond - Historical information indicates that the Lower Mill Pond covered Lot 33-128 and portions of Lots 33-129 until 1959. As such, there is no indication of manufacturing activities in this area prior to 1959, nor is there historical information to suggest that manufacturing activities have occurred in this area since that time.

Areas Peripheral to Manufacturing Activities - Both historical information and existing chemical data indicate that areas peripheral to manufacturing activities have a low potential for significant levels of chemical constituents. These areas include the northern portion of Lot 33-174, which has historically been used for residential purposes or as a vacant lot and only in more recent times as a support area for certain manufacturing operations; portions of Lots 33-173, 33-208, 33-209, and Lots 33-165-3, 33-165-10, 33-165-11, and 33-165-14; and the former railroad ROW, Lots 33-119, 33-120, 33-121.

Historically Residential or Undeveloped Properties - Historical information indicates that a number of properties included in the definition of the Site have been residential or undeveloped historically and continue to be so at this time. Although asbestos was detected in soil samples from limited areas of Lots 33-123and 33-259, the 1992 RA was effective in removing asbestos-containing soil from these lots. All asbestos concentrations detected in soil samples from residential/undeveloped Lots 33-122, 33-124, and 33-125, were less than 1%; thus, no further action was required. At the remainder of the residential parcels, including Lots 33-130, 33-137, and 33-138, asbestos was not detected at concentrations greater than the detection limit of 1%.

In addition to the above-described areas, Lewis Pond was identified in the Work Plan as an area of interest because it was assumed to be a depositional area, and therefore the anticipated downgradient limit of sediment accumulation that may be associated with the Site.

1.2.3 Previous Site Investigations and Remedial Actions

Environmental investigations to review possible impacts to the Site engendered by historical industrial activities were initiated in 1985, and were generally carried through 1990. Environmental data were also generated as a result of historical above ground and underground storage tank (AST and UST) closure and removals (primarily in 1987), and the RA conducted primarily in 1992 by Canonie Environmental Services Corporation (Canonie) to address the presence of asbestos-contaminated soil at the Site.

Historical pre-RI data are discussed in the EDRA Report. In general, a Data Usability Assessment of historical data from the Site (performed by SHA and New Environmental Horizons, Inc. [NEH] during completion of the EDRA Report) concluded that a majority of the existing data was usable for planning the Site RI; therefore, these data were used to support the data collection design for the RI presented in the Work Plan. However, the Data Usability Assessment contained in the EDRA report also indicates that much of the existing data could not

be incorporated directly into the RI and/or be used in human health or ecological risk assessment due to the limited quality of the data and because significant data gaps were shown to exist for some compounds (e.g., volatile organic compounds [VOCs] in soil) due to rejection of results for quality assurance/quality control (QA/QC)-related issues. Additionally, non-comparability of methods used to generate the pre-RI data compared to current analytical methods contributed to the uncertainty in the pre-RI data. COPCs were not eliminated on the basis of pre-RI data.

For a more detailed discussion of the usability or details of the pre-RI data, the reader is referred to the EDRA Report.

Despite the overview nature of this section of the RI report, more detailed information discussed in the EDRA regarding former Settling Basin Nos. 1 and 2 is presented below. This is in response to questions raised by USEPA during the Phase 1A Remedial Investigation regarding the contents of the capped containment cell constructed during the 1992 RA in Settling Basin No. 2. Further investigations into this matter were not carried out as part of the RI, and so, with the exception of limited mention, the Settling Basins are not discussed in the remainder of the report.

As detailed Section 2.3.2 of the EDRA Report (SHA, 2000b), former Settling Basin Nos. 1 and 2 received discharge from a mixing / neutralization tank designed to neutralize (with respect to pH) the process water used in the cotton bleaching / mercerizing process located on the Southwest corner of the former bleachery. Subsequent to neutralization, process water was discharged to the settling basins (where cotton fibers settled out) and then discharged to the sanitary sewer system.

As discussed in Section 1.2.1, above and in the EDRA Report (SHA, 2000b), former Settling Basin No. 2 was used during the 1992 RA to contain excavated asbestos-containing soil from the former mill tailrace removed by Canonie during the 1992 RA; these sediments were consolidated in a high density polyethylene (HDPE)-lined and capped containment cell constructed within the former settling basin. Chemical analyses of these former mill tailrace sediments by Dames and Moore in 1989, indicated elevated semi-volatile organic compounds (SVOCs) and some metals, as well as elevated pH. Toxicity characteristic leaching procedures (TCLP) analyses performed on a composite sediment sample from these tailrace sediments by Canonie in 1992, indicated that only lead exceeded the threshold concentration for toxicity characteristics (with a concentration of 13 milligrams per liter [mg/L], equivalent to parts per million [ppm]). TCLP results for VOCs and SVOCs in the composite sample were below the analytical detection limit. Sediments from the former mill tailrace were mixed with cement (for stabilization) prior to being placed in the containment cell. The Settling Basin No. 2 cap is covered by two feet of sand and six inches of vegetated topsoil.

As discussed in Section 5.5.2 of the EDRA Report (SHA, 2000b), prior to construction of the containment cell, Dames & Moore collected six samples in 1989 from the sediments within Settling Basin No. 2. The analytical results of these sediments represent the quality of the soil

underlying the Settling Basin No. 2 containment area and indicated concentrations of metals (including barium, copper, lead, nickel, and zinc) below Massachusetts Department of Environmental Protection (MADEP) S-1/GW-1 soil standards. In addition, low level concentrations of polycyclic aromatic hydrocarbons (PAHs) were also detected in these samples, ranging from approximately 0.35 to 55 milligrams per kilogram (mg/kg; for reference, as discussed in Section 5.1.2.4, below, total PAH concentrations in lower soil samples from the industrial area west of South Street, including the AOC, collected during the Phase 1A RI, ranged from approximately 0.1 to 6,400 mg/kg.)

1.2.4 Initial Site Characterization

SHA initiated the Initial Site Characterization (ISC) activities or Phase 1A RI activities in November 2000 as a component of the RI. The findings of the ISC Report have been incorporated into this RI Report. The reader is referred to the ISC Report (SHA, 2003c), approved by USEPA on July 16, 2003, for details regarding the ISC activities, findings, and recommendations.

1.3 Report Organization

This Report is organized as follows:

- Section 1.0 – Introduction, describes the purpose of RI and provides a brief summary of background information on Site description, history, and the previous environmental activities completed at the Site.

- Section 2.0 – Study Area Investigation, summarizes the field and analytical program completed during the RI.

- Section 3.0 - Summary of Field and Laboratory Quality Assurance/Quality Control Results and Implications For Site Data, summarizes the results of data validation (as described in the Phase 1A Data Usability Report [Phase 1A DUR - SHA, 2002a] and the Phase 1B Data Usability Report [Phase 1B DUR – SHA, 2004a]), achievement of project quality objectives, and evaluation of the RI data quality with respect to the project as a whole.

- Section 4.0 – Physical Characteristics of the Site Area, discusses the local demographics, climate conditions, surface water hydrology, and regional and Site hydrogeology.

- Section 5.0 – Nature and Extent of Analytes Detected, describes the distribution of analytes in soil, groundwater, surface water, and sediment, as determined during the RI.

- Section 6.0 – Analyte Transport and Fate, presents the results of the evaluation of contaminant migration pathways and transport mechanisms.

2.0 STUDY AREA INVESTIGATION

The RI was conducted in two phases of work: the Phase 1A RI and Phase 1B RI. The Phase 1A RI was conducted as part of the ISC in accordance with the Work Plan finalized in November 2000. The Phase 1B RI was conducted in two stages, the Phase 1B-1 RI and the Phase 1B-2 RI.

The Phase 1B-1 RI was conducted to address data gaps identified during completion of the ISC Report (SHA, 2003c). Specific tasks included the completion of a fish habitat survey; toxicity testing of sediment; and bioaccumulation testing of aquatic invertebrates using sediment from Lewis Pond, the Neponset River, and the former mill tailrace.

The Phase 1B-2 was conducted in accordance with Section 3 and 4 of the SOW to meet the remaining data collection objectives of the RI/FS, and to fulfill remaining Site Characterization requirements. Specific tasks included the installation and development of additional monitoring wells; permeability testing; surface and groundwater elevation monitoring; as well as groundwater, sediment and ecological sampling. Field and analytical programs completed during the RI are summarized below.

The scope of work completed for the RI followed that presented in the Work Plan. Further discussion of field and analytical procedures and methods are included in the Work Plan, including the QAPP, Field Sampling Plan (FSP) and Sampling and Analysis Plan (SAP)[5]; the Phase 1B-1 and 1B-2 Work Plans; Addendum No. 1 to the Phase 1B RI Work Plan; and the minor modifications indicated in Table 1 of the Data Usability Report for the Phase 1A RI (Phase 1A DUR-SHA, 2002a) and the Phase 1B RI Data Usability Report (Phase 1B DUR-SHA, 2004a). Analytical results generated during the RI are summarized in the Phase 1A DUR and the Phase 1B DUR and tabulated in Tables 6 through 19 of this report.

Exploration logs and other field documentation are included in Appendix B. The locations of field explorations are depicted on Figures 4 through 9.

2.1 Surveying of Site

In accordance with Section 8.8 of the QAPP and the requirements of Section 3 (IV)(A) of the Order, a Site survey (base map) was performed by Bryant Associates, Inc. (Bryant) of Boston, Massachusetts, a licensed land surveyor and subcontractor to SHA. This mapping was based on recent (Spring 2000) aerial photogrammetry obtained from Cole-East of North Adams, Massachusetts. The photogrammetric mapping data were compiled at a scale of 1 inch equals 40 feet (ft), with ground surface elevation contours plotted in two-ft intervals. Mapping detail included major building features, limits of pavement surfaces, above ground utilities, and major natural and manmade features. Photogrammetric ground control was performed.

[5] The QAPP, FSP, and SAP are components of the Work Plan finalized in November 2000.

Between April and December 2001, and in October and November of 2003, Bryant surveyed the elevations and horizontal locations of newly-installed monitoring wells; well points; staff gauges; surface water and surface water reference sampling locations; sediment sampling locations (including locations in the former mill tailrace, Neponset River, Neponset River reference area, Lewis Pond, floodplain, floodplain reference areas); soil borings; and selected other features (e.g., Phase 1A RI support trailers, investigation derived waste [IDW] storage areas). In addition, the location of the culvert within the AOC was also surveyed by Bryant (refer to additional discussion regarding the location of the culvert in Section 2.2). Horizontal locations are referenced to the Massachusetts State Plane Coordinate System (N.A.D.1983) and elevations are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. The reference point elevations were surveyed to an accuracy of +/- 0.01 ft. As noted previously, Site survey data are recorded on Figure 3.

2.2 Geophysical Survey

In accordance with Section 8.7 of the QAPP, on April 19, 2001 Hager-Richter Geoscience, Inc. (HRGI) of Salem, New Hampshire performed a geophysical survey in the north-central portion of Lot 33-174 (former Lot 1235-1) in an attempt to locate an approximately 10,000-gallon UST discovered in May 1990 during preparation for the 1992 asbestos RA (refer to Section 2.3.1 of the EDRA Report for additional detail). The geophysical survey was conducted using two complementary geophysical methods: time domain electromagnetic induction metal detection (EM61) and ground penetrating radar (GPR).

As indicated in HRGI's report (included as Appendix D), EM61 has the capability to detect buried metal, and was initially used to explore the north-central portion of Lot 33-174 for the presence of a buried metal object with dimensions consistent with a 10,000-gallon UST. EM61 data were collected at approximately 8-inch intervals along lines approximately 5 ft apart. Following a preliminary field evaluation of the EM61 data, GPR data were also collected in a portion of Lot 33-174, with traverses spaced approximately 5 ft apart. Reportedly, the 5-foot GPR traverse spacing is sufficient to detect an intact 500-gallon UST with a high degree of confidence (provided the UST is not buried at a depth below the effective penetration depth of the method, which was determined on the basis of the 60 nanosecond time window used to be approximately six to ten feet).

Based on the results of the EM61 and GPR surveys, HRGI concluded that "there is no 10,000-gallon UST with properties sufficient to produce an EM anomaly or GPR reflections" (HRGI, 2001) in the north-central portion of Lot 33-174.

In addition, on April 19, 2001, HRGI used GPR to locate the centerline of the Neponset River culvert within the AOC. GPR data were collected within the AOC, with traverses spaced approximately 20 ft apart, oriented perpendicular to the assumed alignment of the culvert. The approximate centerline of the culvert was marked in the field with pin flags; the centerline was later included in the survey of the Site completed by the land surveyor (Bryant).

2.3 Hydrogeologic Characterization (Overburden and Bedrock)

2.3.1 Installation of Groundwater Monitoring Wells

The objective of the groundwater monitoring well network was to provide information regarding hydrogeologic conditions including horizontal and vertical groundwater flow directions, to provide a sufficient number of monitoring wells to characterize the nature, extent, and magnitude of contamination; and in so doing, provide data to assess whether potential risk to human health and the environment exists due to Site conditions. As discussed in Section 5.1.7.2.a of the QAPP (and consistent with Section 3 (IV)(C) of the Order), discrete groundwater monitoring locations were chosen to assess groundwater quality upgradient and downgradient of suspected historical source areas, as well as portions of the Site where groundwater discharge to surface water receptors was considered likely. The monitoring well network was designed using information regarding hydrogeologic conditions, including depth to groundwater, groundwater flow direction, etc. collected during historical investigations performed at the Site and information obtained after completion of the Phase 1A RI.

A total of 55 borings were completed with groundwater monitoring wells (28 shallow, 18 deep[6], and 9 bedrock) between December 2000 and November 2003 in accordance with the Work Plan, the Phase 1B-2 Work Plan, and Amendment No. 1 to the Phase 1B-2 Work Plan. Installation was performed pursuant to the procedures documented in Standard Operating Procedures (SOPs) S-1669C for Boring Completion and Monitoring Well Installation, S-1669E for Soil Sampling (included in the QAPP), as modified to include sonic drilling procedures[7], S-2032F for Mud and Air Rotary Drilling Techniques, and S-2032G for Installation of Multi-Level Monitoring Wells in Bedrock. These explorations were completed by D.L. Maher Company (Maher) of North Reading, Massachusetts; Maher's subcontractor, Boart Longyear Environmental Drilling of Salt Lake City, Utah; and Environmental Drilling, Inc. (EDI) of Sterling, MA; and were observed and logged by SHA. Groundwater monitoring well locations are depicted on Figure 5.

Soil sampling was performed continuously to the top of the groundwater table and at approximately 5-ft intervals thereafter for each monitoring well cluster. One set of soil samples was collected from each monitoring well cluster. Soil samples were collected during the drilling of the shallow, deep, or bedrock wells or a combination of the three locations. Soil sampling for monitoring wells installed using rotosonic drilling techniques was performed continuously to the bottom of the soil boring.

[6] One groundwater monitoring well (SH-16D) anticipated in the Work Plan was not installed as part of the Phase 1A RI (as discussed in the February 2001 Monthly Progress Report [No. 17]) due to the presence of an obstruction (interpreted to be shallow bedrock).

[7] As discussed in a letter to USEPA dated March 26, 2001, modification of the drilling-related SOPs for the inclusion of sonic drilling was necessary due to the rate of drilling at the Site, which progressed much slower than originally projected, primarily due to the extraordinary density of the soils at the Site. These SOP modifications were approved by USEPA on May 31, 2001.

Bedrock groundwater monitoring wells were completed adjacent to shallow and deep overburden wells to form a triplet or quadruplet well cluster. Bedrock wells were constructed using approximately 10-ft well screens. The depths of the well screens were chosen based on conditions encountered in the field. For example, the screen in well SH-01R was installed between 55 and 65 ft bgs, approximately 10 ft into bedrock, to capture the fractured portion of the bedrock interval. Each of the bedrock wells was designated with an "R" suffix (e.g., SH-01R).

Bedrock well installation used either rotosonic or drive and wash cased-hole drilling techniques to advance 6-inch inner diameter SW casing, 5-inch inner diameter PW casing, or 4-inch inner diameter HW casing, through the overburden and into the upper portion of bedrock. Subsequently (with the exception of four bedrock wells noted below), a test boring rig was mobilized over the casing and a HQ waterline rock core (with an approximate inner diameter of $3\ ^{25}/_{32}$ inches) was advanced approximately 15 to 20 ft into bedrock. After the rock coring was complete, the rotosonic drilling rig was re-mobilized over the boring to complete the monitoring well installation. The monitoring well was installed based on observations made during the rock coring.

Bedrock monitoring wells SH-05R-A, SH-05R-B, SH-06R-A and SH-06R-B were installed using mud and air rotary drilling techniques. The borehole was advanced through the overburden and into the upper portion of bedrock using mud rotary techniques. Six-inch inner diameter SW casing was seated and grouted into shallow bedrock. Subsequently, air rotary techniques were employed to advance the borehole into bedrock. Soil samples were not collected; however, once bedrock was encountered, rock chips were collected in approximately 5-ft intervals to the bottom of the borehole. During drilling of the borehole, blown yield tests were performed in accordance with SOP S-2032F to assess hydraulically conductive zones within the borehole. This information was used to assess the placement of the screened interval within the borehole. An "upper" bedrock well was installed at approximately 18 to 25 feet below the bedrock surface and was designated with an "A" suffix (e.g., SH-05R-A). Within the same borehole, a second "lower" bedrock well was installed at approximately 45 to 50 feet below the bottom of the shallow bedrock well and was designated with a "B" suffix (e.g., SH-05R-B). Bentonite chips were used to isolate the screened intervals.

Deep overburden groundwater monitoring wells were installed adjacent to shallow overburden groundwater monitoring wells at eighteen locations, to form well couplets and were designated with a "D" suffix (e.g., SH-01D). The wells were installed to bedrock (i.e., at refusal or approximately 5 ft into bedrock) using drive and wash cased hole, hollow stem auger, or sonic drilling methods. Deep overburden wells were generally constructed using approximately 10-ft screen intervals[8], placed just above bedrock (or refusal).

Shallow overburden monitoring wells were installed using drive and wash cased hole or hollow stem auger drilling techniques and were designated with an "S" suffix (e.g., SH-01S). Well

[8] Five-foot well screens were used in two deep monitoring wells, SH-08D and SH-09D.

locations were selected based on observations made during the installation of the deep (or bedrock) well and existing adjacent water quality and/or hydrogeologic data. Shallow groundwater monitoring wells were constructed in overburden soils using approximately 15-ft screens, such that the screened interval intersected the observed groundwater table (i.e., approximately five ft of the screen was placed above the encountered water table and 10 ft of the screen was below the water table).

The screened depths and other attributes of monitoring well installations are summarized in Table 1. Additional information on installation details and subsurface conditions encountered is provided for each monitoring well on logs included in Appendix B.

2.3.2 Installation of Shallow Well Points

The objective of the shallow well point network was to provide supplemental information concerning hydraulic interaction between groundwater and surface water, and contaminant distribution in the vicinity of the Site. Well points were installed in accordance with SOP S-2032D as outlined Section 3.2 in the Phase 1B-2 Workplan. Well points were given a "WP" designation (e.g., WP-01). Well point locations are depicted on Figure 5.

SHA installed seven well points on September 8 and 10, 2003 using a 30-pound manual slide hammer. In accordance with Section 3.2 of the Phase 1B-2 Work Plan and SOP S-2032D, SHA installed two types of well points. Well points WP-01 through WP-03 were installed along the banks of the Neponset River and were constructed using approximately five-foot long well screens that intercepted the groundwater table. Well points WP-04 through WP-07 were constructed of approximately one-foot long well screens, installed approximately one to five feet below the bottom of the Neponset River. Well point construction consisted of 1.25-inch diameter stainless steel v-wired well screen (0.010-inch wire wrapped slots) and 1.25-inch diameter stainless steel riser. Well points not installed in the Neponset River were finished with a 2-inch diameter stainless steel casing with a 0.5-foot concrete surface seal. All well points were finished with a locking expandable cap.

2.3.3 Well Development

Subsequent to installation and prior to groundwater sampling and consistent with SOP S-1669C and Section 3.3 of the Phase 1B-2 RI Work Plan, the newly-installed monitoring wells and well points were developed to remove water introduced during drilling (i.e., for wells installed using drive and wash and sonic drilling techniques) and to remove fine-grained materials. The amount of water removed during development was based on the estimated quantity of water introduced during the drilling of each location, removal of sediment inside the well screen and sump, visual observation of turbidity, and the capacity of the well to yield groundwater. Well development logs summarizing the well development program are included in Appendix B-3.

2.3.4 Groundwater Sampling

SHA collected groundwater samples between September 5 and 13, 2001; May 15 and May 24, 2002; and October 27 and November 21, 2003; in accordance with Section 8.1 of the QAPP; the Spring 2002 Sampling Work Plan document entitled "Addendum to the Quality Assurance Project Plan: Draft Work Plan for Spring 2002 Groundwater Sampling, Blackburn and Union Privileges Superfund Site, Walpole, Massachusetts" submitted to USEPA on May 15, 2002 (SHA, 2002b); and Section 3.5 of the Phase 1B-2 Work Plan. Samples were collected using low-flow techniques described in SOP F-1669F for Groundwater Sampling (included in the November 2000 USEPA-approved QAPP) as amended by modifications approved by USEPA in September 2001[9] and the minor modifications indicated in Table 1 of the Phase 1A and Phase 1B DURs (SHA, 2002 and 2004, respectively), and SOP S-2032E for the Collection of Groundwater from Shallow Well Points.

In general, groundwater samples were screened in the field for temperature, specific conductance, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity. In addition, field measurements of pH were collected from each groundwater monitoring well. Figure 5 indicates the location of the groundwater monitoring wells and well points. Groundwater Field Sampling Summary forms are included in Appendix B.

2.3.4.1 Groundwater Sampling – Phase 1A RI

SHA personnel collected groundwater samples from the 40 existing monitoring wells at the Site between September 5 and 13, 2001.

As summarized in Table 2A, groundwater samples were submitted to Woods Hole Group Environmental Laboratory (WHGEL) for chemical analyses including, VOCs by USEPA Method 8260B; SVOCs by USEPA Methods 8270C-EI and 8270C- select ion monitoring (SIM); target analyte list (TAL) metals by USEPA Methods 6010B, 6020, and 7000 series; weak acid dissociable (WAD) cyanide by Standard Method 4500-CN I for distillation and colorimetric analysis by USEPA Method 9014; and natural attenuation parameters including common anions (chloride, sulfate, nitrate) by USEPA Method 300.0, alkalinity by USEPA Method 310.1, and total Kjeldahl nitrogen (TKN) by USEPA Method 351.3. Groundwater samples from five monitoring wells (those in the vicinity of former UST areas) were also submitted for volatile

[9] A modification to SOP S-1669F was made for sampling of monitoring wells in the presence of a suspended non-aqueous phase liquid (NAPL), in particular in well SH-08S (and any other location where suspended NAPL may be encountered). This modification was described in a letter to USEPA dated September 4, 2001 entitled "Modification to Section F 2.1 of Standard Operating Procedure SOP S-1669F, Blackburn & Union Privileges Superfund Site, Walpole, Massachusetts." A second modification to SOP S-1669F was made for situations where monitoring wells were screened within strata with very low permeabilities and where drawdown of greater than 0.3 ft was observed during sampling, even under low-flow conditions. These modifications are detailed in a letter to USEPA dated September 7, 2001 entitled "Modifications to Standard Operating Procedure for Groundwater Sampling (SOP S-1669F), Blackburn & Union Privileges Superfund Site, Walpole, Massachusetts."

petroleum hydrocarbons/extractable petroleum hydrocarbons (VPH/EPH) analyses by MADEP approved methods for hydrocarbon ranges only (MADEP, 1998).

In addition to the above-described sampling, SHA collected six groundwater samples not planned in the QAPP. These samples were submitted to Eastern Analytical Inc. (EAI) of Concord, New Hampshire; analyses were completed by Camin Cargo Control, Inc. (CCCI) of Chelsea, Massachusetts, a subcontractor to EAI, for screening-level analysis of density by the American Society of Testing Materials (ASTM) Method D-4052 and kinematic viscosity by ASTM Method D-445. Samples were collected from monitoring wells SH-01D, SH-01R, SH-04S, and SH-08D on November 28, 2001, from monitoring well SH-15S on December 11, 2001, and from monitoring well SH-06D on December 13, 2001. The locations were chosen to represent a range of elevated pH levels based on previously collected pH data (i.e., from well development and the September 2001 groundwater sampling). At each location, groundwater samples were collected using new, single-use disposable polyethylene bailers lowered to the bottom of the well (the screened zone of the well) and then retrieved. A portion of each sample was screened at the Site for pH; these pH data are included in Table 13C.

Results of analyses performed on groundwater samples from the Site are discussed in Section 5.2 of this Report. Data validation and data usability issues related to the September 2001 groundwater sampling round are discussed in the Phase 1A DUR (SHA, 2002a). Groundwater data are presented in Tables 7D, and 13A through 13F. Groundwater Quality Field Sampling Summary Forms are included in Appendix B.

2.3.4.2 Groundwater Sampling – May 2002

SHA personnel collected groundwater samples from the 40 existing monitoring wells at the Site between May 15 and 24, 2002.

As summarized in Table 2A, groundwater samples were submitted to WHGEL for chemical analyses including VOCs by USEPA Method 8260B; SVOCs by USEPA Method 8270C-EI and Method 8270C-SIM; TAL metals by USEPA Methods 6010B, 6020, and 7000 series; WAD cyanide by Standard Method 4500-CN I for distillation and colorimetric analysis by USEPA Method 9014; and natural attenuation parameters including common anions (chloride, sulfate, nitrate) by USEPA Method 300.0, alkalinity by USEPA Method 310.1, and TKN by USEPA Method 351.3.

Groundwater samples from five monitoring wells (those in the vicinity of former UST areas) were also submitted for VPH/EPH analyses by MADEP-approved methods for hydrocarbon ranges only (MADEP, 1998).

Results of groundwater analyses are presented in Tables 13A through 13F. Data validation and data usability issues are discussed in the May 2002 Groundwater Sampling Report (SHA, 2003e). Groundwater Quality Field Sampling Summary Forms are included in Appendix B.

2.3.4.3 Groundwater Sampling – Phase 1B RI

SHA personnel collected a total of 56 groundwater samples from 32 monitoring wells installed as part of the Phase 1A RI, and 24 monitoring wells and well points installed as part of the Phase 1B RI, between October 27 and November 21, 2003.

As summarized in Table 2A, groundwater samples were submitted to WHGEL for chemical analyses including: VOCs by USEPA Method 8260B; TAL metals by USEPA Methods 6010B, 6020, and 7470A; WAD cyanide by Standard Method 4500-CN I (for new wells); 17 PAHs plus two SVOCs (bis[2-ethylhexyl]phthalate and carbazole) by USEPA Method 8270C-EI, or 17 PAHs by Method 8270C-SIM and non-PAH SVOCs by Method 8270C-EI (for existing and new wells respectively).

Since non-PAH SVOCs, other than bis[2-ethylhexyl]phthalate and carbazole, were either not detected above Project Action Limits (PALs) in the May 2002 groundwater sampling round, or are not considered COPCs subsequent to completion of the Phase 1A RI, the larger list of SVOC analytes was not included in the Phase 1B Field Work for existing wells installed during the Phase 1A RI. Additionally, WAD cyanide was also eliminated from the parameter list for existing wells installed during the Phase 1A, since it was either not detected, or detected at very low concentrations during the two groundwater sampling rounds performed during the Phase 1A RI. However, groundwater from all wells and well points installed as part of the Phase 1B RI were analyzed for the full list of SVOCs as well as WAD cyanide.

In addition, groundwater samples collected during the Phase1B RI were analyzed for the following natural attenuation parameters to assist in characterizing possible remedial alternatives at the Site: anions (chloride, nitrate, sulfate) by USEPA Method 300.0, alkalinity by USEPA Method 310.1, TKN by USEPA Method 351.3, total organic carbon (TOC) by USEPA Method 415.1, total dissolved solids (TDS) by USEPA Method 160.1, and sulfide by USEPA Method 376.2.

Results of groundwater analyses are presented in Tables 13A through 13F. Data validation and usability issues associated with the groundwater sampling are discussed in the Phase 1B DUR (SHA, 2004a). Groundwater Quality Field Sampling Summary Forms are included in Appendix B.

2.3.5 Water Level Monitoring

In accordance with Section 8.5 of the QAPP and Section 3.4 of the Phase 1B-2 Work Plan, six rounds of Site-wide water level measurements were collected from monitoring wells and well points installed during the RI. In addition, the elevation of surface water in the Neponset River, former mill tailrace, and Lewis Pond were also recorded during each of the Site-wide water level rounds. Water level rounds were conducted on August 20, 2001; October 29, 2001; March 5, 2002; May 14, 2002; November 17 and 18, 2003; and May 25 and 26, 2004. Groundwater

elevations recorded during the six Site-wide monitoring rounds are presented in Table 3A and are further discussed in Section 4.4.3 of this Report.

In addition, consistent with Section 8.5 of the QAPP, groundwater hydraulic head information was gathered using data loggers installed within select monitoring wells SH-03S/D, SH-04S/D, and SH-15S/D located adjacent to the Neponset River. Groundwater levels in these six monitoring wells, as well as the surface water levels in three adjacent locations, SG-114, SG-113, and TR-3, were recorded hourly during two, one-month periods of groundwater/surface water interaction monitoring in the Fall 2001 and Spring 2002. Results of the groundwater/surface water interaction monitoring are discussed in Section 4.4 and are included in Appendix HB of this Report.

2.3.6 Aquifer Hydraulic Conductivity Testing

Consistent with Section 8.6 of the QAPP and Section 3.3 of the Phase 1B-2 Work Plan, SHA performed aquifer permeability testing to evaluate the hydraulic conductivity of Site soils.

As indicated in Table 1, falling head field permeability (open borehole) tests completed during the drilling of the boring for monitoring well SH-15S were performed on February 20, 2001. The borehole permeability tests were completed following the procedures detailed in SOP S-1669D included in the QAPP. Logs of the field data collected from the two borehole permeability tests performed in the SH-15S boring are included in Appendix HD.2.

Rising head (slug) and falling head (bail) field permeability tests were performed by SHA between October 3 and 17, 2001; between December 3 and 13, 2001; and between September 30 and November 25, 2003, in 49 of the monitoring wells (as identified in Table 1). The field permeability tests were completed in accordance with SOP S-1669D. Data collected during completion of field permeability tests are included in Appendix HD.1. Results of field permeability hydraulic testing are further discussed in Section 4.4 and Appendix HD of this Report.

2.4 Soil Characterization

Soil characterization completed during the RI included soil sampling and analysis as described in Sections 5.1.4.3 and 8.2 of the QAPP, and consistent with Section 3 (IV)(B) of the Order. As described in Section 5.1.4.3 of the QAPP (and in the EDRA Report), the Site was apportioned into several horizontal strata on the basis of general historical use and the likelihood of environmental contamination at each area.

On the basis of the findings of the EDRA, soil borings at the Site were located using a statistical approach (with the exception of the AOC and the historically residential/undeveloped areas). A discussion of the statistical sampling approach, including grid spacing and information on appropriate number of samples, is provided in Section 5.1.7.3 of the QAPP. An evaluation of the

assumptions made in the QAPP regarding the statistical sampling approach is discussed in Section 3.0 and presented in Appendix E.

In general, and as described in Section 5.1.4.4 of the QAPP, two primary vertical strata ("upper" - 0 to 1 ft bgs, and "lower" - 1 to 10 ft bgs) were identified to evaluate potential residential exposure for each of the areas, except for the industrial area west of South Street comprised primarily of the AOC and restricted by deed[10]. In cases where fill was present at depths greater than 10 ft bgs, samples from greater than 10 ft bgs were collected to provide information regarding potential leaching of contaminants to groundwater and to characterize the vertical extent of contamination at the Site.

As described in Section 8.2 of the QAPP, with the exception of the upper vertical stratum (0 to 1 ft bgs), composite soil samples from 4-ft intervals (i.e., 2 to 6 ft, 4 to 8 ft, etc.) were collected to accommodate the volume of soil required for the selected chemical analyses. The composite interval for soil samples submitted for chemical analyses from the lower stratum was chosen randomly.

Several additional discrete, "targeted" vertical soil samples were submitted for chemical analyses on the basis of visual/olfactory observations made during drilling (e.g., staining, strong odor) and/or the results of photoionization detector (PID) screening results.

Logs for soil borings and monitoring wells are included in Appendix B. A total of 157 soil borings/monitoring wells were completed during the RI. As summarized in Table 2B, in total, 144 soil samples from 83 soil boring locations (75 SB-series locations, two SH-series locations [borings completed as monitoring wells], and six UST-series locations) were collected and submitted for chemical analysis during Phase 1A RI field activities completed between December 2000 and August 2001. Soil samples collected during the Phase 1B RI drilling activities were not submitted for chemical analysis. Soil sampling locations are identified on Figure 4. As summarized in Table 2B, soil samples were submitted to WHGEL for analysis of SVOCs by USEPA Method 8270C-EI; PAHs by USEPA Method 8270C-SIM; TAL metals by USEPA Methods 6010B, 6020, and 7000 series; and WAD cyanide by Standard Method 4500-CN I for distillation and colorimetric analysis by USEPA Method 9014.

Depending on location relative to horizontal strata at the Site, between 26% and 95% percent (58% total, across all horizontal strata) of the soil samples were also submitted for analysis of VOCs by USEPA Method 8260B. Approximately 20% percent of soil samples from the industrial portions of the Site were submitted for polychlorinated biphenyl (PCB) analysis (aroclors only) by USEPA Method 8082 and pesticides by USEPA Method 8081A. Approximately 20% of the soil samples collected from the industrial portions of the Site and areas peripheral to the industrial portions of the Site were submitted for analysis of TOC by USEPA Method 9060 (modified). Soil samples from targeted soil borings (between

[10] The vertical sampling approach for this portion of the Site was discussed in Section 8.2.1.1 of the QAPP and did not include sampling of upper soil due to the presence of the soil cap.

approximately 20% and 35% of the total number of soil samples from the industrial portions of the Site) were also submitted for VPH/EPH (hydrocarbon ranges only) analysis by an approved Massachusetts Department of Environmental Protection (MADEP) methods (MADEP, 1998). A subset of soil samples (26 samples total from ten soil borings and 11 SH-series wells) was submitted for grain size distribution in accordance with ASTM Method D-422.

In accordance with Section 8.2 of the QAPP, in addition to fixed laboratory analyses, the presence of Site-related pH contamination in soil was measured in the field. Field measurement of pH was performed on a total of approximately 387 soil samples from the industrial area west of South Street and the downgradient portion of the area peripheral to the industrial area west of South Street (the wetland and former mill tailrace area). These soil samples included (but were not limited to) soil samples submitted for fixed laboratory chemical analyses. Field measurements of pH were made in general accordance with SOPs F-1669B (B.7.3) and S-1669E (5.0), using USEPA "Method 9045C Soil and Waste pH," in Test Methods for Evaluating Soil and Waste and SW846 (USEPA, 1996a). The pH data are presented in Tables 11A and 12A. In addition, soil samples were also screened in the field to evaluate the potential presence of Site-related VOC contamination through the use of a PID, in accordance with section SOP S-1669E (4.0).

Consistent with allowances made in Table 8-3 of the QAPP, several planned soil samples were not collected due to the presence of a shallow groundwater table. In total, greater than 93% of the soil samples planned for laboratory chemical analysis were submitted for analysis.

Results of analyses performed on soil samples from the Site are discussed in Section 5.1 of this Report. Data validation and data usability are discussed in the Phase 1A DUR (SHA, 2002a) and the Phase 1B RI DUR (SHA, 2004a). Soil data are presented in Tables 6A, 7A, 11B through 11E and, 12B through 12E.

2.5 Surface Water Characterization

2.5.1 Surface Water Elevation Monitoring

In accordance with Section 8.5 of the QAPP, 12 staff gauges were identified/established along the Neponset River, former mill tailrace, and in Lewis Pond during the initial portion of the Phase 1A RI. These staff gauges, designated SG-101 through SG-112, were installed as indicated on Figure 5 (note that SG-102, SG-103, and SG-105 through SG-108 correspond to surface water sampling locations as discussed below). The elevation of surface water at these staff gauges was measured concurrently with collection of surface water samples for chemical analyses to allow for correlation between river (and former mill tailrace) stage and chemical concentration. In addition, surface water elevation measurements were recorded at each staff gauge location during the six Site-wide water level rounds. Surface water elevations recorded during the six Site-wide monitoring rounds are presented in Table 3B and are discussed in more detail in Section 4.4.2.2 of this Report.

Two additional staff gauges, SG-113 (established on October 29, 2001in the Neponset River between SG-104 and SG/SW-105) and SG-114 (established on November 15, 2001, inside the aluminum culvert approximately 80 ft from where the Neponset River discharges from the culvert) were established as surface water station locations to be monitored with data loggers in connection with groundwater/surface water interaction data collection (refer to Section 4.4 of this Report).

In November 2003, due to the discovery of several missing staff gauges, SHA personnel re-established, consistent with Section 8.5 of the QAPP, the following staff gauge locations at the approximate locations established during the Phase 1A RI:

- SG-101A – designated SG-101AE (embankment) and SG-101AM (middle);
- SG-106 – designated SG-106A;
- SG-107 – designated SG-107A;
- SG-109 – designated SG-109A;
- SG-110 – designated SG-110A and;
- SG-113 – designated SG-113E (embankment) and SG-113M (middle).

The elevations and horizontal locations were subsequently surveyed by Bryant. Depth to water measurements and surface water elevations for staff gauge locations are presented in Table 3B.

2.5.2 Stream Gauging

Although not originally identified in the Work Plan, in order to better understand Site hydrology, and in response to several comments offered by the USEPA Hydrogeologist regarding the Work Plan in USEPA's May 31, 2000 Comment Response Memorandum, on April 5, 2001 and August 3, 2001, SHA performed stream gauging at staff gauge locations SG-102 and SG-108 (these locations correspond to surface water sampling locations SW-102 and SW-108). The dates of stream gauging were chosen to monitor early spring (typically high) and mid/late summer (typically low) water level conditions.

Depth of flow and velocity measurements were collected using a steel measuring tape and a Global Flow Probe FP101 manufactured by Global Water at 1-foot intervals along transects established at each of the two staff gauge locations. Velocity measurements were collected in accordance with the manufacturer's instruction manual. Calculation of total discharge of the Neponset River (included in Appendix HA) was made based on the measured cross-sectional area and observed velocities of the River.

Results of the stream gauging are discussed in Section 4.4 of this Report.

2.5.3 Surface Water Sampling

As identified in Section 8.4 of the QAPP, SHA performed a reconnaissance of surface water sampling locations on March 20, 2001. As depicted on Figure 6, in accordance with Section 8.4 of the QAPP, Site surface water sampling locations (designated SW-102, SW-103, SW-105, SW-106, SW-107, and SW-108[11]) were established along the Neponset River as it traverses the Site, and in the former mill tailrace. In addition, surface water reference locations (designated SWR-1 through SWR-5) were established in the field during the reconnaissance from just downstream of the Blackburn Dam and Pond (location SWR-1, which coincides with SG-101) to upstream of SG/SW-102 and Union Pond. Field measurements of pH in surface water were completed following establishment of the surface water quality sampling stations. In addition, field screening for specific conductance, temperature, DO, ORP, and depth of water were also recorded during the surface water reconnaissance. Surface Water Quality Field Sampling Summary forms are included in Appendix B-5.

Two rounds of surface water samples were collected and analyzed from the 11 surface water quality sampling stations for the Site. The first sampling round was completed on April 4 and 5, 2001 under early spring (typically high) flow conditions in the Neponset River; the second sampling round was completed on August 1 and 2, 2001 under mid/late summer (typically low) flow conditions. The samples were collected according to the procedures in SOP S-1669G of the QAPP with the exception of the minor modifications described in Table 1 of the Data Usability Report.

As summarized in Table 2C, surface water samples were submitted to WHGEL for analysis of VOCs by USEPA Method 8260B; SVOCs by USEPA Method 8270C-EI; PAHs by USEPA Method 8270C-SIM; dissolved and total TAL metals by USEPA Methods 6010B, 6020, and 7000 series; and TOC by USEPA Method 9060 (modified). In addition, samples were submitted to International Asbestos Testing Laboratory (IATL) of Mont Laurel, New Jersey for analysis of asbestos by the EPA 600/4-83-043 and EPA Method 100.1. During each of the surface water sampling rounds, field measurements of pH were recorded. In addition, screening-level measurements of DO, ORP, specific conductance, and temperature were also recorded during each sampling round. Surface Water Quality Field Sampling Summary forms are included in Appendix B-5.

Results of chemical analyses performed on surface water samples from the Site are discussed in Section 5.3 of this Report. Data validation and usability issues associated with the surface water sampling are discussed in the Phase 1A DUR (SHA, 2002). Surface water data are presented in Tables 7C, and 14A through 14F.

[11] Note that the surface water sampling stations are not numbered consecutively; staff gauges are numbered consecutively.

2.6 Sediment Characterization

In accordance with Section 8.3 of the QAPP, and Sections 3.6 and 3.7 of the Phase 1B-2 Work Plan, SHA collected sediment samples to evaluate the nature and extent of contaminants in sediment at, adjacent to, and downstream of the Site; to identify the extent of contaminant migration/transport; and to estimate local background concentrations. Samples were collected between July and November 2001, December 2002, and August 2003. In conjunction with the December 2002 sediment sampling, SHA collected sediment as part of an ecological sampling task in accordance with Section 3.2 and 3.3 of the Phase 1B-1 Work Plan. The Sediment Toxicity Analysis and Sediment Bioaccumulation Testing are discussed in Section 2.8.3 and 2.8.4 of this Report.

2.6.1 Sediment Sampling – Phase 1A RI

Between July and October 2001, sediment samples were collected from Site sampling locations, as proposed in Section 8.3 of the QAPP. A total of eight sediment samples (designated NR-1 through NR-8) were collected from the top approximately six inches of sediment within the potential groundwater discharge zone along the bed of the Neponset River at and immediately downstream of the Site; another five sediment samples (designated SedRN-1 through SedRN-5) were collected within the Neponset River upstream of the Site to serve as background to the NR-series samples. Five sediment samples (designated TR-1 through TR-5) were collected from the upper approximately six inches of sediment in the former mill tailrace. Ten samples (designated LP-1 through LP-10) were collected from the upper approximately six inches of sediment along three transects across Lewis Pond. Nine samples (designated FP-1 through FP-6, and FP-8 through FP-10) were collected from 0 to 1 ft bgs in the floodplain downstream of the Site, between the Site and the dam at Lewis Pond. Ten upstream reference floodplain samples (designated FPR-1 through FPR-10) were collected from 0 to 1 ft bgs and analyzed for comparison. Sediment sampling locations are depicted on Figure 7.

As summarized in Table 2D, sediment samples were submitted to WHGEL for chemical analyses, including: VOCs by USEPA Method 8260B; SVOCs by USEPA Method 8270C-EI and Method 8270C-SIM; TAL metals by USEPA Methods 6010B, 6020, and 7000 series; TOC by USEPA Method 9060 (modified); WAD cyanide by Standard Method 4500-CN I for distillation and colorimetric analysis by USEPA Method 9014; and grain size analysis by ASTM Method D-422. In addition, sediment samples were submitted to IATL for analysis of asbestos according to the USEPA Region I Method May 1994 and transmission electron microscopy (TEM) ELAP Method 198.4. Sediment samples from non-reference areas were also submitted for analysis of acid volatile sulfides (AVS) / simultaneously extractable metals (SEM) according to USEPA guidance (1996b).

In addition to fixed laboratory analyses, since pH is considered a definitive data parameter, the pH of sediment samples was measured in the field. Sediment pH data are presented in Table 15A. Field screening of sediment samples for the possible presence of VOC contamination was performed using a PID.

Results of analyses performed on sediment samples from the Neponset River, former mill tailrace, Lewis Pond, the floodplain, and Neponset River and floodplain reference areas are discussed in Section 5.4 of this Report. Data validation and usability issues associated with the Phase 1A sediment sampling are discussed in the Phase 1A DUR (SHA, 2002a). Sediment data are presented in Tables 6B, 7B, and 15A through 15F. Sediment Field Sampling Summary Forms are included in Appendix B.

2.6.2 Sediment Sampling – Phase 1B RI

In accordance with Sections 3.6 and 3.7 of the Phase 1B-2 Work Plan, SHA collected sediment samples from locations previously sampled during the Phase 1A RI to further delineate the extent of sediment contamination in the former mill tailrace and floodplain area.

On August 5, 2003, SHA personnel collected sediment from sampling locations FP-05, FP-06, and FP-09 in accordance with SOPs S-1669G and S-1669H. Two samples were collected at each location. The first sample was collected from approximately from 0 to 1 ft bgs and the second sample 1 to 3 feet bgs. Samples were collected using a stainless steel shovel, and a stainless steel scoop and bowl, and designated with location, depth and date (e.g., FP-06/0-1/8-5-03).

Floodplain sediment samples were submitted to WHGEL for analysis of select SVOCs (bis[2-ethylhexyl]phthalate, and carbazole) by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C-SIM; TAL metals minus four nutrients (calcium, magnesium, potassium, and sodium) by USEPA Methods 6010B, 6020, and 7471A; percent solids by USEPA Method 2540B; TOC by USEPA Method 9060 (modified); and grain size by ASTM Method D-422. Samples were also submitted to IATL for analysis for asbestos by USEPA Region I Method May 1994 and TEM ELAP Method 198.4. In addition to fixed laboratory analyses, the pH of sediment samples was measured in the field.

On August 6 and 7, 2003, SHA personnel collected three sediment samples from sampling locations TR-3, TR-4, and TR-5 in accordance with SOPs S-2032A and S-1669G. Sample depths were from approximately 0 to 3.0 feet below the sediment/water interface. Samples were collected using an AMS stainless steel sediment coring device with a manual slide hammer and a stainless steel scoop and bowl, designated with a location, depth and date (e.g., TR-03/0-3.0/8-6-03), and submitted to IATL for asbestos analysis by USEPA Region I Method May 1994.

Data validation and usability issues associated with the Phase 1B RI sediment sampling are discussed in the Phase 1B DUR (SHA, 2004a). Sediment data are presented in Tables 6B, 7B and 15A through 15F. Sediment Field Sampling Summary Forms are located in Appendix B.

2.6.3 Lewis Pond Sediment Sampling Reference Locations

Three candidate sediment reference areas for Lewis Pond were selected for reconnaissance sediment sampling during the initial portion of the Phase 1A RI in accordance with Section 8.3.2 of the QAPP. These three reference areas were ponds, chosen with concurrence from USEPA

and USEPA's oversight contractor, Metcalf & Eddy (M&E), based on watershed development and general morphological characteristics and included: Stoughton Pond in Stoughton, Massachusetts; Lower Pond in Norwood, Massachusetts; and Memorial Pond in Walpole, Massachusetts.

In November 2001, approximately 30 samples (approximately 10 samples from each potential reference area: designated "SedRS-" series samples from Stoughton; "SedRNwd-" series samples from Norwood; and "SedRW-" series samples from Walpole) were collected for the purpose of comparing the physical and chemical characteristics of the sediment reference area samples with the Lewis Pond sediment samples. Sediment samples were collected from approximately 0 to 0.5 ft bgs using an Eckman dredge sampler, and a stainless steel scoop and bowl. Samples were submitted to WHGEL and analyzed for grain size and percent solids analysis by a subcontractor to WHGEL, Applied Marine Sciences, Inc. (AMS) of League City, Texas. Additionally, samples were also submitted to WHGEL for TOC analysis. A comparison of the results of grain size and TOC data from the candidate reference areas to results from Lewis Pond sediments is included in Section 5.4.1 of this Report. Upon comparison, Lower Pond, located in Norwood, Massachusetts was chosen as the sediment sampling reference area location for Lewis Pond.

In December 2002, ten sediment samples were collected and designated with the prefix "SedRNwd" (e.g., SedRNwd-01) from Lower Pond in Norwood, Massachusetts. Sediment samples were collected using a stainless steel Eckman dredge sampler, and a stainless steel scoop and bowl in accordance with SOP S-1669G.

Samples were submitted to WHGEL for analysis of VOCs by USEPA Method 8260B; SVOCs by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C-SIM; TAL metals by USEPA Methods 6010B, 6020, and 7471A; percent solids by USEPA Method 2540B; TOC by USEPA Method 9060 (modified); and WAD cyanide by Standard Method 4500-CN I. Additionally, samples were submitted to IATL for asbestos analysis according to the USEPA Region I Method May 1994, phase light microscopy (PLM) Method EPA 600/R-93-116, and TEM ELAP Method 198.4. One sample (SedRNwd-01/12-17-02) was submitted for ammonia analysis by USEPA Method 350.1.

2.7 Ecological Site Characterization

Consistent with Section 8.9 of the QAPP, the requirements of Section 5.2 of the Ecological Risk Assessment Work Plan, and the requirements of Section 3 (IV)(F) of the Order, a subcontractor to SHA, Normandeau Associates, Inc. (NAI) of Bedford, New Hampshire, completed a natural resource inventory and assessment at, and in the vicinity of the Site. Initially, NAI reviewed natural and developed resources using soil maps and aerial photographs. Subsequently in June of 2001, NAI performed several field studies to evaluate and describe wetland and upland vegetation cover types and to identify features of value to wildlife.

A copy of NAI's report, entitled "Ecological Site Characterization Report, Blackburn & Union Privileges Superfund Site, Walpole, Massachusetts" (Ecological Characterization Report), dated December 2001 is included as Appendix C of this Report. Results of NAI's resource inventory are summarized in Section 4.5 of this Report.

In accordance Section 3.1 of the Phase 1B-1 RI Work Plan Aquatec Biological Sciences, Inc. (Aquatec) performed a preliminary fisheries survey to evaluate the potential of fish being present and potentially available for fish tissue analysis. The assessment of fish habitat was conducted at Lewis Pond, the Neponset River (downstream of the Site), and the former mill tailrace following USEPA Rapid Bioassessment Protocols.

2.8 Ecological Sampling

In accordance with Sections 3.2 and 3.3 of the Phase 1B-1 Work Plan and Section 3.8 of the Phase 1B-2 Work Plan SHA, Menzie-Cura & Associates, Inc. (MCA), and Aquatec performed various ecological sampling/testing tasks including sediment toxicity tests, sediment bioaccumulation tests, fish sampling, and earthworm sampling.

2.8.1 Fish Sampling and Analysis

In accordance with Section 3.8.1 of the Phase 1B-2 Work Plan, whole body fish samples were collected from the Neponset River (in the vicinity of the former mill tailrace), Lewis Pond, and from a reference area (Lower Pond in Norwood, Massachusetts) to evaluate potential risk to ecological receptors. Fish fillet samples were also collected from the same locations to evaluate potential risk to human receptors. In addition, due to the limited size and numbers of fish, the fillet and remaining carcass from the same fish were occasionally collected and submitted for laboratory analysis to evaluate the human health risk (from the fillet) and ecological risk (from the carcass plus fillet).

On August 18 and 19, 2003, SHA and Aquatec collected fish from the Neponset River (upstream of Lewis pond, downstream of the culvert) and Lewis Pond in accordance with SOP S-2032B. Fish were collected using a backpack electroshocker and nets. The fish were classified, measured and given a pathological exam. Samples were prepared for laboratory analysis using ceramic fillet knives and glass cutting boards. The Neponset River and Lewis Pond were fished in segments (as depicted on Figure 8) in order to identify where fish were collected from within the Neponset River and Lewis Pond.

Five whole body fish samples were collected from Lewis Pond, designated with an "LPW" prefix (e.g., LPW-1), and four whole body fish samples were collected from the Neponset River, designated with a "NRW" prefix (e.g., NRW-1). Five fish fillet samples were collected from Lewis Pond and the Neponset River designated with an "LPF" and "NRF" prefix respectively (e.g., LPF-1, NRF-1). One carcass sample was also collected from the Neponset River designated with a "NRC" prefix (e.g., NRC-5).

In addition, on October 30, 2003, fish samples were collected from Lower Pond, located in Norwood, Massachusetts, to be used as background reference samples, and were designated with a "NWD" prefix. Five fish fillets samples (e.g., NWD-1-F), two whole body samples (e.g., NWD-6-W), and three carcass samples (e.g., NWD-1-C) were collected in accordance with SOP S-2032B of the Phase 1B-2 Work Plan. Samples were collected, processed, and analyzed in the same manner as the August 2003 sampling round.

As summarized in Table 2E, fish samples were submitted to WHGEL for processing and analysis of select SVOCs (including 2,4-dimethylphenol, 4-methylphenol, 4-nitroanaline, benzoic acid, benzyl alcohol, bis[2-ethylhexyl]phthalate, carbazole and di-n-octylphthalate) by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C-SIM; select metals (including aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc) by USEPA Methods 6020A and 7471A; and percent lipids by WHGEL SOP OP-015, Rev.1.

The validation and usability assessment of the analytical data are discussed in the Phase 1B DUR (SHA, 2004a). The fish data are tabulated in Tables 16A and 16B. The Fish Field Sampling Summary Forms are included in Appendix B.

2.8.2 Earthworm Sampling and Analysis

In accordance with Section 3.8.2 of the Phase 1B-2 Work Plan, SHA and MCA collected earthworm and co-located soil samples to evaluate potential risk to ecological receptors. On August 7 and 8, 2003 SHA and MCA collected composite earthworm samples and co-located soil samples from four upland areas including the East Upland Area, On-Site Area, Orlando Property, and Floodplain as well as an On-Site Reference Area in accordance with SOP-2032C at the locations depicted on Figure 9.

Earthworms were collected from several sub-locations within each area and combined into a composite sample to provide sufficient tissue for chemical analysis, for a total of three earthworm samples per upland area. Co-located soil samples were collected by taking equal portions of soil from each earthworm sampling sub-location and combining them into composite samples. Samples collected within the East Upland Area were designated with an "EUA" prefix (e.g., EUA-1), samples collected from the On-Site Area were designated with an "OSA" prefix (e.g., OSA-1), samples collected within the On-Site Reference Area were designated with an "OSR" prefix (e.g., OSR-1), samples collected within the Orlando Property were designated with an "OP" prefix (e.g., OP-1), and samples collected within the Floodplain were designated with a "FPW" prefix (e.g., FPW-1). Samples were collected using a stainless steel scoop, bowl, and rake with an average depth of 0 to 0.5 feet bgs. Earthworm mortality during the depuration process was encountered for earthworms collected from the Eastern Upland Area, On-Site Area, and On-Site Reference Area; therefore, these areas were re-sampled as indicated on the Field Sampling Summary Forms included in Appendix B of this Report.

As summarized in Table 2B, soil samples were submitted to WHGEL for select SVOCs (including 1,2 dichlorobenzene, 4-methylphenol, benzoic acid, butylbenzylphthalate, carbazole, and dibenzofuran) by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C; select metals (aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc) by USEPA Methods 6010B, 6020 and 7471A; TOC by USEPA Method 9060 (modified); and grain size analysis by ASTM Method D-422.

As summarized in Table 2F, earthworm samples were submitted to WHGEL after depuration for chemical analysis of select SVOCs (including 1,2-dichlorobenzene, 4-methylphenol, benzoic acid, butylbenzylphthalate, carbazole, and dibenzofuran) by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C-SIM; select metals (aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc) by USEPA Methods 6020 and 7471A; and percent lipids by WHGEL SOP OP-015, Rev.1.

Data validation and usability issues related to the earthworm and co-located soil samples are discussed in the Phase 1B RI DUR (SHA, 2004a). The earthworm data are tabulated in Tables 18A and 18B, and the co-located soil data are tabulated in Tables 6A, 7A, 11B, and 11C. Earthworm and co-located soil Field Sampling Summary Forms are included in Appendix B.

2.8.3 Sediment Toxicity Analysis

Consistent with Section 3.2 of the Phase 1B-1 Work Plan, sediment toxicity analysis was conducted at the Site in accordance with SOP S-1669G. Sampling locations included NR-7, NR-8, LP-01, and TR-3. Two additional samples (SedRN-4, SedRNwd-1) were collected and used as reference samples from the upstream Neponset River of the Site and from Lower Pond, located in Norwood, MA.

Sediment samples were collected in December 2002 using a stainless steel Eckman dredge sampler, and a stainless steel scoop and bowl. Homogenized sediment from the top two inches (the likely exposure zone for fresh water invertebrates) was submitted to Aquatec for 28-day survival and growth toxicity testing in accordance with laboratory SOP L-48 (Aquatec's SOP for toxicity testing entitled "Amphipod, *Hyalella azteca*, 28-day Survival and Growth Toxicity Testing for Sediments"). In addition, sediment samples were submitted to WHGEL for analysis of select SVOCs (benzoic acid, benzyl alcohol, bis[2-ethylhexyl]phthalate, carbazole, 2,4-dimethylphenol, di-n-octylphthalate, 4-methylphenol, and 4-nitroaniline) by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C-SIM; select VOCs (acetone, 2-butanone, carbon disulfide, and methyl-tert-butyl ether) by USEPA Method 8260B; TAL metals by USEPA Method 6010B, 6020, and 7471A; TOC by USEPA Method 9060 (modified); pH in accordance with SOP S-1669B and S-1669E; and ammonia by USEPA Method 350.1.

Data validation and usability issues associated with the sediment toxicity analysis are discussed in the Phase 1B-1 Data Usability Report (SHA, 2004a). Sediment toxicity data are presented in Table 19. Sediment Field Sampling Summary Forms are included in Appendix B.

2.8.4 Sediment Bioaccumulation Testing

Consistent with Section 3.3 of the Phase 1B-1 Work Plan, SHA and MCA collected sediment samples to evaluate potential risk to an omnivore through ingestion of aquatic invertebrates in the Neponset River, Lewis Pond, and the former mill tailrace. Sediment samples were submitted to Aquatec where aquatic invertebrates were exposed to the sediment for 28 days. Subsequently, the invertebrates were submitted to WHGEL for analysis.

Sediment samples were collected on January 27 and 28, 2003 from three locations in Lewis Pond (LP-01, LP-06, and LP-09), three locations in the Neponset River (NR-5A, NR-7, and NR-8), and one location in the former mill tailrace (TR-3), in accordance with SOP S-1669G. Two reference samples were collected; one from Lower Pond located in Norwood, Massachusetts (SedRNwd-1), and one reference sample was collected from the Neponset River upstream of the Site (SedRN-4).

Sediment samples were collected from 0 to 0.5 ft bgs in accordance with SOP S-1669G using a stainless steel Eckman dredge sampler, and a stainless steel scoop and bowl. Homogenized sediment samples were submitted to Aquatec for 28-day bioaccumulation testing using *Lumbriculus variegates* in accordance with laboratory SOP L-47 (Aquatec's SOP for bioaccumulation testing entitled "Oligochaete, *Lumbriculus variegates*, 28-day Bioaccumulation Test for Sediments"). As summarized in Table 2G, following the 28-day test, Aquatec submitted the *Lumbriculus variegates* to WHGEL for analysis of select SVOCs (including 2,4-dimethylphenol, 4-methyphenol, 4-nitroanaline, benzoic acid, benzyl alcohol, bis[2-ethylhexyl]phthalate, carbazole, and di-n-octylphthalate) by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C-SIM; select metals (aluminum, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc) by USEPA Methods 6020, and 7471A; and percent lipids using WHGEL SOP OP-015, Rev. 1. Sediment samples from the nine sampling locations were also submitted to WHGEL for chemical analysis select SVOCs (including 2,4-dimethylphenol, 4-methyphenol, 4-nitroanaline, benzoic acid, benzyl alcohol, bis[2-ethylhexyl]phthalate, carbazole, and di-n-octylphthalate) by USEPA Method 8270C-EI; 17 PAHs by USEPA Method 8270C-SIM; select metals (aluminum, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc) by USEPA Methods 6020, and 7471A.

Data validation and usability issues associated with the sediment bioaccumulation testing are discussed in the Phase 1B-1 DUR (SHA, 2004a). Sediment bioaccumulation data are presented in Tables 17A and 17B. Sediment Field Sampling Summary Forms are included in Appendix B.

2.9 Survey of Existing Water Supply Wells

Consistent with Section 8.1.3 of the QAPP and Section 3 (IV)(C)(1)(i) of the Order, SHA reviewed and evaluated available data from the Town of Walpole, MADEP, United States Geological Survey (USGS), and USEPA regarding the presence of private and public water supply wells in the vicinity of the Site. This information is summarized in Section 4.1.3 of this Report.

2.10 Investigation Derived Waste

During the course of the RI, various streams of IDW were generated. Solid wastes generated at the Site included drill cuttings from soil borings, personal protective equipment (PPE), sampling material (i.e. polyethylene bailers, tubing etc.) and wastes from demolition of the IDW storage areas. Liquid IDW included groundwater pumped from monitoring wells, drilling fluids, decontamination water, decontamination water with methanol, and rainwater pumped from IDW storage areas. Consistent with the SOP for handling IDW (SOP F – 1669I) included in the QAPP, during RI activities, IDW was maintained in a central accumulation area located north of the former mill building on the west side of South Street. Additionally, non-hazardous aqueous IDW was stored in a 20,000-gallon frac tank located within the AOC on the south side of the former mill building during the Phase 1A RI and another 20,000-gallon frac tank located within the AOC on the north side of the former mill building during the Phase 1B RI.

2.10.1 Phase 1A RI Investigation Derived Waste Management

Between November 2001 and January 2002, SHA observed and documented removal of IDW materials generated during the Phase 1A by several subcontractors (including CWM Chemical Services, L.L.C. [CWM] of Model City, New York and Norfolk Services, Inc. [Norfolk] of Stoughton, Massachusetts). The work completed included the following:

- Sampling, analysis, and disposal of 73 drums of non-hazardous investigation derived soil generated from portions of the Site owned by the Shaffers;
- Sampling, analysis, and disposal of three drums of investigation derived soil generated during completion of soil borings on portions of the Site owned by the Shaffers;
- Sampling, analysis, and disposal of 13 drums of non-hazardous investigation derived soil generated from portions of the Site owned by parties other than the Shaffers (non-Shaffer);
- Sampling, analysis, and disposal of approximately eight tons of non-hazardous solid IDW (including, PPE, sampling material, and wastes from demolition of the IDW storage areas);

- Sampling, analysis, and disposal of approximately 15,650 gallons of non-hazardous aqueous IDW generated from portions of the Site owned by the Shaffers;

- Sampling, analysis, and disposal of approximately 3 partial drums of hazardous aqueous methanol waste generated during decontamination;

- Sampling, analysis, and disposal of approximately 1,155 gallons of hazardous (caustic) aqueous IDW generated from portions of the Site owned by the Shaffers; and

- Sampling, analysis, and disposal of approximately 1,720 gallons of non-hazardous aqueous IDW generated during well development and sampling of wells located on portions of the Site owned by parties other than the Shaffers (non-Shaffer).

In general, non-hazardous Shaffer and non-Shaffer aqueous IDW were delivered to Turnkey Landfill in Rochester, New Hampshire for solidification and disposal. Solid non-hazardous Shaffer and non-Shaffer waste, as well as the caustic hazardous aqueous IDW and waste methanol hazardous aqueous waste (both Shaffer wastes) generated during the Phase 1A RI were transported to CWM in Model City, New York. The three drums (1,500 pounds) of hazardous investigation-derived soil were transported to Pollution Control Industries' facility in East Chicago, Indiana, and disposed at the Environmental Quality Company facility in Belleville, Michigan. Non-hazardous solid IDW (PPE, sampling material, and demolition materials from the IDW storage areas) were delivered to Pond View Landfill in Rhode Island for disposal.

2.10.2 Phase 1B RI Investigation Derived Waste Management

On February 19, 2004 and August 24th through August 27, 2004 SHA observed and documented removal of IDW materials generated during the Phase 1B RI by Norfolk. The work completed included the following:

- Sampling, analysis, and disposal of 7 drums and approximately 6 cubic yards (contained in a roll-off dumpster) of non-hazardous investigation derived soil generated from portions of the Site owned by the Shaffers;

- Sampling, analysis, and disposal of 17drums of non-hazardous investigation derived soil generated from portions of the Site owned by parties other than the Shaffers (non-Shaffer);

- Sampling, analysis, and disposal of approximately 8,009 gallons of non-hazardous aqueous IDW generated from portions of the Site owned by the Shaffers;

- Sampling, analysis, and disposal of approximately 1,930 gallons of non-hazardous aqueous IDW generated from portions of the Site owned by parties other than the Shaffers (non-Shaffer);

- Sampling, analysis, and disposal of approximately 1 drum of hazardous aqueous methanol waste generated during decontamination; and

- Sampling, analysis, and disposal of approximately 2 drums of hazardous (caustic) aqueous IDW generated from portions of the Site owned by the Shaffers.

In general, non-hazardous Shaffer and non-Shaffer wastes (solid and aqueous) generated during the Phase 1B RI were delivered to Turnkey Landfill in Rochester, New Hampshire for disposal. The hazardous Shaffer aqueous methanol waste and the hazardous Shaffer caustic aqueous waste generated during the Phase 1B RI were delivered to Phillip Services Corporation's facility in Providence, RI for disposal.

3.0 SUMMARY OF FIELD AND LABORATORY QUALITY ASSURANCE/ QUALITY CONTROL RESULTS AND IMPLICATIONS FOR SITE DATA

Two individual Data Usability Reports were prepared by SHA for the Blackburn & Union Privileges Superfund Site and were submitted to USEPA in March 2002 and April 2004. Approval of the Phase 1A DUR was provided by USEPA on July 15, 2002, and the Phase 1B DUR is still under review. The Phase 1A and Phase 1B DURs present the data generated during the Phase 1A RI and Phase 1B RI sampling events, respectively, and provide a detailed summary of the usability of the data for project decisions. A brief summary of the findings of both of these reports is provided herein; for additional discussion regarding the quality of the data generated as compared to the project quality objectives (PQOs), measurement performance criteria (MPC), and data quality indicators (DQIs) defined in the QAPP, and the use or limitations of such data for project decisions, the reader is referred to the Phase 1A DUR and the Draft Phase 1B DUR (and any subsequent modifications).

3.1 Data Validation

Following the protocols established in the QAPP and in the Region I, USEPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses (USEPA, 1996a), New Environmental Horizons, Inc. (NEH) performed independent comparisons (data validation and usability assessments) of the Phase 1A and Phase 1B sampling and analysis results with the MPC for completeness, precision, accuracy, representativeness, sensitivity, and comparability established in the QAPP. Subsequently, an evaluation of the overall quality of the data was completed for each matrix/medium, analytical parameter, concentration level, and analyte collected and reported in support of the Phase 1A RI and Phase 1B RI. NEH separately evaluated the MPC for each matrix-specific sample delivery group (SDG), which were summarized by NEH in individual Data Usability Reports, included as Appendix B of the Phase 1A DUR and Phase 1B DUR. The on-Site field measurements of pH, which were not validated by NEH, are also considered definitive data; therefore, SHA completed a data usability assessment of pH data collected during the Phase 1A RI and Phase 1B RI, as summarized in Appendices B.6 and B.7 of the Phase 1A DUR and Phase 1B DUR, respectively. SHA and NEH summarized and included technical comments regarding achievement of the PQOs and MPC in Section 3.0 and Tables 3 through 19 of the Phase 1A DUR, and in Section 3.0 and Tables 3 through 27 of the Phase 1B DUR.

3.2 Evaluation of Data Quality with Respect to the Project as a Whole

Results of the Phase 1A RI and Phase 1B RI were evaluated in terms of the data as a whole in achieving the PQOs to make environmental project decisions, including an overall evaluation of sampling and analysis strategy established during the Work Plan development process for RI activities. A brief assessment of the data with respect to the project as a whole was presented in Section 20.0 of the QAPP. However, as indicated in the Phase 1A and 1B DURs, a complete assessment of the data with respect to the project as a whole can only be made in conjunction with reviewing both chemical and non-chemical (e.g., geological, hydrological, etc.) information

generated during the RI in the context of site characterization and risk assessment. As such, data gaps identified in the ISC Report were appropriately addressed in the Phase 1B-1 and Phase 1B-2 Work Plans and implemented in the Phase 1B RI.

Evaluating the data quality with respect to the project as a whole requires an evaluation of the representativness and completeness of the data set. Representativeness describes the extent to which a sampling design and implementation (including sample collection and analysis) adequately reflects the environmental conditions of the Site. As such, evaluation of representativeness involves a review of chemical and non-chemical data. One quantitative measurement of representativeness was evaluated via relative percent difference (RPD) precision criteria for field duplicate (FD) samples. Other QC measures used to evaluate representativeness include review of chain-of-custody (C-O-C) documentation and review of the sampling design and strategy and implementation.

Completeness of the data set defines the effectiveness of the sampling and analysis for each medium by measuring the amount of valid/usable data collected. In Sections 3.3.1 through 3.3.7 below, completeness is assessed quantitatively for the Phase 1A and Phase 1B data sets for all media.

Representativeness and completeness of the data collected during the RI are discussed in Section 3.3 below on a per matrix basis.

3.3 Achievement of Project Quality Objectives

The usability of the data summarized in the Phase 1A DUR and Phase 1B DUR, according to the reviews completed by NEH and SHA, indicated that the MPC for completeness, precision, accuracy, representativeness, sensitivity, and comparability were met for all definitive (SVOCs [including PAHs], VOCs, PCBs, VPH/EPH, metals, WAD cyanide, asbestos, and pH) and non-definitive (TOC, particle size, AVS/SEM, and natural attenuation parameters) parameters, with several minor exceptions. Minor instances where the MPC were not met were documented through qualification of the data. Qualified data were considered usable for project objectives because they fell outside of MPC but within acceptable tolerances for usability (based on USEPA data validation and risk assessment guidance). Rejected data fell outside of both the project MPC and the acceptable tolerances for usability and were therefore considered unusable for project decisions.

In the few cases where the data were rejected as unusable (e.g., WAD cyanide in groundwater samples from Phase 1A), the percent completeness of the data set overall and for the specific analyte decreased. In approximately half of these cases, the data rejection was caused by the complicated nature of Site media (in particular, groundwater with pH greater than 9 s.u.) and/or a limitation of currently available analytical methods. Consequently, similar matrix effects and/or analytical difficulty would be anticipated in repeat analyses of these samples.

Overall, the completeness criterion of 90% usable data was achieved in both the Phase 1A RI and Phase 1B RI, indicating that the combined data set is sufficient in quality and quantity to meet the PQOs, characterize the nature and extent of contamination at the Site, and determine the COPCs and calculate exposure point concentrations in the Baseline Human Health and Ecological Risk Assessments[12] (BHHRA and BERA). The achievement of 90% usable data is notable, particularly given the number of samples collected and the type and the complexity of the media sampled, which included sediment, surface water, soil, groundwater, bioaccumulated invertebrates, fish, and earthworms.

The significance of biases or spatial trends in qualified (or rejected) chemical results was also evaluated, considering whether the qualified concentration was significantly above or below the PAL and whether a compound was a historical Site-related contaminant. The few results that were determined to be unusable (rejected) during the data usability assessment were not considered for Site characterization or risk assessments. As discussed below for each media and chemical of concern, based on statistical evaluations performed for the BHHRA and BERA, the detailed assessment of uncertainties in qualified results presented in the Phase 1A and Phase 1B DURs, and professional judgment, particularly in light of the achievement of greater than 90% usable data, critical Site characterization data gaps were not identified in the data set as a whole.

3.3.1 Soil

3.3.1.1 Representativeness of Phase 1A RI Soil Data

The number of soil samples and their respective locations were chosen to best represent actual conditions at the Site in order to make environmental decisions regarding Site characterization, risk assessment, and remedial alternatives. As outlined in Section 5.0 of the QAPP, a statistical and non-statistical sampling approach was developed.

As established in Section 5.0 of the QAPP, for the Phase 1A RI, a statistical approach to identify appropriate soil sample locations was adopted in selected areas. Integral to human health and ecological risk assessment, a statistical evaluation pertaining to risk was completed for each of three horizontal strata including: 1) the industrial portion of the Site east of South Street; 2) the areas peripheral to the industrial areas (including the former Lower Mill Pond area); and 3) the historically residential or undeveloped portions of the Site). In these horizontal strata, possible sources of contamination and the potential distribution of contamination were not generally well known prior to the Phase 1A RI. Each of two vertical strata, including: 1) surficial soil and 2) subsurface soil, were also evaluated statistically. A discussion of this statistical evaluation is included in the BHHRA and BERA and in Appendix E.

The coefficient of variation (CV, a measure of variability) of a number of chemicals was large (primarily due to the often multi-modal distribution of contamination, or the presence of elevated

[12] For additional discussion regarding the selection of COPCs, the reader is referred to the BHHRA and BERA, included in this report.

concentrations, as well as non-detected concentrations). As a result, using only the mathematical expressions and statistical approaches described in the QAPP, additional samples were determined to be potentially required for one or more horizontal and vertical strata. However, in many cases, the number of samples that would be required (if only statistics were considered) was unreasonable (and often unrealizable: in some cases, greater than 5,000 additional samples, and often greater than 20). Tables E-1 through E-3 (included in Appendix E) summarize the results of the statistical evaluation of soil data from the three horizontal strata to which this approach was applied in the QAPP and the rationale for whether an adequate sample population was collected during the RI.

As discussed in Appendix E, compounds which were identified as "Possibly Contaminated" and requiring additional samples were identified as potential data gaps which need to be evaluated in light of other Site-related deterministic information including historic Site use, Site geology, and Site hydrogeology (as discussed in Section 4.0 and 5.0). These "Possibly Contaminated" compounds will also be further considered in the BHHRA and BERA.

Section 5.0 of the QAPP indicated that a non-statistical soil sampling approach be adopted for the Phase IA RI within the AOC on the industrial area west of South Street where specific areas of contamination had been documented in historical investigations, and where the presence of risk was acknowledged in a baseline exposure scenario. As indicated in Section 8.0 of the QAPP, non-statistical soil sampling locations and the appropriate number of samples for this medium were determined systematically during the development of the Work Plan based on historical use of the Site and limited existing data.

Thirteen soil FD samples were collected during the Phase 1A RI to assess precision and representativeness. Table 19A of the Phase 1A DUR presents the results of the FD soil samples. Of the 23 metals analyzed in soil from the Site, FD precision and representativeness was acceptable for approximately 95% of the positively detected results. WAD cyanide was present in one FD sample pair; the resulting RPD for this pair met the FD MPC. Approximately 78% of the positively detected SVOC results indicated acceptable precision and representativeness for soil samples from the Site. Although there were very few VOC analytes, EPH fractions, and pesticides detected in soil samples from the Site, when detected, a majority of these parameters met the required MPC. All TOC data met the MPC for FD precision. FD precision could not be quantitatively evaluated for VPH and PCBs because these compounds were detected below the project quantitation limit (PQL).

Across all parameters, the FD results indicate acceptable overall precision and representativeness of the soil data generated during the Phase 1A RI. Qualified results are usable for project decisions with the understanding that they indicate soil heterogeneity for certain compounds that might affect the representativeness of the sample.

3.3.1.2 Completeness of the Phase 1A RI Soil Data

As presented in Section 3.1.1.1 and Table 3 of the Phase 1A DUR, greater than 93% of the Phase 1A soil samples originally anticipated in the QAPP were submitted for chemical analysis, which exceeds the MPC for overall completeness of 90%. Consistent with allowances made in Table 8-3 of the QAPP, several anticipated soil samples were not collected due to the presence of a shallow groundwater table.

On a compound-by-compound basis, the overall completeness MPC of 90% was met for all parameters in soil in the Phase 1A RI with the exception of WAD cyanide and three SVOCs. As shown in Tables 3A through 3D of the Phase 1A DUR, analytical completeness (percentage of usable data obtained compared to the number of samples submitted to the laboratory for analysis) was 93% for WAD cyanide in soil; however, overall completeness for this parameter was 87%, just below the MPC for overall completeness (due to more samples planned for collection than submitted to the laboratory and rejection of 8 WAD cyanide results). The analytical completeness of three SVOCs, 2,4-dinitrophenol, benzoic acid, and benzyl alcohol ranged from approximately 92% to 94%; however, the overall completeness of these three compounds ranged from approximately 86% to 88%, just below the MPC. The distribution of the 12 rejected benzoic acid results were for soil samples collected from an area in the northeastern portion of the industrial area east of South Street; the other rejected SVOC results in soil are from samples that appear to be distributed across the Site. Based on the evaluation of the statistical analysis presented in the ISC and the BHHRA and BERA, combined with a lack of a historical source for these parameters from Site use, and the lack of elevated detections of these compounds in other media, it was concluded that WAD cyanide, 2,4-dinitrophenol, benzoic acid, and benzyl alcohol do not represent COPCs for the Site. Therefore, the number and distribution of rejected soil data for these four compounds do not represent a data gap.

3.3.1.3 Representativeness of Phase 1B RI Soil Data

As a result of the Phase 1A data evaluation, direct measurement of chemical concentrations of terrestrial COPECs (as summarized in Table 3 of the Phase 1B-2 Work Plan) in composite earthworm samples and co-located soil samples was recommended for each of the four upland areas (East Upland Area, on-Site Upland Area, Orlando Property, and Floodplain). A total of 15 composite earthworm and co-located soil samples were collected and analyzed in the Phase 1B RI. Sample locations were determined in the field based on observations of possible worm habitat. Composite co-located soil samples consisted of approximately equal amounts of soil from each earthworm sampling sub-location. Earthworm sampling and analysis is discussed further in Section 3.3.7, below.

Two soil FD samples were collected and analyzed for the Phase 1B RI to quantitatively assess precision and representativeness. Table 27A of the Phase 1B DUR presents the analytical results of the FD soil samples. Of the 17 metals analyzed in soil from the Site, precision and representativeness was acceptable for a majority of the positively detected results, with exceptions in one pair for cobalt, iron, manganese, nickel, and zinc. All TOC data met the MPC.

Grain size results for the sand fraction and silt fraction achieved acceptable precision and representativeness, although the coarse fraction in both FD pairs exceeded the criteria. The FD precision for SVOCs was acceptable for 11 of the 14 detected target SVOCs in these samples. The three exceptions were acenaphthylene, anthracene, and dibenz(a,h)anthracene in one of the FD pairs.

In general, the FD results indicate acceptable overall precision and representativeness of the soil data generated during the Phase 1B RI, with the exceptions of several metals, several SVOCs, and the coarse fraction of grain size. The soil results qualified due to imprecision are usable for project decisions with the understanding that they indicate soil heterogeneity that might affect the representativeness of these data.

3.3.1.4 Completeness of the Phase 1B Soil Data

As presented in Section 3.1.1.1 and Table 3 of the Phase 1B DUR, all soil samples planned in the Phase 1B Work Plans were successfully collected and analyzed. Tables 3A and 3B in the Phase 1B DUR indicate that 100% analytical and overall completeness was achieved on a compound-by-compound basis for metals, SVOCs, TOC, and grain size. No results were rejected due to QC exceedances.

Based on the information and evaluation presented herein and in the referenced project documents, the combined soil data set (Phase 1A and Phase 1B data) is considered usable for the project as a whole.

3.3.2 Groundwater

3.3.2.1 Representativeness of Phase 1A Sampling

The design of the groundwater monitoring network was intended to provide information regarding hydrogeologic conditions including horizontal and vertical groundwater flow, and to provide a sufficient number of monitoring wells to characterize the nature, extent, and magnitude of contamination; and in so doing, provide data to assess whether potential risk to human health and the environment exists from Site conditions. The Phase 1A monitoring well locations were determined systematically during the development of the Work Plan.

As described in the ISC Report, the 40 wells installed during the Phase 1A RI were not sufficient to characterize the horizontal and vertical extent of groundwater contamination. Data gaps were identified in the downgradient former mill tailrace area and off-Site residential properties located north and west of the Site and in the central portion of the AOC. Therefore, the data set was not representative of the nature and extent of contamination and necessitated further investigation, which was accomplished in the Phase 1B RI.

A total of five groundwater FD samples were collected during the Phase 1A RI to quantitatively assess precision and representativeness. Results for FD samples in groundwater are summarized

in Table 19B of the Phase 1A DUR. FD precision and representativeness was acceptable for approximately 85% of the positively detected metals in groundwater from the Site. Results for cyanide were below the PQL for all FD samples; therefore FD precision could not be evaluated. Results of natural attenuation parameters in groundwater met the MPC established for FD precision. Approximately 97% of the positively detected SVOC results indicate acceptable precision for groundwater samples from the Site. Although there were very few VOC analytes, as well as very few EPH and VPH fractions detected in groundwater samples from the Site, when detected, 100% of these analytes met the required MPC.

These FD results indicate acceptable overall precision and representativeness of the groundwater data generated during the Phase 1A RI. Qualified results are usable for project decisions with the understanding that they indicate heterogeneity for certain compounds that might affect the representativeness of the sample.

As indicated in the ISC Report, the groundwater monitoring well network was insufficient to adequately define the nature and extent of groundwater contamination at the Site. Further delineation of the groundwater contaminant plume was accomplished in the Phase 1B RI.

3.3.2.2 Completeness of the Phase 1A Data Set

As presented in Section 3.1.1.2 and Table 4 of the Phase 1A DUR, greater than 99% of the groundwater samples anticipated in the QAPP for Phase 1A RI were collected and submitted for chemical analyses. On a compound-by-compound basis, most of the analytes included in the analyses for groundwater met the MPC of 90% for both overall and analytical completeness. Only four parameters in groundwater (WAD cyanide, benzoic acid, 2-chloroethylvinyl ether, and pH) did not meet the MPC in the Phase 1A RI.

The rejected results for 2-chloroethylvinyl ether and WAD cyanide are for groundwater samples collected from several wells within the central/downgradient portion of the soil capped portion of the AOC; whereas, the rejected results for benzoic acid and pH are from samples that appear to be distributed across the Site. These rejected results were from samples with complex matrices exhibiting high pH values (>9 s.u.), high specific conductance, and visual observation of color and foaming. These attributes suggest that the cause of the rejections was due to the complicated nature of Site groundwater in certain locations (in particular, groundwater with pH greater than 9 s.u.) and/or a limitation of currently available analytical methods to successfully quantitate these compounds in the complex medium. Consequently, similar matrix effects and/or analytical difficulty would be anticipated in repeat analyses of these samples.

The remaining usable results in groundwater for WAD cyanide, benzoic acid, and 2-chloroethylvinyl ether were either non-detect at a reporting limit below the PAL or were detected at concentrations below the PAL. The lack of elevated concentrations of benzoic acid, 2-chloroethylvinyl ether, and WAD cyanide in groundwater in the usable results, combined with a lack of a historical source for these parameters from the Site and a lack of elevated detections of

these compounds in other media, suggest that these compounds do not represent COPCs for the Site and that these rejected data do not represent data gaps for making project decisions.

Similarly, although the MPC for completeness for pH in groundwater was not achieved, completeness of this parameter was 87.5%, which is just slightly less than the 90% criterion. Furthermore, pH results of soil samples collected during the Phase 1A RI provided supplemental information regarding the distribution of pH in these locations. Therefore, the slightly low completeness of pH data in groundwater in the Phase 1A RI was not considered to be a data gap as sufficient pH data were generated for project decisions.

3.3.2.3 Representativeness of Phase 1B Sampling

Data gaps identified in the groundwater monitoring well network after completion of the Phase 1A RI were addressed in the Phase 1B RI with the installation of additional groundwater monitoring wells and the collection of additional groundwater samples. Additional analysis was performed on groundwater samples collected during the October/November 2003 groundwater sampling round to aid in the assessment of potential remedial options.

As described in Sections 5.0 and 6.0, the groundwater data set collected during the RI is sufficiently representative to determine the nature and extent of groundwater contamination for Site characterization purposes, the assessment of human health and ecological risk, and remedial alternative purposes. The extent of groundwater contamination is well defined and contaminant source areas are well characterized.

A total of three groundwater FD pairs were collected and analyzed during the Phase 1B RI to quantitatively assess precision and representativeness. Table 27B in the Phase 1B DUR presents the results of the FD groundwater samples collected and analyzed during the Phase 1B RI. All detected results for total metals and natural attenuation parameters met FD precision criteria for two of the three FD pairs. FD imprecision was observed in one FD pair for aluminum and iron. Precision and representativeness was acceptable for all detected compounds in two of the three FD pairs analyzed for SVOCs. FD imprecision was observed for carbazole in one FD pair. Precision and representativeness was acceptable for the six positively detected VOC results for the three FD pairs.

Overall, the FD results indicate acceptable precision and representativeness of the groundwater data generated during the Phase 1B RI, with the few exceptions listed above. The few groundwater results qualified for imprecision are usable for project decisions with the understanding that they may indicate sample heterogeneity that might affect the representativeness of the sample.

3.3.2.4 Completeness of the Phase 1B Data Set

As presented in Section 3.1.1.2 and Table 4 of the Phase 1B DUR, groundwater results from the Phase 1B RI achieved the MPC of 90% for overall completeness of the data. As summarized in

Tables 4A through 4C of the Phase 1B DUR, on a compound-by-compound basis, all parameters achieved the overall and analytical completeness goals of at least 90% for groundwater. No results were rejected for metals, natural attenuation parameters, TOC, or WAD cyanide. Only one SVOC result was rejected for 3,3'-dichlorobenzidine; however, this rejection did not generate a data gap as this compound still met the MPC of 90% for analytical and overall completeness.

The majority of rejected VOC data occurred in a single sample in which headspace was generated during the holding time period prior to analysis. The pH of this sample, measured in the field, was greater than 12 s.u, and therefore, the sample was not acid preserved (consistent with QAPP protocols). The complex matrix (i.e., high pH) of the sample is likely responsible for the creation of headspace during the holding time period. Even considering these rejected data however, no data gap was identified as both the overall and analytical completeness goals of 90% were achieved on a compound-by-compound basis for all VOC compounds in groundwater.

Based on the information and evaluation presented herein and in the referenced project documents, the combined groundwater data set (Phase 1A and Phase 1B data) is considered usable for the project as a whole. No further data gaps have been identified for the groundwater matrix.

3.3.3 Surface Water

3.3.3.1 Representativeness of Phase 1A Sampling

The number of samples and their respective locations were chosen to represent actual conditions at the Site in order to make environmental decisions regarding Site characterization and risk assessment that reflect the project as a whole. As indicated in Section 8.0 of the QAPP, for the Phase 1A RI, surface water sampling locations and the appropriate number of samples for this medium were determined systematically during the development of the Work Plan based on historical use of the Site and limited existing data.

The primary objectives of the surface water sampling and analyses were 1) to evaluate the nature and extent of spatial distribution of contaminants in the surface water at the Site, adjacent to the Site, and downstream of the Site; 2) to identify the extent of contaminant migration from the Site; and 3) to collect and analyze surface water at reference stream channel locations to estimate local background concentrations of analytical parameters. Two rounds of twelve surface water samples were collected in the Phase 1A RI from the Neponset River, the former mill tail race, and a reference location. As described in Sections 5.0 and 6.0, the nature and extent of surface water contamination is generally well defined. As such, the surface water data set is considered representative of actual conditions at the Site.

A total of two surface water FD samples were collected during the Phase 1A RI to quantitatively assess precision and representativeness. Results for FD samples in surface water are summarized in Table 19C of the Phase 1A DUR. FD precision and representativeness was acceptable for

approximately 88% of the positively detected dissolved metals and 56% of the positively detected total metals results in surface water. Results for WAD cyanide in surface water samples were below the PQL for both FD samples; therefore FD precision could not be evaluated. Results of TOC analysis on surface water samples met the MPC established for FD for one out of two samples. Approximately 62% of the positively detected SVOC results indicated acceptable precision and representativeness, which was attributed to the PAH results in one FD pair that generally did not meet FD MPC. All (100%) of the positively detected SVOC results for the other FD pair met the MPC. One VOC analyte was detected in a FD surface water sample collected from the Site; the result for this analyte met the required MPC. Both FD pairs for asbestos exhibited imprecision in the surface water samples.

Poor FD precision primarily occurred in surface water samples collected during the April 2001 sampling round. Heterogeneity in the these samples may be a result of the high flow of the Neponset River during sampling; the higher velocity flow in April is anticipated to have entrained larger amounts of bottom sediment in the water column than the lower flow observed during the August 2001 sampling round. Although sample heterogeneity may have compromised the precision and representativeness of the April surface water samples for several total metals, PAHs, and TOC, the qualified results are usable for project decisions with the understanding that they indicate heterogeneity for certain compounds that could affect the representativeness of the sample.

3.3.3.2 Completeness of the Phase 1A Data Set

As presented in Section 3.1.1.3 and Table 5 of the Phase 1A DUR, greater than 99% of the surface water samples anticipated in the QAPP were collected and submitted for chemical analyses. On a compound-by-compound basis (Tables 5A through 5C of the Phase 1A DUR), all but one of the analytes (dimethylphthalate) included in the analyses for surface water met the MPC for overall and analytical completeness of 90%.

The rejected results for the SVOC dimethylphthalate were from the surface water samples collected during the April 2001 sampling round. The results for dimethylphthalate from the August 2001 surface water sampling round were considered usable as non-detected results at a detection limit well below the PAL. In addition, dimethylphthalate was not detected in soil, groundwater, or sediment at levels above the reporting limit. The lack of detected concentrations of dimethylphthalate in surface water in the Phase 1A RI samples, combined with a lack of a historical source for this parameter from Site use and the lack of elevated detections of this compound in other media, suggests that this compound does not represent a COPC for the Site. Therefore, the rejected data do not represent a data gap.

Based on the information and evaluation presented herein and in the referenced project documents, the surface water data set (Phase 1A data) of chemical results is considered usable for the project as a whole. No further data gaps have been identified for the surface water matrix.

3.3.4 Sediment

3.3.4.1 Representativeness of Phase 1A Sampling

As indicated in Section 8.0 of the QAPP, for the Phase 1A RI, sediment sampling locations and the appropriate number of samples for this medium were determined systematically during the development of the Work Plan based on historical use of the Site and limited existing data.

As indicated in Section 7.0 of the ISC Report, data gaps in the Phase 1A RI sediment data set were identified and necessitated further sediment sampling to assess the nature and extent contaminated sediment at the Site. Therefore, the data set was not representative of the nature and extent of sediment contamination and necessitated further investigation, which was accomplished in the Phase 1B RI.

Three sediment FD samples were collected during the Phase 1A RI to quantitatively assess precision and representativeness. Results for FD samples in sediment are summarized in Table 19D of the Phase 1A DUR. FD precision and representativeness was acceptable for approximately 89% of the positively detected metals results, indicating generally acceptable precision from the field through analysis for these sediment samples. Results for WAD cyanide in sediment were below the PQL for two of the three FD samples (and FD precision could not be evaluated) and met the established MPC for the third. TOC data met the MPC for FD in two of the three sets of sediment samples. In general, there was poor FD precision for two of the three sets of sediment samples for AVS/SEM analyses. One FD pair met the MPC for AVS/SEM in all positively detected parameters. Approximately 84% of the positively detected SVOC results met the established MPC. Although there were very few VOC analytes detected in sediment samples from the Site, when detected, all of these parameters (100%) met the required MPC. Only one FD pair had detected results for asbestos, which met the MPC.

These FD results indicate acceptable overall precision and representativeness of the sediment results for the definitive Site parameters of VOC, SVOC, metals, WAD-cyanide, and asbestos. The qualified sediment results are usable for project decisions with the understanding that they indicate heterogeneity for certain compounds that could affect the representativeness of the sample.

3.3.4.2 Completeness of the Phase 1A Data Set

As presented in Section 3.1.1.4 and Table 6 of the Phase 1A DUR, greater than 99% of the sediment samples anticipated in the QAPP were collected and submitted for chemical analyses. Based on Tables 6A through 6C of the Phase 1A DUR, sediment data from the Site achieved the MPC for both overall and analytical completeness of 90% established in the QAPP.

3.3.4.3 Representativeness of Phase 1B Sampling

Based on the results of the Phase 1A RI, comments by the USEPA, and data gaps identified in the ISC and preliminary ecological and human health risk assessment analysis, field investigations proposed in the Phase 1B Work Plan incorporated collection of additional sediment samples that were deemed necessary to develop a representative data set for the RI, BHHRA, and BERA. Additional data requirements were identified and investigations were undertaken in the Phase 1B RI to address:

- Evaluation of potential toxicity to benthic invertebrates in sediment due to direct contact through toxicity testing of sediment from select locations at the Site;
- Analysis of metals and PAH contamination in floodplain sediments from the vicinity of three previously sampled locations, including an assessment of whether contaminant concentrations represent local background conditions; and
- Further vertical delineation of asbestos contamination, for the purpose of assessing potential remedial alternatives associated with possible excavation/dredging and disposal of the former mill tailrace sediments, at three locations within the former mill tailrace.

Sediment samples were collected from 24 locations during the Phase 1B RI from the Neponset River and its floodplain, the former mill tailrace, Lewis Pond, and a nearby reference location. As discussed in Sections 5.0 and 6.0, the nature and extent of sediment contamination is generally well defined and the sediment data set (collected during the Phase 1A and Phase 1B RI) is representative of Site conditions.

Three sediment FD pairs were collected and analyzed during the Phase 1B RI to quantitatively assess precision and representativeness. Results for FD samples in sediment are summarized in Table 27C of the Phase 1B DUR. FD precision was acceptable for a majority of the positively detected metals results in the three FD pairs. FD imprecision was noted in one FD pair where 16 of the 23 metals analyzed failed FD precision criteria. Ammonia also exceeded FD precision criteria in this sample. MPC precision for metals for the remaining two FD pairs was acceptable. Four of the five detected VOCs in the three FD pairs exceeded the MPC for precision. These included results for 2-butanone (MEK), acetone, carbon disulfide, and m/p-xylene. The one FD pair that detected asbestos met MPC for precision. All of the positively detected SVOC results met the established MPC for FD analysis in the three FD pairs with one exception for carbazole.

In summary, the matrix and FD results indicate that the overall precision of the sediment data was variable with several VOCs, total metals, and ammonia results exceeding criteria. This is an indication of sample matrix heterogeneity that may affect the representativeness of the sediment samples and will be considered in the assessment of risk and in the RI Report.

3.3.4.4 Completeness of the Phase 1B Data Set

As presented in Section 3.1.1.3 and Table 5 of the Phase 1B DUR, the sediment data achieved the MCP goal of 90% overall completeness for usable data. The overall percent completeness for sediment samples per parameter type was 100% for each of the following: metals, WAD cyanide, asbestos, ammonia, TOC, and grain size. Overall percent completeness for VOCs and SVOCs was 99.5% and 99.4%, respectively.

Tables 5A through 5C of the Phase 1B DUR show completeness on a compound-by-compound basis. Only one compound, benzoic acid, did not meet the MPC for overall and analytical completeness of sediment. The rejected benzoic acid results were from 5 sediment samples collected during the second sampling round in December 2002. Detected concentrations of benzoic acid in sediment samples collected during the Phase 1B RI (considered usable for project objectives) were all several orders of magnitude lower than the PAL. Additionally, in the Phase 1A RI, benzoic acid achieved 95% overall and analytical completeness and all detected and non-detected results were reported at a concentration well below the PAL. Based on these reasons, combined with a lack of a historical source for this parameter from Site use and the lack of elevated detections of this compound in other media, this compound does not represent a COPC for the Site and the rejected data do not represent a data gap.

Based on the information and evaluation presented herein and in the referenced project documents, the combined sediment data set (Phase 1A and Phase 1B data) is considered usable for the project as a whole. No further data gaps have been identified for the sediment matrix.

3.3.5 Bioaccumulated Invertebrates

3.3.5.1 Representativeness of the Sampling

Based on the results of the Phase 1A RI sampling, comments by the USEPA, and data gaps identified in the ISC and preliminary ecological and human health risk assessment analysis, field investigations proposed in the Phase 1B Work Plans incorporated collection of ecological samples that were deemed necessary to develop a representative data set for the RI and the BHHRA and BERA. In order to further evaluate potential risk to an omnivore through ingestion of biota, bioaccumulation testing of aquatic invertebrates using sediment from Lewis Pond, the Neponset River, and the former mill tailrace was performed during the Phase 1B RI. "Bioaccumulated Invertebrates" refers to the tissue samples that were generated during bioaccumulation testing using the invertebrate *Lumbriculus variegates*. The results of the analyses completed on nine samples were used to assess the potential for bioaccumulation of contaminants at higher trophic levels.

The bioaccumulated invertebrate sample locations were selected based potential risk identified during preliminary ecological modeling performed on sediment sample analytical results subsequent to completion of the Phase 1A RI. Given that the sample locations selected for bioaccumulated invertebrate testing generally correlated to sediment sample locations with the

highest contaminant concentrations, the bioaccumulated invertebrate data set is likely to be conservatively representative of conditions at the Site.

One bioaccumulated invertebrate FD sample was collected during the Phase 1B RI to quantitatively assess precision and representativeness. Results for the FD sample in the invertebrate biota matrix are summarized in Table 27D in the Phase 1B DUR. FD precision was acceptable for all detected metals results with two exceptions for nickel and vanadium. FD precision was acceptable for all of the detected SVOC results with two exceptions for benzoic acid and benzyl alcohol.

These FD results indicate acceptable overall precision and representativeness of the bioaccumulated invertebrate results for metals, percent lipids, and SVOCs, with the few exceptions noted above. The qualified bioaccumulated invertebrate sample results are usable for project decisions with the understanding that they indicate heterogeneity for certain compounds that might affect the precision and representativeness of the sample.

3.3.5.2 Completeness of the Data Set

As presented in Section 3.1.1.4 and Tables 6, 6A, and 6B of the Phase 1B DUR, data generated from the bioaccumulated invertebrates met the QAPP MPC by achieving 100% overall and analytical completeness for metals, SVOCs, and percent lipids. No results were rejected due to QC exceedances.

Based on the information and evaluation presented herein and in the referenced project documents, the bioaccumulated invertebrate data set (Phase 1B data) is considered usable for the project as a whole to evaluate potential ecological risk. No further data gaps have been identified.

3.3.6 Fish

3.3.6.1 Representativeness of the Sampling

Based on the results of the Phase 1A RI sampling, comments by the USEPA, and data gaps identified in the ISC and preliminary ecological and human health risk assessments, field investigations proposed in the Phase 1B Work Plans incorporated collection of ecological samples that were deemed necessary to develop a representative data set for the RI and the BHHRA and BERA. Modeling based on maximum sediment concentrations indicated potential risk to piscivorous birds through ingestion of fish in the Neponset River, Lewis Pond, and the former mill tailrace. In order to further evaluate potential risks to piscivorous birds through ingestion of fish, collection and analysis of whole body fish tissue samples was recommended to determine actual concentrations of COPECs (as summarized in Table 2 of the Phase 1B-2 Work Plan) in these biota. In addition, surface water and sediment results from the Phase 1A RI were used to model concentrations of metals and SVOCs in fish fillets (the portion of the fish consumed by humans). The modeled results exceeded USEPA Region 3 Risk Based

Concentrations (RBCs) for human consumption and thus required further study in direct measurements of chemicals in fish fillets.

A fish sampling plan was developed for the Phase 1B RI based on the results of the fish habitat assessment performed by Aquatec documented in "An Assessment of the Potential Fisheries Communities Present Near the Blackburn & Union Privileges Superfund Site, Walpole, MA," submitted to USEPA on January 23, 2002 (Aquatec, 2002c). As discussed in Section 2.0 and 5.0, multiple species of fish were collected and submitted for laboratory analysis. Aquatec and MCA selected the species which were most likely to be representative of fish ingested by the human health and ecological receptors.

Consistent with the Phase 1B-2 Work Plan, FD samples were not collected for fish tissue. Overall precision and representativeness of these tissue data were evaluated based on several sets of matrix duplicates. Precision was variable with five metals (aluminum, barium, chromium, manganese, and nickel) and two SVOCs (4-nitroaniline and pyrene) exceeding the MPC. The estimated fish results are usable for project decisions with the understanding that they indicate heterogeneity for certain compounds that might affect the precision and representativeness of the sample.

3.3.6.2 Completeness of the Data Set

As presented in Section 3.1.1.5 and Tables 7, 7A, and 7B of the Phase 1B DUR, overall completeness was 100% for metals and percent lipids. The overall completeness for SVOCs was 96.8%, which meets the MPC. On a compound-by-compound basis, two SVOC compounds, 2,4-dimethylphenol and benzoic acid, did not meet the MPC for overall and analytical completeness for fish. Ten results were rejected for 2,4-dimethylphenol and 14 results were rejected for benzoic acid due to both method and matrix issues.

The detected results of benzoic acid in fish samples collected during the Phase 1B RI that were considered usable for project objectives were all several orders of magnitude lower than the PAL and usable, non-detected results were reported at a reporting limit that was also less than the PAL. Although approximately half of the usable, non-detected results for 2,4-dimethylphenol were reported at a reporting limit that was greater than the PAL, all fish samples collected from on-Site locations were non-detect and not rejected for this compound. All rejections for 2,4-dimethylphenol occurred in samples collected from the off-Site reference location. Based on these reasons, combined with a lack of a historical source for these parameters from Site use and the lack of elevated detections of these compounds in other media, these compounds do not represent COPCs for the Site and the rejected data do not represent a data gap.

Based on the information and evaluation presented herein and in the referenced project documents, the fish data set (Phase 1B data), including whole fish and fish fillets is considered usable for the project as a whole to evaluate potential human health and ecological risks. No further data gaps have been identified.

3.3.7 Earthworm

3.3.7.1 Representativeness of the Sampling

Based on the results of the Phase 1A RI sampling, comments by the USEPA, and data gaps identified in the ISC and preliminary ecological and human health risk assessment analysis, field investigations proposed in the Phase 1B Work Plan incorporated collection of ecological samples that were deemed necessary to develop a representative data set for the RI and the BHHRA and BERA. Modeling based on maximum soil concentrations indicated potential risk to terrestrial small mammals and songbirds through ingestion of earthworms. This data gap called for direct chemical measurements in earthworms for the Phase 1B RI.

Measuring concentrations of terrestrial COPECs (as summarized in Table 3 of the Phase 1B-2 Work Plan) in composite earthworm samples and co-located soil samples was planned for each of the four upland areas (East Upland Area, on-Site Upland Area, Orlando Property, and Floodplain). A total of 15 composite earthworm and co-located soil samples were collected and analyzed in the Phase 1B RI. Actual locations of earthworm sampling were determined in the field based on observations of possible worm habitat such as organic, moist soils. Earthworm samples were composites (consisting of a number of worms to acquire enough tissue for analysis) from several sub-locations. The four upland areas selected were in locations where maximum soil concentrations indicated potential risk to terrestrial small mammals and songbirds through ingestion of earthworms; therefore, the earthworm data set is likely to be conservatively representative of the Site as a whole.

Two earthworm FD samples were collected during the Phase 1B RI to quantitatively assess precision and representativeness. Results for the earthworm FD samples are summarized in Table 27E of the Phase 1B DUR. Earthworm metals results for both FD pairs met precision criteria. Three out of four detected SVOC results in the two FD pairs exceeded the MPC for precision, including benzo[b]fluoranthene, benzoic acid, and pyrene. Percent lipids in one of the earthworm FD pairs exceeded the MPC.

These matrix and FD results are an indication of acceptable precision and representativeness for metals and variable precision and representativeness for SVOCs and percent lipids. The variable precision observed is likely due to the complexity of the earthworm matrix. The qualified earthworm results are usable for project decisions with the understanding that they indicate heterogeneity for certain compounds that might affect the precision and representativeness of the sample.

3.3.7.2 Completeness of the Data Set

As presented in Section 3.1.1.6 and Tables 8, 8A, and 8B of the Phase 1B DUR, earthworm data achieved 100% overall and analytical completeness for all parameters tested. No results were rejected due to QC exceedances.

Based on the information and evaluation presented herein and in the referenced project documents, the earthworm data set (Phase 1B data) is considered usable for the project as a whole to evaluate potential ecological risk. No further data gaps have been identified.

4.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

This section summarizes available demographic, land use and climatic data for the Site and vicinity. Subsequently, regional hydrogeology, Site geology and Site surface water and groundwater hydrology are also described. A brief summary of Site ecology is also provided (further discussion on Site ecology is provided NAI's December 2001 Ecological Characterization Report, included in Appendix C).

4.1 Demography and Land Use

This subsection provides a general summary of the demography and land use of the Site vicinity. The principal source of this information is the 2000 United States Census Bureau (published at www.census.gov/main/www/cen2000.html); other sources are cited when referenced.

4.1.1 Demography

According to 2000 US Census Bureau information, the population of the Town of Walpole was at that date approximately 22,824, with 6.8 percent (%) of the population (1,552) under 5 years of age; 25.8% (5,889) aged 18 years and younger; and 14.4% (3,287) aged 65 and older. The Site is located in Census Track 4111 (an area roughly bordered by Main Street to the west, East Street and High Plain Street to the north, the town lines of Sharon and Foxborough on the east, and the town line with Norfolk to the south). The population of Census Track 4111 in 2000 was 7,351, with 6.9% of the population (507) under 5 years of age; 26.7% (1,963) age 18 and younger; and 15.1% (1,110) age 65 and older.

Walpole High School is located approximately 1,000 ft southeast of the Site on Common Street; Plimpton Elementary School is located immediately southeast of Walpole High School.

4.1.2 Land Use

According to the Walpole Town Clerk, the Town of Walpole encompasses approximately 20.5 square miles[13] and is bordered by Dover on the north, Medfield and Norfolk on the west, Foxborough on the south, Sharon and Norwood on the east, and Westwood on the northeast. According to Office of Environmental Affairs data from 1999 (available in the Walpole town library), land use in Walpole consisted of approximately 42% forest, 33% residential, 2% commercial, 3% industrial, 7% open land or agriculture, 7% water (or wetland), and approximately 6% other uses in 1999.

According to information from the Town of Walpole Assessor's Office (also published at www.walpole.org), zoning regulations include a minimum lot size for a single family house of 15,000 square feet (ft^2); and minimum lot size for a two family house of 20,000 ft^2.

[13] Using 2000 United States Census data this corresponds to a population density of approximately 1,113 persons per square mile.

According to the Town of Walpole Assessor's Office, the industrial portions of the Site (Lots 33-126, 33-127, and 33-174) are zoned "LM," limited manufacturing. In addition, Lots 33-128 (former Lower Mill Pond) and 33-173 (wetland area west of South Street) are also zoned for limited manufacturing. A zoning boundary between LM and "GR," general residential, runs through the approximate center of Lots 33-119 and 33-120 (former Lot 1275-5). Remaining On- and Off-Facility properties, as well as properties surrounding the Site are zoned GR and are currently either occupied by residences or are undeveloped. Figure G-1 (included in Appendix G) depicts the zoning designations of the Site.

4.1.3 Groundwater Use

This section describes the current and potential future use of groundwater at and in the vicinity of the Site. This information is presented at this juncture to provide the reader with an overview of this important consideration, and to help establish the overall hydrogeologic framework for the Site. In so doing a number of concepts relating to Site hydrogeology and analyte (contaminant) distribution and fate are presented; however, it is realized that the reader may wish to revisit this section following more detailed review of these concepts in later Sections of this report.

4.1.3.1 Current Groundwater Use

The Town of Walpole reportedly derives much of its water from groundwater sources. On the basis of a petition submitted by the Town of Walpole to the USEPA on May 10, 1988, USEPA designated the head of the Neponset aquifer a Sole Source Aquifer (SSA) on December 12, 1988. A key consideration in making the SSA designation was USEPA's estimation that approximately 68% of the subject area's drinking water was provided by groundwater supplies, and further, that viable water supply alternatives reportedly did not exist. The area covered by the SSA designation includes the towns of Foxboro, Medfield, and Walpole, as well as portions of Dover, Norwood, Sharon, and Westwood.

In accordance with Section 8.1.3 of the QAPP, SHA reviewed available data from the Town of Walpole, MADEP, USGS, and USEPA regarding the presence of private and public water supply wells in the vicinity of the Site. Table 5 summarizes available water supply well information including total well depth, depth to bedrock, bedrock description, well yield, principal water-bearing zones and the distance from Site for private and municipal wells within a one-mile radius of the Site. Figure F-1 (included in Appendix F) depicts the approximate locations of these wells relative to the Site.

According to the information reviewed from the Town of Walpole Water and Sewer Department and Department of Public Works, the Town of Walpole derives its public drinking water from two wellfields: the "Washington Street Wellfield" (a/k/a "School Meadow Brook Aquifer") and the "Mine Brook Aquifer." Figure F-1 (included in Appendix F) depicts the locations of the School Meadow Brook and Mine Brook Aquifers and the associated MADEP approved Zone II wellhead protection areas (WHPA) relative to the Site. Typically, the Town's water system

produces between 900 million and 1 billion gallons of water per year. Daily demand ranges from approximately 2 to 4.3 million gallons per day.

The School Meadow Brook Aquifer is located approximately one mile south-southeast of the South Street Site, and includes seven active wells along the headwaters of School Meadow Brook on both sides of Washington Street. A small section of the most upgradient portion of the Site (Lot 33-137) falls within the MADEP-approved Zone II WHPA of the School Meadow Brook Aquifer. However, this portion of the Site is upgradient of those areas previously used for industrial purposes; in addition, groundwater on Lot 33-137 is anticipated to flow generally northwest toward the Site, rather than toward the School Meadow Brook aquifer (as discussed in Section 4.4.3.1). In addition to the School Meadow Brook Aquifer, four water supply wells located within the Mine Brook Aquifer, located approximately 0.75 and 1.5 miles north-northwest of the South Street Site, also supply water to the Town of Walpole.

As depicted on a map entitled "Aquifer Map of Town of Walpole, Massachusetts" published by the Walpole Planning Board and adopted October 1985, the Town of Walpole has designated four "Water Resource Protection Overlay Districts": "Area 1 – Area of Pumping Influence;" "Area 2 – Potential Water Supply Area;" "Area 3 – Primary Recharge Area;" and "Area 4 – Secondary Recharge Area." The southernmost portion of the Site near Blackburn Dam is included in the northern limit of Walpole's "Area 1 – Area of Pumping Influence." No other portions of the Site (including Lewis Pond) are located within any of the four Resource Protection Overlay Districts delineated by the Town. Figure F-2, included in Appendix F depicts the location of three of the "Water Resource Protection Overlay Districts" relative to the Site; "Area 4 – Secondary Recharge Area" is not present within the view depicted on Figure F-2.

Due to the presence of a municipal water supply in the Town of Walpole, residences and commercial facilities typically do not obtain their water from private or shared water supply wells.[14] However, according to information reviewed by SHA at the Walpole Town offices, there are approximately five private wells used for domestic water supply, seven wells used for irrigation water supply and two wells of unknown usage within approximately ½-mile of the Site boundary (no recorded wells are located within 500 ft of the Site boundary). Figure F-1 in Appendix F, shows the location of these wells and the respective buffer distances (500 ft., ½ mile, and 1 mile)[15]. Table 5 includes a summary of available information (including well depth, well yield, etc.) for each private well location.

[14] Based on information obtained from conversations with Richard E. Mattson, Jr., Superintendent of Sewer and Water, Town of Walpole, on January 18, 2002.

[15] The shape of the buffer zones was selected based on the portions of the Site where industrial activities occurred. The 500 ft buffer zone does not extend upgradient of these portions of the Site because the groundwater flow direction is well documented to be in a westerly direction. Therefore, these areas would not likely have been impacted by contaminated groundwater emanating from the Site and are not included in the buffer zone. The ½- and 1-mile buffer zones are presented to add perspective to the reader regarding the location of the industrial portions of the Site relative to the features (e.g., residential wells, public wells, aquifer protection districts, etc.) depicted on the figures in Appendix F.

Existing private and public wells are not considered to be threatened by impacted groundwater emanating from the Site for the following reasons:

- **Distribution of Groundwater Contamination at the Site:** As discussed in Sections 4.0, 5.0, and 6.0 of this Report, the hydrogeologic and contaminant distribution data consistently indicate that the plume of contaminated groundwater delineated at the Site is at a 'steady state' configuration, and not growing. Data documented in this Report consistently indicate that the contaminant plume is discharging to the nearby former mill tailrace and Neponset River in the vicinity of the westerly boundary of the Site. In this regard, the Neponset River is acting as a hydrogeologic barrier to groundwater flow and contaminant transport at the downgradient side of the Site. Under current pumping conditions of existing private and public wells in Walpole, groundwater contamination associated with the Site does not migrate to the west, beyond the Neponset River; and

- **Consistent Westerly Direction of Groundwater Flow:** Six comprehensive rounds of groundwater and surface water level measurements have been collected at the Site. Each water level measurement round indicates groundwater flows in a predominantly westerly direction. Hence there is no reason to suspect that groundwater contamination sourced at the Site will be transported to the north, south, or east of its current location.

4.1.3.2 Potential Future Groundwater Use

Potential groundwater use at the Site and in the vicinity of the Site is assessed herein on the basis of the USGS Hydrologic Atlas Series mapping of groundwater favorability for the Town of Walpole.[16] In accordance with Section 3 (I)(11) of the Order, this approach is consistent with the requirements of the MADEP and the groundwater classification requirements of USEPA guidance (USEPA, 1996b)[17].

As depicted on Figure F-3 (included in Appendix F), the majority of the Site (including both the industrial portions of the Site east and west of South Street and the AOC) falls within a zone characterized as "Non-aquifer," with a yield less than 100 gallons per minute (gpm) and transmissivity less than 1,400 square feet per day (ft^2/day). As shown on Figure F-3, the western-most portion of the wetland and former mill tailrace area downgradient of the industrial portions of the Site are mapped as a medium yield aquifer (100 to 300 gpm and transmissivity between 1,400 and 4,000 ft^2/day). Although this area is mapped as a medium yield aquifer by USGS, Site-specific data regarding the aquifer in this portion of the Site generated during the RI indicate that it is, hydrogeologically speaking, characteristically similar to the Site as a whole. As discussed in Section 4.4.3.3, the transmissivity of the aquifer in the wetland and former mill tailrace area ranges from approximately 84 to 200 ft^2/day, with a geometric mean of approximately 128 ft^2/day. Similarly, transmissivity values for the downgradient/sidegradient

[16] Obtained from the Massachusetts Geographic Information System (MassGIS) website: www.state.ma.us/mgis.
[17] USEPA, 1996b replaces USEPA's 1986 Ground Water Protection Strategy, which is referenced in Section 3 (I) (11) of the Order.

residential properties range from 12 to 144 ft^2/day with a geometric mean of 48 ft^2/day. Transmissivity values from both of these areas are considerably less than the USGS' upper transmissivity limit of 1,400 ft^2/day for "Non-Aquifers." Given that the transmissivity of the aquifer in the wetland and former mill tailrace area and the downgradient/sidegradient residential properties are less than the transmissivity of the medium or high yield aquifers designated by USGS and used by the MADEP, this area of the Site may meet the requirements for exclusion from consideration of a potential drinking water source area as detailed in the Massachusetts Contingency Plan (MCP, 310 CMR 40.0932(5b), [MADEP, 1999]).

Similarly, soil descriptions from borings completed on the Orlando property (Lot 33-259) suggest the presence of a thin (less than 5 foot) zone of sand overlying glacial till. Due to the similarities of the relative density and description of soils encountered on the Orlando property, although this area is also mapped as a medium yield aquifer by USGS, this area of the Site may also meet the requirements for exclusion from consideration of a potential drinking water source area under the MCP.

Future exposure to Site groundwater from potential new public or private water supply wells installed in the vicinity of the Site is highly unlikely for the following reasons:

- **Availability of Public Water Supplies:** Although there are no institutional controls which prohibit further development of existing domestic water supply wells or the installation of new domestic water supply wells, the Site is located in a highly developed portion of Walpole; public water is available to the Site and all areas surrounding the Site. This fact, and the high density of development make it unlikely that private wells will be drilled in this area of Walpole in the future.

- **Hydraulic Characteristics of Soils:** As mentioned above, there are mapped Potentially Productive Aquifers (PPAs) in the vicinity of the Site that may include westerly portions of the Site. However, these maps are generalized and do not take into consideration the data obtained during the course of the RI that consistently show Site soils to consist of very dense, silt and clay-rich glacial till. Transmissivity data collected during the RI from monitoring wells: SH-15S, SH-15D, SH-04S, SH-04D, SH-25S, SH-25D, SH-26S, SH-24S, SH-24R, SH-28S, SH-28D, and SH-28R, all located within the mapped medium yield aquifer in the western portion of the Site, and also west of the Site, indicate an average transmissivity well below the 1,400 ft^2/day transmissivity criterion MADEP uses to classify a PPA as a medium yield aquifer. These Site-specific data gathered during the RI indicate the Site and surrounding area should be classified as a non-aquifer. This, in turn, is strong evidence that the Site and surrounding area would be unsuitable for a public water supply. Even the viability of a private water supply would be questionable under these hydrogeologic conditions.

- **Land Use West (Downgradient) of the Site:** The land use within the relatively narrow mapped PPA west of the Site consists of a high density of mixed residential/commercial/industrial properties, many with a history of documented

chemical releases. Multiple commercial / industrial facilities, including but not limited to, two gasoline fueling stations, two dry cleaners, 11 automotive service stations, six factories, and a Massachusetts Bay Transportation Authority train station are present within this area. Figure F-3, included in Appendix F, depicts the locations of the commercial and industrial facilities within or near the PPA located west of the Site. The photograph log in Appendix F presents photo documentation of many of these facilities.

There are multiple documented chemical releases within or near the PPA located west of the Site. Figure F-3, included in Appendix F, depicts the locations of those parcels where there is history of a chemical release. Table F-1, included in Appendix F, summarizes the type of chemical release from each of these parcels. Approximately nine parcels have histories of petroleum-related releases, two parcels have histories of chlorinated solvent releases, and one parcel has a history of a chemical release; however, the type of release was not documented in the databases searched by SHA.

The Site and the area of the downgradient mapped PPA are poor locations for a private or public water supply. While no institutional controls are presently in place to prevent these areas from being developed as drinking water resources, it is highly unlikely that this would occur based on the information presented above.

4.1.4 Surface Water Use

The Neponset River bisects the Site in a generally east-west direction. The Neponset River flows northerly through Walpole, beginning at its headwaters at the Neponset Reservoir in Foxboro, Massachusetts and discharging to Dorchester Bay approximately 30 miles from Walpole. A number of tributaries to the Neponset River exist, all of which, with the exception of School Meadow Brook, enter the Neponset downgradient of the Site.

According to 314 CMR 4.06, surface water in the Neponset River drainage basin is predominantly classified as Class B Inland Waters, which are "designated as habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation." Surface water in the Neponset River within approximately four miles of Dorchester Bay is classified as Class SB Coastal and Marine Water. The Neponset River is presumed to be fished recreationally (i.e., non-subsistence). A freshwater fish advisory is in place for the Neponset River for "all towns between Walpole and Boston," which advises that children under 12, pregnant women and nursing mothers eliminate consumption of fish from the River, and that the general public limit consumption of fish to two meals per month due to the presence of PCBs (MADPH, 2004).

The Neponset River from its headwaters to Dorchester Bay has been identified as a water body "not expected to meet surface water quality standards after the implementation of technology-based controls" under Section 303(d) of the Federal Clean Water Act. Inclusion of the Neponset River in the vicinity of the Site (from the outlet of the Neponset Reservoir in Foxboro to the confluence with the East Branch River, Canton) on the 303(d) list is due to the presence of the following pollutants and stressors: "priority organics," "metals," "nutrients," "siltation," "organic

enrichment/low DO", "pathogens," "suspended solids," "noxious aquatic plants," and "turbidity" (MADEP, 1999).

4.2 Climate

4.2.1 Regional Climatic Information

Climatic conditions for the Site were evaluated based on data provided by the National Climatic Data Center (NCDC) of Asheville, North Carolina for the Walpole 2 Station located approximately five miles south of the Site, which is the nearest station with available "Annual Climatological Summary" and the more comprehensive "Local Climatological Data, Annual Summary with Comparative Data" (NCDC website: www.ncdc.noaa.gov; Anderson, 1989).

The NCDC climatic summary for the town of Walpole indicated:

- Winters are generally relatively short and temperate. Between 1949 and 2003, the average temperatures for December, January, and February were between 17 and 40 degrees Fahrenheit (ºF). Average high temperatures for November and March were approximately 51ºF and 46ºF, respectively.

- Summers in Walpole are also generally temperate. The average high temperatures in July and August were 82ºF and 80ºF, respectively, between 1949 and 2003.

During any month, temperatures considerably above the average maxima and below the normal minima are observed.

The average annual precipitation for the Town of Walpole between 1949 and 2003 was 46.9 inches. The average amount of precipitation for the warmer half of the year is not significantly different from that for the colder half. The lowest average precipitation between 1949 and 2003 occurred in June and July, offsetting the higher average precipitation in November and December. The earliest snowfall of an inch or more was recorded in October 1979, but is more likely to come between the middle of November and the middle of December. The snow cover normally lasts from mid- to late-December until approximately the last week of March, but bare ground is not rare in the winter, nor is a snowscape rare earlier or later in the season. Walpole averaged approximately 52 inches of snowfall annually between 1950 and 2003[18]. Rain, sleet, or freezing rain is also common. (NCDC website; Anderson, 1989).

NCDC average monthly temperatures and precipitation amounts for Walpole, Massachusetts are listed below.

[18] Annual snowfall data for Walpole, MA was not available for 1950, 1952, and 1955.

NCDC AVERAGE MONTHLY TEMPERATURE AND PRECIPITATION FOR WALPOLE, MASSACHUSETTS
Temperature (°F) & Precipitation (inches) by Month From 1949- 2003

Month	Avg. High	Avg. Low	Extreme High	Extreme Low	Max. Snowfall	Avg. Precip.	Max. Precip.
January	35.9	17.3	69 (1/25/50)	-19*	40.7 (1966)	3.93	11.76 (1979)
February	38.3	18.7	70	-19*	45.7 (1969)	3.72	7.52 (1984)
March	46	26.7	90 (3/31/98)	-13 (3/19/67)	43.8 (1956)	4.12	10.62 (2001)
April	58.1	35.7	96 (4/19/76)	10 (4/4/54)	26.8 (1997)	3.92	11.75 (1987)
May	69.1	45	95 (5/30/87)	22 (5/3/66)	8.2 (1977)	3.36	8.11 (1954)
June	77.3	54.5	97 (6/15/88)	33 (6/6/64)	0	2.96	12.98 (1998)
July	82.4	60.3	101 (7/21/77)	39 (7/7/65)	0	3.20	10.73 (1988)
August	80.2	58.7	102 (8/2/75)	32 (8/31/65)	0	3.98	20.48 (1955)
September	72.2	50.6	100 (9/2/53)	26*	0	3.77	8.88 (1954)
October	62.4	40.3	88 (10/12/54)	15 (10/31/66)	2.8 (1979)	3.66	9.86 (1962)
November	51.2	32.3	82 (11/2/50)	4 (11/24/89)	12.3 (1986)	4.66	9.1 (1983)
December	39.5	21.7	76 (12/7/98)	-14 (12/26/80)	29.4 (2003)	4.24	11.16 (1969)

Notes: * recorded on multiple dates in different years

4.2.2 Site-Specific Climatic Data

In addition to information gathered from the NCDC for the Walpole 2 Station, Site-specific climatic data were collected and tabulated for comparison to the Walpole 2 Station data. Table G-2 included in Appendix G summarizes the Site-specific climatic data. In general, Site-specific

data (presented in Table 4) seem to correlate well with the average monthly temperature and precipitation data presented in the above table. As presented in Table 4, the average Site-specific temperatures recorded generally fall towards the lower end of the range of temperatures ("Avg. Low" to "Avg. High" presented in the table above) presumably reflecting the fact that temperatures were consistently collected in the early morning (usually between approximately 7:00 am and 9:00 am) when temperatures are typically relatively low. The total Site-specific monthly precipitation measurements are between the historical average precipitation and the historical maximum precipitation from 1949 to 2003 in the above table.

As summarized in Table G-2, included in Appendix G, the wind speed, as measured at the Site between January 2001 and December 2003, for the days on which SHA personnel were on Site, ranged from 0 to 17 miles per hour (mph), with an average wind speed of approximately 3.2 mph. Wind direction varied, but was most often recorded from the north, northeast, or north-northeast.

4.3 Geology

4.3.1 Regional Geologic Setting

Regional geologic mapping in the area of the Neponset River Valley indicates the Site and surrounding area are located in a region of broad ridges or mounds of glacial till overlying bedrock which are drained by valleys underlain by thicker sequences of glacial till, sand and gravel, and localized stream and floodplain deposits. Brief descriptions of the surficial and bedrock geologic settings of the Site and surrounding area are provided in the following subsections.

4.3.1.1 Surficial Geologic Setting

According to regional surficial geologic mapping (Volckmann, 1975; Chute, 1966), overburden strata identified in the area of the Site include an upward sequence of glacial till, ice-contact glaciofluvial sand and gravel deposits (including flat-topped kame terraces and deltas), and late-glacial or post-glacial alluvium and swamp deposits generally localized to poorly drained areas proximate to the Neponset River.

Mapped exposures of glacial till in the area of the Site include a small area about 500 ft south of the Site (near the crest of a small hill on the southeast side of South Street), and a large area northeast and east of the Site that extends from near Diamond Pond to Walpole Heights (refer to the Locus Plan provided as Figure 1). According to Volckmann (1975), mapping across eastern Massachusetts has reportedly identified two distinct glacial till strata that have been subdivided regionally into an "upper" sandy till and "lower" fine-grained till. The upper till is described as being "composed of a slightly compact to friable light-gray to olive-gray very poorly sorted mixture of silt, sand, pebbles (gravel), cobbles, and boulders." Some of the boulders are reported to be over 20 ft in diameter. Minor lenses of sand and gravel may also occur in localized horizons within this till stratum. The lower till is described as "a very compact olive-brown

poorly sorted mixture of silt, sand, pebbles (gravel), and cobbles." However, in the vicinity of the Site exposures of the lower till stratum are reportedly rare[19] making subdivisions of the glacial till based on minor textural and/or density variations difficult. Chute (1966), makes no such distinction between the till but rather indicates the variations in till "are the result of such factors as the source of the till, the amount of silt and clay removed by melt water before and during deposition, and the effects of weathering."

In the vicinity of the Site, the granular ice-contact glaciofluvial sand and gravel deposits are mapped as "mixed sand and gravel" deposited by melt water streams in contact with blocks of stagnant ice within and proximate to Glacial Lake Medfield. According to Volckmann (1975), the "mixed sand and gravel" soils located southwest of the Site (including the non-contiguous Orlando property) and the Neponset River are mapped as Quaternary Period Neponset River Deposits (Qnr), while sand and gravel soils located beneath the portion of the Site located northeast of the Neponset River are mapped as Quaternary Period Mill Brook Deposits (Qmb1). The granular soils mapped as Qnr are inferred to be kames and kame deltas deposited during the early stages of Glacial Lake Medfield. The granular soils mapped as Qmb1 are inferred to be deltas and coarse-grained lake bottom sediments deposited during a later stage of Glacial Lake Medfield. Chute (1966), mapped similar coarse-grained proglacial (near ice) ice-contact sand and gravel features east and southeast of the Site. Surficial mapping in the area of the Site indicates late glacial and/or post-glacial swamp deposits consisting of sand, silt, clay, and organic material are primarily localized to the floodplain of the Neponset River. The nearest regionally mapped area of swamp deposits is located within the Neponset River floodplain southeast of the former railroad ROW.

4.3.1.2 Bedrock Geologic Setting

Regional bedrock geologic mapping (Volckmann, 1977; Chute, 1966) indicates the Site and surrounding region is underlain by Mississippian and Pennsylvanian (Carboniferous) Period sedimentary rocks consisting of sandstone, conglomerate, and shale. These sedimentary rocks are located within the Norfolk basin, a narrow fault-bounded basin, roughly twenty-two miles long and two miles wide, with its main axis oriented southwest to northeast. The majority of the sedimentary rocks within the Norfolk basin are mapped as the Wamsutta Formation. Near the margins of the Norfolk basin the sedimentary rocks are mapped as the Pondville Conglomerate.

According to Chute (1966) the Wamsutta Formation "consists predominantly of fine-grained red sandstone and considerable interbedded red shale; it also contains some gray granule and pebble conglomerate." A distinctive purple shale interbedded with green shale and sandstone has also been identified in the area of the Site. By comparison, the Pondville Conglomerate is described as consisting of a lower member of cobble and boulder conglomerate and an upper member of gray coarse sandstone, granule conglomerate, and pebble conglomerate. Most of the Site is mapped as being underlain by the Wamsutta Formation. However, mapping by Chute (1966),

[19] According to Volckmann (1975), only one exposure of the "lower" till, observed in a temporary road cut, is identified in the entire Medfield 7 ½-minute Quadrangle.

implies a northeast to southwest trending contact between the Wamsutta Formation, to the northwest, and Pondville Conglomerate to the southeast, extends across the area where the Neponset River flows beneath the former railroad ROW.

4.3.2 Site Geology

Our understanding of Site geologic conditions is based on observations made during the completion of approximately 4,000 lineal ft of overburden and bedrock test borings, combined with observations of surface exposures of Site soils in the area of the Neponset River. The locations of test borings and monitoring well installations are shown on Figures 4 and 5. Five hydrogeologic profiles summarizing our interpretation of geologic conditions within the area of the Site are included on Figures 11A through 11E. Test boring/well installation logs are included in Appendix B.

4.3.2.1 Overburden Stratigraphy and Inferred Depositional History

The sequence of overburden strata encountered at the Site is in general conformance with that indicated by regional surficial geologic mapping. As depicted on Figures 11A through 11D, soil conditions at the Site are typified by an upward sequence of glacial till, ice-contact glaciofluvial sand or sand and gravel (sand/sand and gravel), and soil fill. Late glacial and/or post-glacial swamp deposits and post-glacial alluvium have also been identified above the ice-contact sand/sand and gravel in areas proximate to the floodplain of the Neponset River.

The sequence and contact relationships of the different overburden Site strata reflect a complex history of deposition by ice- and water-dominated processes during glaciation and deglaciation, followed by reworking of glacial deposits by post-glacial streams and erosion. The following depositional history has been inferred for the Site and surrounding region, based upon contact relationships between different Site strata, apparent soil density conditions, and correlations with surficial geologic units mapped within the Neponset River Valley.

The **glacial till** stratum was deposited directly from glacial ice as a discontinuous layer on the bedrock surface. During continued advance, retreat, and readvance of glacial ice in the region, the till stratum was occasionally shaped to form a series of glacial streamlined ridges elongated in a roughly northwest to southeast direction (drumlins) and a series of less distinct roughly east to west oriented ridges or mounds (end or ground moraines). An apparent east to west oriented ridge in the surface of the glacial till stratum beneath the central portion of the Site (depicted on Figure 13) is believed to likely represent a subsurface extension of one such moraine, marking a standstill position of the glacial ice prior to a re-advance or retreat of the ice front.

During subsequent stages of glaciation, sediments consisting of poorly to well-sorted silty sand, sand, and sand and gravel (**ice-contact sand/sand and gravel**) accumulated above the glacial till due to deposition by a combination of glacial ice and glacial meltwater streams. These ice-contact glaciofluvial sand/sand and gravel deposits formed in tunnels beneath or were deposited adjacent to blocks of stagnant glacial ice. As the glacial ice sheet continued to melt, Glacial

Lake Medfield formed due to damming of glacial meltwaters. Coarse-grained sand and gravel continued to be deposited within and adjacent to Glacial Lake Medfield in the form of kame or kame deltas in front of the receding ice margin. During subsequent readvances and retreats of the ice front these ice-contact deposits were deformed, compressed, and reworked, resulting in a complex sequence of very dense, poorly-sorted to well-sorted and locally stratified, sand or sand and gravel.

Following retreat of the glacial ice sheet and drainage of Glacial Lake Medfield, late-glacial and post-glacial streams and erosion reworked portions of the ice-contact sand/sand and gravel, and glacial till strata. As the Neponset River and its tributaries approached their present floodplain elevations, localized deposition of these reworked soils resulted in accumulation of **stream and floodplain deposits** consisting of alluvium and swamp deposits of sand, silty sand, and sand and silt interbedded with organic silt or peat.

4.3.2.2 Site Soil Conditions

As described above, a sequence of glacial and post-glacial soils with differing hydrogeologic characteristics have been identified beneath soil fill at the Site. The findings of Site-specific explorations and testing are described below for each of the major strata.

4.3.2.2.a Soil Fill

As depicted on Figures 11A through 11D, soil fill underlies much of the developed portion of the Site. In general, the fill appears to consist primarily of reworked sand/sand and gravel or glacial till soils with variable amounts of other miscellaneous fill materials such as brick, wood, concrete, ash, metal, plastic, and glass. The thickness of soil fill encountered across the Site varies from about one foot to as much as 23 ft. As shown on Figure 12A, Site areas with greater than 10 ft of soil fill include: the soil- capped portion of the AOC; a portion of the former mill tailrace; a portion of the asphalt-capped portion of the AOC; and portions of the former railroad ROW proximate to the Neponset River. Areas where the thickness of soil fill appears to be less than five ft include the northern portion of the industrial area west of South Street, the wetland area and former mill tailrace, the central and northern portion of the industrial area east of South Street, the area of residential properties on Gleason Court, Lewis Avenue and Clark Street, and the area of the former Lower Mill/Union Pond.

Soil fill materials encountered beneath the Site generally consist of brown to black, fine to coarse sand, with variable amounts of gravel, some to trace amounts of silt, and variable amounts of other miscellaneous fill materials. Gray fibrous materials, presumed to be asbestos, were primarily observed in a limited number of soil fill samples obtained within the AOC. As indicated in Table 6A, results of gradation analyses of six samples of the soil fill indicate the major constituents are either sand (29 to 89%) or gravel (12 to 67%), with little to trace amounts of silt and clay (4 to 27%). As depicted on Figure 12B, portions of the fill are saturated with the largest area of saturated fill coinciding with the soil-capped portion of the AOC.

Results of TOC analyses for fifteen samples of soil fill, one sample of fill and sand, four samples of sand, one sample of sand and gravel, and twelve samples of topsoil are summarized in Table 7A. As shown in the table, the TOC concentrations detected in the fill samples varied over a large range, from 610 to 208,000 mg/kg with an average of approximately 55,863 mg/kg. In general, the highest concentrations were for samples that appeared black and were described as having "ash," "burnt coal," or "petroleum staining." No pattern in the spatial distribution of TOC concentrations in the soil fill is readily apparent. The TOC concentration detected in the one sample of fill and sand was 2,000 mg/kg. The TOC concentrations detected in the sand samples ranged from 1,200 to 18,000 mg/kg and the concentration in one sample of sand and gravel was 410 mg/kg. TOC concentrations in topsoil samples ranged from 12,000 to 160,000 mg/kg with an average of approximately 73,333 mg/kg.

4.3.2.2.b Stream and Floodplain Deposits

Stream and floodplain deposits consisting of alluvial sediments and swamp deposits have been identified in the southern portion of the Site beneath the Neponset River, adjacent wetland and low-lying floodplain areas (wetland and former mill tailrace area and area of the former Lower Mill/Union Pond), and within the floodplain of the Neponset River. As depicted on the hydrogeologic profiles, these soils are either exposed at the ground surface in areas proximate to the Neponset River floodplain or are located beneath soil fill and are typically less than 4 ft thick. In general, the thickness of these deposits is inferred to be greatest proximate to the existing and former drainage channels of the Neponset River. Under conditions normally observed at the Site, the stream and floodplain deposits are typically saturated.

As summarized in Table 6B, results of gradation analyses of sediment samples obtained within and proximate to the Neponset River indicate predominately fine to coarse sand (ranging from 23.8 to 99.5%) with trace to some gravel (ranging from 0.4 to 76.2 %) and trace amounts of silt and clay (typically less than 1%).

4.3.2.2.c Ice-Contact Sand/Sand and Gravel

The ice-contact glaciofluvial sand/sand and gravel stratum encountered beneath the Site typically has a poor degree of sorting with stratification apparently limited to a few localized horizons of sand or silty sand. This stratum occurs across much of the Site with the exception of an area of shallow glacial till directly north of the wetland and former mill tailrace (refer to the log for SH-16D included in Appendix B), and an area in the central portion of the AOC (refer to the logs for SH-01S/D/R, SH-02S/D/R, and SH-03S/D included in Appendix B). Soils included in this stratum have generally been differentiated from glacial till on the basis of lesser fines content, the localized presence of thin stratified horizons, and/or a slightly lower density. However, due to the heterogeneous texture and very dense nature of the ice-contact sand/sand and gravel at the Site discerning distinctions between some of this stratum and the underlying glacial till is difficult.

As shown on the hydrogeologic profiles included as Figures 11A through 11D, these granular deposits are typically encountered beneath soil fill and are underlain by glacial till. The apparent thickness of this stratum ranges from a few ft in the area of a glacial till ridge near the west-central portion of the Site to greater than 40 ft in the wetland area south of the Neponset River.

Soil types encountered within this stratum primarily include light olive brown to olive brown and grayish brown to gray, fine to medium or fine to coarse sand with variable amounts of gravel and typically little to trace amounts of silt. Localized horizons of finer-grained silty sand, sand and silt, or silt have been identified beneath portions of the site as well as horizons primarily consisting of cobbles and boulders. The thickest silt layer was encountered in the vicinity of SH-27D/R/S, an off-Site side-gradient residential property, where approximately 13 ft of silt was observed just below the fill. As depicted on the cross-sections (Figures 11A through 11D), lateral variations between the silt, sand, sand and gravel, and cobbles/boulders within this stratum appear to be relatively abrupt, consistent with a complex depositional history of both ice- and water-dominated deposition. In general, the ice contact sand / sand & gravel deposits are typically partially or fully saturated throughout the Site.

As indicated in Table 6A, results of gradation analyses of twelve samples of the sand and gravel portion of this stratum indicate the major constituents are either sand (31 to 93%) or gravel (1 to 64%) with little to trace amounts of fines (2 to 22%). As indicated in Table 6B, similar results were obtained for the 25 floodplain sediment samples of fine to coarse sand presumably consisting of reworked sand/sand and gravel soils proximate to the Neponset River.

Results of TOC analyses for three samples of sand (from borings SB-06, SB-13A, and SB-40) and one sample of sand and gravel (from boring SB-22) collected from depths greater than two ft below the ground surface are presented in Table 7A. As indicated in the table, the TOC concentrations detected in the three sand samples (2,100, 1,200 and 2,200 mg/kg, respectively) are about three to five times higher than the TOC concentration of 410 mg/kg reported for the sand and gravel sample. These results are roughly one to three orders of magnitude lower than TOC results from the soil fill samples.

4.3.2.2.d Glacial Till

Glacial till is located directly above bedrock throughout the Site. Results of drilling using conventional split-spoon sampling methods as well as sonic and air rotary drilling methods indicate the till stratum beneath the Site is very dense, and is heterogeneous in texture. Portions of soil cores of the till obtained during sonic drilling were often difficult to break apart, approaching the consistency of concrete. The texture of the till varies both laterally and vertically from sand-rich to silt-rich. However, a lateral or vertical trend in density and/or texture could not be distinguished. Thin localized horizons of slightly less dense sandy till encountered within the till stratum indicate the potential for a combination of both ice-dominated and water-dominated deposition during advancement or retreat of glacial ice.

In general, the thickest glacial till soils were encountered in the southwestern portion of the Site in the area of a bedrock trough or depression in the vicinity of SH-05R-B. Where fully penetrated, glacial till thickness ranges from about 10 ft, at well locations SH-09D and SH-16D south of the former mill building and south of Clark Avenue, to about 64 ft at well location SH-05R-B on the western portion of the AOC. As shown on the glacial till surface elevation contour plan provided as Figure 13, a broad, roughly east to west trending ridge of glacial till appears to extend through the central portion of the Site from the area north of the wetland and former mill tailrace to the central portion of the industrial area east of South Street. The depression in the till surface centered around well SH-08D in the asphalt-capped portion of the AOC could have formed due to a block of ice placed during the later stages of till deposition.

In general, the glacial till consists of a heterogeneous mixture of yellowish brown to light olive brown and grayish brown to gray, sand, silt, gravel, and clay with lesser amounts of cobbles and boulders. Some of the boulders encountered using sonic drilling methods were greater than 2 ft in diameter and appeared highly weathered. As indicated in Table 6A, results of gradation analyses of nine samples of the till stratum indicate a range of 11 to 60% gravel, 27 to 49% sand, 4 to 32% silt, and 6 to 20% clay. In aggregate the grain size results indicate the glacial till stratum typically has a greater percentage of clay as compared to the sand/sand and gravel stratum. In general, the glacial till unit is fully saturated throughout the extent of the Site with the exception of an area in the vicinity of monitoring well SH-16S and soil boring SB-33 where it is partially saturated.

4.3.2.2.e Site Bedrock

Our understanding of Site bedrock geology is based on review of rock core samples obtained by HQ wireline coring or sonic drilling techniques, and from rock chips collected during mud and air rotary drilling. The sedimentary rock types encountered beneath the Site include: soft to moderately hard, highly to slightly weathered, red to purple, aphanitic shale; moderately hard to hard, slightly weathered, light yellowish- to olive brown, greenish-gray or bluish-gray, fine to coarse-grained quartzofeldspathic sandstone; moderately hard to hard, moderately weathered, dark grayish brown or medium bluish gray, aphanitic to fine-grained siltstone; moderately hard to hard, slightly weathered, greenish-gray or bluish-gray fine to coarse-grained pebble conglomerate; and moderately hard to hard, slightly weathered, greenish-gray or bluish-gray fine to coarse-grained granule conglomerate. Groundwater occurrence in Site bedrock is typically dependant upon and occurs within fractures within the bedrock unit.

The presence of red to purple shale and gray granule and pebble conglomerate is consistent with regional descriptions of the Wamsutta Formation. However, the presence of gray coarse sandstone is more commonly described for the upper member of the Pondville Conglomerate, supporting the possibility that the gradational contact between the Wamsutta Formation and the Pondville Conglomerate is located near the Site, as discussed in Section 4.3.1.2.

As depicted on the hydrogeologic profiles included as Figures 11A through 11D, the depth to bedrock encountered beneath the Site ranges from about 14 to 80 ft bgs. As shown on Figure 14,

bedrock surface features beneath the Site include: an apparent ridge located in the vicinity of SH-16D and another located between the northern limits of the soil-capped portion of the AOC and the industrial area east of South Street; and an apparent north-northwest trending narrow trough located in the vicinity of SH-05R-A. The presence of the two bedrock surface ridges support the possibility that the central portion of the Site was a location for stagnation of the glacial ice front with numerous localized advances and retreats resulting in a complex sequence of very dense glacial till and ice contact sand and gravel.

4.4 Hydrology

4.4.1 Regional Hydrology

The Site is located within the Neponset River watershed, which includes all or portions of the towns of Foxboro, Walpole, Medfield, Sharon, Stoughton, Canton, Norwood, Westwood, Dedham, Milton, and Quincy. According to the USGS, the total drainage area of the Neponset River is approximately 34.7 square miles. According to the Federal Emergency Management Agency (FEMA, 1988), "at the Walpole corporate limits, the Neponset River drainage area is approximately 26 square miles." The average 100-year flood elevation of the Neponset River in the vicinity of South Street is approximately 160 ft (FEMA, 1988).

According to Hardy and Coviello (1975), the Neponset River loses 170 ft in elevation along its main course through Walpole. Beginning at an elevation of approximately 234 ft in South Walpole, the river falls to 64 ft as it crosses into the Town of Norwood (Hardy and Coviello, 1975).

Stream gauging information for the Neponset River was compiled from the USGS for Gauging Station Number 01105000, located in Norwood, Massachusetts, approximately 3.7 miles downgradient from the Site. Based on USGS data from the Norwood gauging station # 01105000, historically mean annual stream flow in the Neponset River from 1950 to 2001 ranged from 24 to 95 cubic feet per second (cfs) with an average of 57 cfs. In general stream flow is highest in March and April with a monthly mean streamflow of 116 and 109 cfs respectively, and the lowest occurring in July and September at 22 and 23 cfs respectively with a monthly average of 59 cfs. Flow in the Neponset is also affected by several diversions upstream of this gauging station for industrial and municipal uses. Three times since 1950 these diversions have increased streamflow in the Neponset to greater than 1,000 cfs; August 19, 1955 (1,490 cfs), March 18, 1968 (1,140 cfs), and June 1998 (1,100 cfs).

As discussed in Section 4.1.3.1, the Site meets the USGS classification criteria for a "Non-Aquifer," characterized by well yields of less than 100 gpm and transmissivity less than 1400 ft^2/day. According to the Aquifer Map of the Town of Walpole, Massachusetts (dated May 9, 2000), the majority of the Site is not included in any of the four designated "Water Resource Protection Overlay Districts" in Walpole. As discussed in Section 4.1.3.1, the southernmost portion of the Site near the Blackburn Dam is included in the northern limit of Walpole's "Area 1 - Area of Pumping Influence;" however, groundwater in this portion of the Site is anticipated

to flow westward, away from the area of influence. The western and northern limits of Walpole's "Area 3 - Primary Recharge Area" are located approximately ½-mile south and west of the Site.

4.4.2 Surface Water Hydrology

Principal surface water hydraulic parameters evaluated for the Site include surface water elevations, stream gradients, vertical gradients (i.e., between surface water and groundwater) and stream discharge.

4.4.2.1 Occurrence of Surface Water at the Site

As observed on Figures 2 and 3, there are several surface water bodies at and in the vicinity of the Site. The Neponset River extends from the Blackburn dam at the southeast side of the Site approximately 0.7 miles[20] to Lewis Pond. Between staff gauges SG-103 and SG-104, the Neponset River travels through an aluminum culvert, which was constructed during the 1992 RA. Details regarding the construction of this culvert are summarized in the EDRA Report (SHA, 2000b). In addition, surface water is present in a remnant of the former mill tailrace located west of the AOC, which flows approximately 135 ft west to its confluence at the Neponset River. As described in the EDRA (SHA, 2000b), the former mill tailrace was historically used to supply power for former Site activities.

Lewis Pond extends from slightly south of SG-111 to the dam at West Street, just north of SG-112. While described as a pond in nomenclature, the morphology and bottom sediments of Lewis Pond are more consistent with that of a stream. As detailed in Section 4.4.2.2, the surface water gradient in Lewis Pond is significantly less than the Neponset River in the vicinity of the Site. This observation, coupled with the fact that there is a relatively large floodplain near Lewis Pond and a dam at West Street explains why this area is colloquially called a "pond."

Several wetlands have been delineated at and in the vicinity of the Site, as discussed in Section 4.5. In particular, the reconstructed wetland/former mill tailrace area immediately west of the industrial area west of South Street is an important Site feature with respect to the surface water and groundwater hydrology. As discussed in Section 4.4.3.8, the wetland/former mill tailrace area is a groundwater discharge point for Site groundwater.

4.4.2.2 Surface Water Elevations and Stream Gradients

Surface water elevations were measured at 23 locations along the Neponset River and Lewis Pond during six comprehensive water level rounds (August 2001, October 2001, March 2002 May 2002, November 2003, and May 2004). In addition, a fourteenth location, SG-114, was installed inside the aluminum culvert in the vicinity of monitoring wells SH-03S and SH-12S on November 15, 2001; surface water elevation measurements were collected from this and other

[20] Straight line distance, not the reach of the River.

staff gauges, as well as groundwater elevations from nearby monitoring wells during two, one-month periods of groundwater/surface water interaction monitoring in the Fall 2001 and Spring 2002. The staff gauge locations are depicted on Figure 5. Surface water elevation data are summarized in Table 3B; data collected from SG-114 are presented in Appendix HB.

In August 2001, surface water elevations ranged from approximately 166.3 ft at SG-101 to 139.2 ft at SG-112 reflecting a total elevation drop across the monitored length of the Neponset River of approximately 27.1 ft; a similar total elevation drop across the monitored length of the Neponset River of approximately 27.0 ft was measured in October 2001, when surface water elevations ranged from approximately 166.0 ft at SG-101 ft to 139.0 at SG-112. In March 2002, observed surface water elevations ranged from approximately 166.7 ft at SG-101 to 139.7 ft at SG-112, reflecting a total elevation drop across the monitored length of the Neponset River of approximately 27.0 ft. In May 2002, surface water elevations ranged from 159.5 ft at SG-102 to 140.2 ft at SG-112 (note that a measurement was not able to be collected from the SG-101 location on this date because the staff gauge had been removed). In November 2003, surface water elevations ranged from 158.7 ft at SG-102 to 139.9 ft at SG-108, resulting in an elevation drop of 18.8 ft across this portion of the Site. Staff gauges downgradient of SG-108 were inadvertently not recorded during the November 2003 water level round. In May 2004, surface water elevations ranged 159.0 ft at SG-102 to 139.5 ft at SG-112, reflecting an elevation drop of 19.5 ft across this portion of the Site. In May 2004, SG-101AM was missing and SG-101AE was dry; therefore no measurements were recorded for these locations.

The elevations of the Neponset River were fairly consistent throughout the six comprehensive water level rounds. In general, the highest elevations were recorded in May 2002, whereas the lowest elevations were recorded in August and October 2001 as well as November 2003.

Surface water gradients were calculated based on surface water elevations collected from the six comprehensive water level rounds as summarized in Table HA-1 (included in Appendix HA). The average surface water gradient over the approximate 5,910-ft reach of the Neponset River from SG-101 to SG-112 was approximately 0.005 feet per foot (ft/ft). The gradient of the stream from SG-101 to SG-111 was, on average, approximately 0.006 ft/ft. The average gradient of the stream in the Lewis Pond area from staff gauge SG-111 to SG-112 is approximately 0.00008 ft/ft.

4.4.2.3 Stream Discharge

As described in Section 2.5, SHA performed stream gauging at two transects within the Neponset River: one at a transect located just upstream of SG-102 and one at a transect located just downstream of SG-108 in April 2001 and August 2001. The results of the stream gauging (and associated calculations) are included in Appendix HA. The measured discharge of the Neponset River during the April 2001 stream gauging event was approximately 60.8 cfs; the measured discharge of the Neponset River during the August 2001 stream gauging event was approximately 3.6 cfs.

The average monthly flow recorded at USGS stream gauge station #01105000 in the Neponset River in Norwood was approximately 145.7 cfs in April 2001 and approximately 17.0 cfs in August 2001 (published at http://water.usgs.gov/realtime.html). Based on 63 years of monthly data collected by the USGS stream gauge station #01105000 located in the Neponset River at Norwood, MA, the mean monthly stream flow in April is approximately 102 cfs and the mean monthly stream flow in August is approximately 23.1 cfs (published at http://water.usgs.gov/realtime.html).

4.4.3 Groundwater Hydraulics

Principal hydraulic parameters evaluated for the Site include groundwater elevations and flow directions, hydraulic conductivities, transmissivities, hydraulic gradients, and seepage velocities. The results of this evaluation are summarized below. Generally speaking, the hydrogeolgic and chemical data indicate that the principal hydrogeologic units (e.g. soil fill, ice contact sand/sand & gravel, glacial till and bedrock) have some degree of hydraulic connection.

4.4.3.1 Groundwater Elevation and Flow Direction

Understanding groundwater elevations and the direction of groundwater flow at the Site is important to understanding the migration of contamination from the Site. As described in Section 2.3 of this Report, and consistent with Section 8.5 of the QAPP, SHA performed comprehensive water level measurement rounds in August 2001, October 2001, March 2002, May 2002, November 2003, and May 2004 during which groundwater and surface water levels were measured in up to approximately 28 shallow overburden wells, 18 deep overburden wells, 11 bedrock wells, seven well points, and 14 staff gauge locations. Additionally, data was collected from selected monitoring wells and staff gauges using pressure transducers during month-long periods of groundwater/surface water interaction monitoring, as discussed in Section 4.4.3.8 and presented in Appendix HB.

Groundwater and surface water elevations from the six comprehensive water level rounds are summarized in Tables 3A and 3B. Additionally, groundwater and surface water elevations for all dates where water level measurements were collected are presented on the field data sheets included in Appendix B. Figures 15A through 15F present groundwater elevation contour plans for the shallow, deep, and bedrock wells from two of the six comprehensive water level rounds. Additionally, groundwater elevations are also presented on the subsurface profiles (Figures 11A through 11F).

Depth to groundwater at the Site ranges between approximately 0.9 to 20.5 ft bgs with an average of approximately 9.8 ft bgs. Elevations of ambient groundwater levels at the Site range from approximately 142.3 to 165.5 ft with an approximate average elevation of 151.5 ft (NGDV). Groundwater elevations on the industrial area east of South Street range from approximately 156.8 to 165.5 ft with an average elevation of approximately 159.6 ft, while groundwater elevations on the industrial area west of South Street (including the AOC) range from approximately 147.1 to 157.3 ft with an average elevation of approximately 152.2 ft. The

elevation of groundwater in the wetland/former mill tailrace area located west of the AOC ranges from approximately 143.6 to 150.5 ft with an average elevation of approximately 146.8 ft. The elevation of groundwater for the downgradient and side gradient residential properties ranges from approximately 142.3 to 149.7 ft with an average elevation of 145.8 ft.

Overall (as depicted on Figures 15A and 15D), shallow overburden groundwater at the Site flows to the west/northwest. There is a slight divergence of flow in the vicinity of the former mill building and Building No. 5 on the industrial area east of South Street, where groundwater flows in a slightly more northerly direction in the vicinity of wells SH-19S and SH-18S, and appears to flow in a more westerly direction in the vicinity of wells SH-20S and SH-09S. Downstream of the Neponset River culvert, shallow groundwater appears to flow northwest, presumably as a result of the presence of the nearby former mill tailrace and the northward bend in the Neponset River downstream of SG-105. In the vicinity of SH-28S and SG-108 the groundwater flow shifts to a westerly flow again, coinciding with a westward bend in the Neponset River in this area. Staff gauge measurements of surface water elevations (in SG-108 through SG-112) indicate a consistent northwesterly trend in surface water flow direction. A comparison of Figures 15A through 15D indicates that seasonal fluctuations in water levels seem to have little effect on the overall shallow overburden groundwater flow regime.

As depicted on Figures 15B and 15E, groundwater in deep overburden generally flows in a westerly direction until reaching the central portion of the Site (approximately the well SH-01D location); west of this area, groundwater flows to the northwest, likely influenced by the northward bend in the Neponset River and an apparent groundwater discharge area in the wetland and former mill tailrace area. In and around monitoring well SH-01D is an area of apparent converging groundwater flow that is likely a result of the presence of high pH fluids - dense aqueous phase liquid (DAPL [i.e., pHs above about 12.5 s.u.] at the Site, as discussed in Section 5.2.1.2)[21]- in this area. DAPL has fluid properties that are different than ambient groundwater[22]; specifically, DAPL appears to have higher densities and viscosities than ambient groundwater. The presence of a fluid with a higher density than ambient groundwater in an aquifer effectively lowers the observed groundwater levels in a well (Fetter, 1994).

Limited density data are available from groundwater collected within monitoring wells in the deep overburden aquifer. However, preliminary calculations indicate that applying a density correction to the head measured in monitoring well SH-01D (groundwater was observed to have a pH of over 14 s.u. in this location) would result in a water level approximately 1.7 ft higher than that presented in the RI. Since the water levels presented in Figures 15A through 15F were not adjusted for the density of the DAPL or high pH fluids, the observed water levels in

[21] As discussed in Section 5.2.1.2 historic releases of high-concentration sodium hydroxide at the Site have resulted in high pH conditions – as high as approximately 14 – in the subsurface in areas of the Site. Although present in an aqueous phase, this liquid has a higher viscosity and density than ambient groundwater. Thus, we refer to this liquid (or, more specifically the portion of this liquid with a pH greater than 12.5) as a DAPL. This is further explained in Section 5.0.

[22] This will be further discussed in Section 4.4.3.2.

monitoring wells impacted by DAPL or high pH fluids may be artificially lower than if they had been adjusted for the density of these fluids. The converging groundwater flow lines in the vicinity of SH-01D depicted on the deep overburden groundwater flow figures may be reflective of the fact that a density correction was not applied to water levels in this area. However, while applying a density correction to the water levels in wells where DAPL is present may be more fundamentally correct if ample density data were available, our review of this matter does not suggest it would appreciably influence the overall deep overburden groundwater flow regime outside the area impacted by DAPL.

The density contrast between DAPL and ambient groundwater likely inhibits mixing of DAPL and ambient groundwater in a manner similar to that of a salt water / fresh water interface in coastal aquifers. Density contrasts between salt water and fresh water often result in a relatively distinct boundary between salt water and freshwater with a mixing zone (or zone of diffusion) that is relatively thin with respect to the overall thickness of the fresh-water lens (Fetter, 1994). Similarly, we expect that there is a relatively distinct boundary between DAPL and ambient groundwater at the Site with limited little mixing occurring between the DAPL and ambient groundwater.

In general, groundwater flow directions in the deep overburden are consistent with those in shallow overburden. Seasonal fluctuations seem to have little effect on the overall deep overburden groundwater flow.

As depicted on Figures 15C and 15F, groundwater in bedrock generally flows in a westerly direction until reaching the central portion of the Site (approximately the well SH-01R location); downgradient of this area groundwater flows to the northwest. A pronounced shift towards a westerly flow in the vicinity of wells SH-24R and SH-28R is apparent from the November 2003 comprehensive water level round, but is less pronounced during the May 2004 comprehensive water level round. In general, groundwater flow in bedrock is consistent with deep overburden groundwater flow.

Figures HB-1 through HB-12 (included in Appendix HB) depict water level elevations recorded in three groups of adjacent groundwater monitoring wells and surface water staff gauge locations during two, one-month periods of groundwater/surface water interaction monitoring. Long-term monitoring at staff gauge SG-114 and in well SH-03S indicates that the elevation of surface water in the Neponset River culvert is lower than adjacent groundwater. Likewise, long-term measurement of water levels at staff gauge TR-3 in the former mill tailrace and in adjacent groundwater monitoring well SH-15S indicate that the elevation of groundwater is higher than surrounding surface water in the former mill tailrace, indicating that groundwater is discharging to surface water in these locations.

By contrast, measurement of water level elevations at staff gauge SG-113 and well SH-04S indicate that the elevation of water in the Neponset River remains consistently higher than adjacent groundwater, suggesting that, at least for prolonged periods, the River is a losing stream

in this area, and reinforcing the likelihood that the former mill tailrace is a key groundwater discharge area.

Data collected from transducers placed in wells SH-03D, SH-04D and SH-15D during the groundwater/surface water interaction monitoring indicates small cyclical fluctuations on the order of approximately 0.02 to 0.09 ft in the groundwater elevations in these deep wells. Figures HB-13 and HB-14 (included in Appendix HB) depict the water level elevations of the deep wells and the difference in water level elevation relative to the start of the test for a 250-hour time period. The cyclical fluctuation is consistent throughout the duration of the tests and seems to be on the same frequency for each well. Appendix HB of this Report further addresses this observation.

4.4.3.2 Hydraulic Conductivity

Hydraulic conductivity (K) is defined as "the capacity of a porous medium to transmit water" (Driscoll, 1986) and is a function of the properties of both the porous medium and the fluid passing through it (Fetter, 1994). Hydraulic conductivity is calculated by the following equation:

$$K = k_i (\rho g / \mu)$$

where:

k_i= the intrinsic permeability of the porous medium;
ρ = the density of the fluid;
g = the acceleration of gravity; and
μ = the dynamic viscosity of the fluid.

An understanding of hydraulic conductivity is critical to predicting seepage velocity of groundwater and, similarly, to understanding contaminant transport rates as required by Section 3 (IV)(C) of the Order. Fluids with higher densities increase hydraulic conductivity and thus increase seepage velocity; conversely, fluids with higher dynamic viscosities decrease hydraulic conductivity and therefore decrease seepage velocity. A summary and explanation of the methods used to estimate K is presented in Appendix HD; in addition, example calculations and the results of slug tests (rising and falling head tests) performed in 49 monitoring wells and borehole permeability tests performed during the drilling of SH-15S are also included in Appendix HD.

The estimated ranges and average of hydraulic conductivity values for the stratigraphic units described in Section 4.3.2, above are provided below and summarized in Table 8. As indicated in Table 8, the geometric mean is based only on the results from the slug test analyses and the borehole permeability tests. The results from the Hazen method and Kozeny-Carmen analyses are not included in this calculation, or in the summary discussion below, for reasons outlined in Appendix HD.

- Estimates of hydraulic conductivity for soil fill at the Site range from approximately 3.3 to 142 feet per day (ft/day), with a geometric mean of approximately 17 ft/day.

- Hydraulic conductivity estimates for the ice contact sand/sand and gravel range from approximately 0.37 to 63 ft/day, with a geometric mean of approximately 5.2 ft/day.

- Estimates of hydraulic conductivity for glacial till range from approximately 0.012 to 9.3 ft/day, with a geometric mean of approximately 0.39 ft/day.

- Hydraulic conductivity estimates for bedrock range from approximately 0.04 to 4.9 ft/day, with a geometric mean of approximately 0.1 ft/day.

As presented in Table 8, the geometric mean of the hydraulic conductivity of the glacial till was estimated at approximately 0.39 ft/day. Assuming a typical density (1 gram per cubic centimeter [g/cm^3]) and dynamic viscosity (1 Centipoise) of water, a hydraulic conductivity of 0.39 ft/day yields an average intrinsic permeability of approximately 6.8×10^{-9} square centimeters (cm^2) for the glacial till at the Site. As such, given the higher density and viscosity observed for the DAPL relative to water, the conductivity of the glacial till with respect to DAPL is estimated to be slightly lower than that for water, ranging from approximately 0.2 ft/day at pH 14.0 standard units (s.u.) to 0.24 ft/day at pH 12.5 s.u.. It is noted that field permeability testing performed at SH-06D (pH of 12.5 s.u.) SH-07D (pH of 13.2 s.u.) yielded even lower estimates for the conductivity of the glacial till (approximately 0.01 to 0.1 ft/day), which may be reflective of natural heterogeneities within the glacial till and/or the limited conductivity of the glacial till with respect to DAPL.

4.4.3.3 Transmissivity

Transmissivity (T) is the "measure of the amount of water that can be transmitted horizontally through a unit width by the full saturated thickness of the aquifer under a hydraulic gradient of 1" and is dependant on the hydraulic conductivity and the saturated thickness of the soil (Fetter 1994). Transmissivity is calculated by the following equation:

$$T=bK$$

where

T = transmissivity (ft^2/day);
b = the saturated thickness of the aquifer (ft); and
K = the hydraulic conductivity (ft/day), as described above.

Individual transmissivity values were estimated at all locations where borings reached or advanced into bedrock. Transmissivity estimates were calculated for the fill, ice contact sand/sand and gravel, and glacial till. Table 9 presents the saturated thickness, the hydraulic conductivity and the transmissivity of the three stratigraphic units at each location.

- The estimated transmissivity of the fill unit ranges from approximately 31 to 283 ft^2/day with a geometric mean of approximately 70 ft^2/day;

- Transmissivity estimates for the ice contact sand/sand & gravel unit range from approximately 7.6 to 125 ft^2/day with a geometric mean of approximately 54 ft^2/day;

- Transmissivity estimates for the till unit range from approximately 3.7 to 25 ft^2/day with a geometric mean of approximately 11 ft^2/day;

- These transmissivity estimates support a geometric mean of total overburden transmissivity at the Site of approximately 97 ft^2/day.

Calculation of overburden transmissivity estimates at each boring location as presented in Table 9 allows for spatial comparison of transmissivity. For example, the transmissivity at well location SH-19R, located on the industrial area east of South Street, is approximately 291 ft^2/day. Transmissivity estimates from the industrial area west of South Street range from approximately 16 to 206 ft^2/day with a geometric mean of approximately 91 ft^2/day. Transmissivity estimates from the wetland area west of the AOC range from approximately 84 to 200 ft^2/day with a geometric mean of approximately 128 ft^2/day. Transmissivity estimates for the downgradient/sidegradient residential properties range from approximately 12 to 144 ft^2/day with a geometric mean of approximately 48 ft^2/day. As indicated in Section 4.1.3.1, the USGS and MCP regulations consider regions with transmissivity values less than 1,400 ft^2/day to be classified as "Non-aquifers."

4.4.3.4 Horizontal Hydraulic Gradients

SHA estimated horizontal hydraulic gradients for the shallow, and deep groundwater based on groundwater levels recorded in August 2001, October 2001, March 2002, May 2002, November 2003, and May 2004. Table HC-1 (included in Appendix HC) summarizes the horizontal hydraulic gradients observed at the Site. Representative transects were chosen to depict horizontal hydraulic gradients in specific areas of the Site.

Overall, estimated horizontal gradients for shallow groundwater range from approximately 0.004 to 0.037 ft/ft, at various locations across the Site. The estimated horizontal hydraulic gradient of shallow overburden groundwater from the AOC to the former mill tailrace area (wells SH-09S to SH-15S) ranges from approximately 0.017 to 0.022 ft/ft, with an average of approximately 0.020 ft/ft. The estimated horizontal hydraulic gradient in shallow overburden groundwater from well SH-22S to SH-19S located in the industrial area east of South St. ranges from approximately 0.004 to 0.007 ft/ft.[23] Horizontal hydraulic gradients from the industrial area west of South Street (average horizontal hydraulic gradient of approximately 0.022 ft/ft) are higher than those from the industrial area east of South Street (average horizontal gradient of approximately 0.009 ft/ft). The contrast in the shallow horizontal hydraulic gradients on the east side of South Street versus those on the west side of South Street is likely attributable to the topographic relief present on

[23] This does not include the measurements taken during the November 2003 water level round in which the water table elevation at SH-19S was 0.2 feet higher than SH-22S, resulting in a horizontal gradient of –0.001.

the west side of the Site relative to the comparatively flat topography present on the east side of South Street.

The estimated horizontal hydraulic gradients for deep overburden groundwater range from 0.008 to 0.021 ft/ft over the six comprehensive groundwater monitoring rounds at various locations across the Site. The horizontal hydraulic gradient from well SH-19D to SH-08D recorded over the six comprehensive water level measurement rounds ranged from approximately 0.015 to 0.020 with an average of approximately 0.018 ft/ft. Similarly, the horizontal hydraulic gradients from well SH-08D to SH-15D over the same measurement period ranged from approximately 0.014 to 0.021 ft/ft with an approximate average of 0.017 ft/ft, indicating that the horizontal hydraulic gradient in deep overburden groundwater is relatively consistent on a Site-wide basis.

The estimated horizontal gradients for bedrock groundwater range from approximately 0.003 to 0.02 ft/ft with an average horizontal gradient of approximately 0.013 ft/ft over the November 2003 and May 2004 comprehensive water level rounds, at various locations across the Site.[24] The horizontal hydraulic gradient from well SH-01R to SH-05R-A was approximately 0.003 ft/ft during the November 2003 comprehensive water level round, but was approximately –0.001 during the May 2004 round. The estimated horizontal gradient from SH-05R-A to SH-24R was consistent ranging from approximately 0.018 to 0.020 ft/ft with an average horizontal gradient of approximately 0.019 ft/ft. The estimated horizontal gradient from SH-17R to SH-28R also showed consistency with a horizontal gradient of 0.010 ft/ft and 0.012 ft/ft for both comprehensive water level rounds, indicating that the horizontal hydraulic gradient is relatively consistent through this area of the Site.

4.4.3.5 Porosity

Porosities (*n*) of granular soils typically range from approximately 0.20 to 0.45 (Fetter, 1994; Freeze and Cherry, 1979; Lambe and Whitman, 1969). Lower porosity values are more typical of poorly sorted, dense deposits, whereas higher porosity values are typical of well sorted, loose deposits. For the fill soils at the Site, which are characterized as poorly sorted, but only moderately dense, a porosity of 0.30 (corresponding to an in place density of approximately 115 pounds per cubic foot [lb/ft^3]) appears reasonable. For the ice-contact sand/sand and gravel, which is also characterized as poorly sorted and moderately dense, a porosity of 0.30 also appears reasonable. For the significantly denser glacial till soils, a porosity of 0.20 (corresponding to an in-place density of approximately 132 lb/ft^3) appears an appropriate estimate.

[24] This does not include the measurement taken at SH-05R-A during the May 2004 water level round in which the water table elevation at SH-05R-A was 0.3 feet higher than SH-01R, resulting in a horizontal gradient of –0.001.

4.4.3.6 Horizontal Seepage Velocities

The horizontal seepage velocity (v_h) provides an estimate of the rate of conservative advective groundwater transport in unconsolidated geologic deposits and is calculated by the following equation using a form of Darcy's Law:

$$v_h = K\, i_h / n$$

where:

K = hydraulic conductivity (ft/day);
i_h = the horizontal gradient (ft/ft); and
n = porosity.

Estimation of horizontal seepage velocities was based on the range of hydraulic gradients recorded over the six comprehensive water level measurement rounds in shallow and deep monitoring wells (discussed in Section 4.4.3.4) and the estimates of hydraulic conductivity presented in Table 8 (discussed in Section 4.4.3.2, above). Details regarding the calculation of horizontal seepage velocities and tabulation of all horizontal seepage velocity data are presented in the notes of Table HC-1 (included in Appendix HC). The estimated porosity values used in the calculation of horizontal seepage velocity were assumed to be 0.30 for the fill and ice contact sand/ sand and gravel units and 0.20 for the glacial till unit, based on our experience with similar soils and ranges provided in the literature (as discussed in Section 4.4.3.5, above).

As summarized in Table HC-1, the estimated horizontal seepage velocity in shallow overburden groundwater (traveling primarily through the soil fill and ice contact sand/sand and gravel unit), from SH-09S to SH-15S (located on the industrial area west of South Street) ranges from approximately 1.0 to 1.3 ft/day with an approximate average of 1.1 ft/day. The estimated horizontal seepage velocity in shallow overburden groundwater, from SH-22S to SH-19S (located on the industrial area east of South Street) ranges from approximately 0.04 to 0.07 ft/day with an average of approximately 0.06 ft/day.[25]

The estimated horizontal seepage velocity in deep overburden groundwater (traveling through the glacial till unit) from wells SH-19D to SH-08D ranges from approximately 0.03 to 0.04 ft/day with an average of approximately 0.03 ft/day. Likewise, the estimated horizontal seepage velocity from wells SH-08D to SH-15D also ranges from approximately 0.03 to 0.04 ft/day with an average of approximately 0.03 ft/day, indicating that the horizontal seepage velocity in deep overburden groundwater is relatively consistent on a Site-wide basis.

4.4.3.7 Vertical Hydraulic Gradients

Understanding the vertical hydraulic gradients of an aquifer is important to understanding three dimensional groundwater flow patterns and in predicting contaminant transport and fate.

[25] This does not include water level measurements taken in November 2003 for which the estimated seepage velocity was –0.02.

Vertical hydraulic gradients were estimated using data collected from 24 locations across the Site during the six comprehensive water level measurement rounds. In addition, data collected during groundwater/surface water interaction monitoring were used to supplement the comprehensive water level round data at well couplet locations SH-03S/D, SH-04S/D, and SH-15S/D. Table 10 presents a summary of the vertical gradients for the six comprehensive water level rounds. Figures 11A through 11D depict groundwater contours superimposed on hydrogeologic cross sections which demonstrate the vertical component of groundwater flow.

In general, downward gradients were observed in upland areas of the Site, indicating expected recharging conditions. Upward gradients are prevalent in westerly portions of the Site near the wetland areas (former mill tailrace) indicating discharge conditions.

Downward hydraulic gradients (from shallow to deep overburden monitoring wells) were observed to be predominant in the following overburden well couplets within the AOC: SH-01S/D, SH-06S/D, SH-07S/D, SH-08S/D, and SH-09S/D; in SH-27S/D located on a side-gradient residential street, as well as in SH-19S/D located in the industrial area east of South Street. The average downward hydraulic gradient in the above overburden wells was approximately 0.06 ft/ft. The strongest downward hydraulic gradient was consistently observed in well couplet SH-08S/D and ranged from 0.12 to 0.14 ft/ft. The anomalously high downward hydraulic gradient at well couplet SH-08S/D may be due to the location of the well screen of SH-08D. As detailed in Section 2.0, most of the deep overburden wells were screened within the till just above bedrock; however, well SH-08D was not installed in this manner. The bottom of well SH-08D is approximately 20 ft above the bedrock/till interface. Further, wells SH-08S and SH-08D are located in a topographic depression of the glacial till surface. Water may accumulate in the vicinity of wells SH-08S and SH-08D due to the surrounding glacial till having a much lower hydraulic conductivity. This may be the cause of the somewhat higher water level in SH-08S relative to other shallow wells in this area.

Upward vertical hydraulic gradients (from deep to shallow overburden) were observed in well couplets SH-02S/D, SH-03S/D, and SH-12S/D in the AOC; wells SH-04S/D, SH-05S/D, SH-14S/D, SH-25S/D, and SH-15S/D in the wetland/former mill tailrace areas; SH-28S/D in a downgradient residential property; and wells SH-18S/D and SH-17S/D located in the northern portion of the Site, west of South Street. The average upward hydraulic gradient observed in overburden monitoring well couplets was approximately 0.03 ft/ft. The strongest upward hydraulic gradient was approximately 0.06 ft/ft and was observed in well couplets SH-28S/D during the May 2004 comprehensive water level round and SH-25S/D in the May 2004 water level round. The weakest upward hydraulic gradient was approximately 0.0005 ft/ft and was observed in well couplet SH-17S/D during the November 2003 comprehensive water level round.

Based on the available data from the six comprehensive water level rounds and the data collected during the periods of groundwater/surface water interaction monitoring, typically, overburden vertical hydraulic gradients appear to be seasonally and directionally consistent. There are two exceptions to this generality. The vertical hydraulic gradients observed during the six

comprehensive water level rounds in well couplet SH-06S/D were downward with the exception of during the October 2001 water level round when a weak upward hydraulic gradient (0.003/ft) was observed. The vertical hydraulic gradients in well couplet SH-15S/D were upward during the August 2001, October 2001, March 2002, November 2003, and May 2004 comprehensive water level rounds; however, a slight downward hydraulic gradient (0.004 ft/ft) was observed during the May 2002 comprehensive water level round. Results from groundwater/surface water interaction monitoring reveal that the overburden vertical hydraulic gradients observed during the comprehensive water level rounds are directionally consistent with results from the vertical hydraulic gradients observed during the two, approximately one-month groundwater/surface water interaction monitoring periods. Importantly, these data consistently indicate upward gradients for the former mill tailrace area, in turn indicating that groundwater discharges to surface water in this area.

As noted in Table 10, vertical hydraulic gradients between shallow bedrock and deep overburden are generally slightly upward, with the exception of SH-17D/R, which showed an average downward gradient of 0.006 ft/ft. However, seasonal fluctuations, or effects from large rain events are possible with some locations showing downward gradients during either the March 2002, May 2002, and May 2004 water level rounds.

4.4.3.8 Groundwater Recharge and Discharge

Groundwater at the Site is recharged by precipitation infiltration and groundwater flow from upgradient upland areas. Additionally, based on information gathered during groundwater/surface water interaction monitoring (discussed in Section 4.4.2.1), it appears that groundwater may be locally recharged by the Neponset River in areas immediately downstream of the aluminum culvert.

As mentioned in Section 4.4.3.7, on average, well couplets SH-04S/D, SH-05S/D, SH-14S/D, SH-15S/D, and SH-25S/D (located in the wetland/former mill tailrace area) and SH-28S/D (located downgradient of the Site just northeast of the Neponset River) consistently indicate upward vertical hydraulic gradients supporting the assertion that this area is a groundwater discharge zone. In addition, results of the two one-month periods of groundwater/surface water interaction monitoring suggest the former mill tailrace is a groundwater discharge area (as discussed in Section 4.4.3.1). As will be noted in Section 5.0, chemical data from samples obtained in the former mill tailrace also indicated this area is a discharge location for groundwater at the Site. Surface water in the former mill tailrace ultimately discharges to the Neponset River downstream of the former mill tailrace.

In general, downward vertical hydraulic gradients are noted in well couplets SH-01S/SH-01D, SH-06S/SH-06D, SH-07S/SH-07D, SH-08S/SH-08D, SH-09S/SH-09D, SH-19S/SH-19D, and SH-27S/SH-27D. These locations are located at greater distances from the Neponset River than the wells mentioned in the previous paragraph. The downward vertical hydraulic gradients are consistent with groundwater recharge areas. The downward vertical hydraulic gradient is likely driven by precipitation/infiltration.

Basin analyses were performed to further understand the groundwater and surface water relationship at the Site and to compare and contrast volumetric discharge calculations in the Neponset River using a basin analysis approach to those calculated using a stream gauging approach. Example calculations are shown in Appendix HE. According to the USGS the average flow of the Neponset River from 1950 to 2001 at USGS station #01105000 in Norwood, MA was approximately 57 cfs. The USGS reports that the area of the drainage basin above USGS station #01105000 is approximately 34.7 square miles. Using an estimated annual recharge rate of 20 inches per year[26] (in/yr, equivalent to 1.67 ft/yr), an estimated volumetric discharge to the Neponset River from the drainage basin was calculated to be approximately 51.2 cfs. A comparison of the volumetric discharge calculations described above indicates that the two methods yield consistent (within an acceptable margin of error) results.

Site-specific volumetric discharge calculations were performed using the basin analyses approach using a similar average annual recharge rate of 20 inches per year and by estimating the drainage basin areas above staff gauges SG-112 and SG-108. The area of the drainage basin above SG-112 is approximately 291,951,000 ft^2. This yields an approximate volumetric discharge of groundwater to the Neponset River from the drainage basin above SG-112 of 15.5 cfs. Comparing the volumetric discharge from the drainage basin above SG-112 with that of the drainage basin above USGS Station #01105000 shows that the discharge from SG-112 is approximately 30% of that from USGS Station #01105000.

The area of the drainage basin above SG-108 is approximately 281,588,500 ft^2 yielding an approximate volumetric discharge of groundwater to the Neponset River from the drainage basin above SG-108 of 14.9 cfs. As discussed in Section 4.4.2.3, the average stream gauging was performed at the SG-108 and SG-102 locations in April and August 2001. Stream gauging during "higher" stream conditions averaged approximately 60.8 cfs during the April stream-gauging event. Stream gauging during "lower" stream conditions averaged approximately 3.6 cfs during the August stream-gauging event. Comparing the stream gauging calculations for volumetric discharge to the basin analysis calculations for the drainage basin above SG-108 shows that the volumetric discharge calculations are relatively consistent. Comparing the volumetric discharge the drainage basin above SG-108 with that of the drainage basin above USGS Station #01105000 shows that the discharge from SG-108 is approximately 29% of that from USGS Station #01105000.

The surface area of the On-Facility property is approximately 525,770 ft^2. Using an estimated annual recharge rate of 20 in/yr gives an approximate volumetric discharge from the On-Facility properties and former tailrace area of approximately 0.3 cfs. Comparing this to the volumetric discharge from the drainage basin above SG-108 shows that the volumetric discharge from the On-Facility properties and former Mill tailrace area is approximately 2% of volumetric discharge from the drainage basin above SG-108.

[26] Based on USGS Report 95-4234, "Using the Approximate Mid-Range of Annual Mean Groundwater Recharge for Stream Gauging Stations in Southeastern Massachusetts and Rhode Island."

A day by day comparison of the measurements collected from staff gauge SG-108 during the stream-gauging in April 2001 to that of the USGS station #01105000 indicates that the volumetric discharge at SG-108 was 29% of that of the USGS station #01105000. This percentage of volumetric discharge contributed to the Neponset River at SG-108 correlates well with the basin analyses calculations, presented above, which also show that the portion of volumetric discharge from the drainage basin above SG-108 is approximately 29% of that contributed by the drainage basin above USGS station #01105000.

4.5 Ecology

For ecological assessment purposes, NAI's natural resource inventory and assessment (including on-Site wildlife surveys and wetland delineations performed between June 19 and 21, 2001 and July 11, 2001, as described in their December 2001 Ecological Characterization Report, included in Appendix C) divided the Site into On-Facility uplands and wetlands, Off-Facility and Off-Site uplands and wetlands, and the Neponset River. Brief descriptions of each of these areas are provided below.

As indicated in Section 4.0 of NAI's Ecological Characterization Report, "the 2000-2001 Massachusetts Natural Heritage Atlas of Estimated Habitats or Rare Wetland Wildlife and Certified Vernal Pools and Priority Habitats of Rare Species (Natural Heritage & Endangered Species Program [NHESP] 1999) indicates that there are no known rare of protected species or ecologically significant natural communities in the Study Area." For more detailed descriptions of each habitat and the wildlife summary, the reader is referred to NAI's Ecological Characterization Report, included in Appendix C. Additionally, the tables and appendices included in NAI's Ecological Characterization Report provide detailed information regarding the vegetation and the wildlife present, or likely to be present in each habitat area, as well as correspondence regarding the lack of endangered and threatened species in the Study Area are also presented in NAI's Ecological Characterization Report.

- <u>On-Facility Wetlands.</u> NAI identified five On-Facility wetlands (identified as Wetlands 3, 4, 5, 6, and 7 on Figure 4 of the NAI Ecological Site Characterization Report, included in Appendix C) at the Site.

    - *Wetland 3*: This wetland covers an area of approximately 21,000 ft^2 (0.5 acre) and is located along the eastern bank of the Neponset River, between South Street and the former railroad bed. Prior to approximately 1959, this area comprised a pond (known as Lower Mill/Union Pond). According to NAI, this area "is now most accurately classified as a Shallow Emergent Marsh (70%), with a young Alluvial Red Maple Swamp component (30%) on its northern edge." NAI indicates that "this small wetland provides moderate wildlife habitat value, including some corridor value, despite its partial isolation from adjacent habitats by roads, developments, and culverts." According to NAI, wildlife within Wetland 3 is anticipated to include white-tailed deer, painted turtles, and birds.

- *Wetlands 4 and 5:* Wetlands 4 and 5 are small, approximately 5,500 ft^2 (0.1 acre) and 1,900 ft^2 (0.05 acre), respectively, and located along the western bank of the Neponset River, south of South Street. According to NAI, both wetlands encountered some disturbance during the 1992 asbestos RA. NAI classified Wetland 4 as a "Alluvial Red Maple Swamp;" Wetland 5 was classified as a "Shrub Swamp" in a "early successional stage of an Alluvial Red Maple Swamp." NAI indicates that "these small wetlands provide minimal flood storage capacity, and little flow augmentation by way of seepage, but add slightly to the wildlife corridor value as they are easily accessible to small animals (such as turtles or amphibians) from the river edge and provide cover and food for mammals and birds."

- *Wetland 6:* Wetland 6 occupies an area of approximately 30,000 ft^2 (0.7 acre) just downstream of the end of the Neponset River culvert, on the west side of the River. NAI speculates that "seepage may be as important to this wetland's hydrology as flooding of the Neponset River." NAI also indicates that "Wetland 6 also provides wildlife habitat value as a vegetated corridor along the River, and for resident wildlife." Referring to their 1993 wetland evaluation (NAI, 1992), NAI's December 2001 Report indicates that "Wetland 6 will continue to a buffer between the residential development and the Neponset River, intercepting (and improving the quality of) direct runoff from the development, screening the sights and sounds of industrial property, and providing access to the River."

- *Wetland 7:* During the 1992 RA, Wetland 7 was created as a compensatory Shrub Swamp and Shallow Emergent Marsh wetland (approximately 12,500 ft^2 [0.3 acre] in size). Again referring to their 1993 wetland evaluation, NAI's December 2001 Report, indicates that "the former mill tailrace continues to show evidence of biological stress, as it did before and during the Removal Action."

- Off-Facility Wetland. NAI identified one Off-Facility wetland (identified as Wetland 2 on the figure included in Appendix C).

  - *Wetland 2:* Located on the western side of the Neponset River, upgradient of the industrial portion of the Site (on Lot 33-137), Wetland 2 is approximately 66,500 ft^2 (1.5 acres) in size, and characterized as a Alluvial Red Maple Swamp. In addition, Wetland 2 includes approximately 19,000 ft^2 (0.5 acre) of Shrub Swamp islands within the Neponset River (for a total area of Wetland 2 of approximately 85,500 ft^2 (2 acres). NAI indicates that "this wetland likely provides a useful riparian corridor, and it is located in close proximity to Wetland 1 and the pond above the dam (Blackburn Pond)."

- Off-Site Wetlands. NAI identified five off-Site wetlands, one upstream and four downstream of the industrial portion of the Site (identified as Wetlands 1, 8, 9, 10, and 11 on the figure included in Appendix C).

- *Wetland 1:* Wetland 1 is located on the eastern side of the Neponset River upstream of the railroad bed, opposite Wetland 2. Wetland 1 is an approximately 16,500 ft^2 (0.4 acre) Shrub Swamp and Deep Emergent Marsh located within and adjacent to a backwater channel of the River. NAI indicates that "the dense vegetation" of Wetland 1 "likely retains nutrients carried by the Neponset River and helps protect the steep upland banks from the erosive forces of channel flow." In addition, "the dense and emergent vegetation, ample standing water, connection to the River, and surficial organic substrates" are well suited to "turtles, amphibians, waterfowl, and perhaps wading birds." "Green frogs, … songbirds, and aquatic insects" were noted by NAI.

- *Wetlands 8, 9, and 11:* Three small wetlands (each less than approximately 5,000 ft^2 [0.1 acre]) are located close to the edge of the River, downgradient of the industrial portions of the Site. NAI characterizes Wetlands 9 and 11 as Alluvial Red Maple Swamps and Wetland 8 is a Shrub wetland. NAI indicates that, "as with other very small Alluvial Red Maple Swamps and Shrub Swamps along the Neponset River, Wetlands 8, 9, and 11 likely provide some groundwater discharge and recharge at different times, and protect portions of the riparian wildlife corridor from development."

- *Wetland 10 (Lewis Pond):* NAI describes Lewis Pond as a "Deep and Shallow Marsh…containing the meandering Neponset River channel." The basin of Lewis Pond is approximately 300,000 ft^2 (7 acres). According to NAI,

  > As a marsh surrounded by residential, commercial, and industrial development, Lewis Pond has value as a refuge for wildlife, yet its value is also diminished by the adjacent development. This habitat is not ideal for wildlife dependant on adjacent uplands for part of their life requisites, and access for upland wildlife is also poor. Noise and visual disturbances are likely from adjacent road and train traffic, commercial and residential properties.

NAI noted that muskrat, green frogs, American toads, Canada geese, mallards, red-winged blackbirds, songbirds, waterfowl, wading birds, and turtles are expected to be associated with open habitats such as Lewis Pond.

- Uplands. According to NAI, on-Facility uplands include "industrially developed properties, a few open habitats, such as mowed grasslands and old fields, and small stands of High Terrace Floodplain Forest," including the mowed grassland on the AOC. NAI indicates that the "grasslands in the Study Area are too small and disconnected to provide breeding territories" for birds and other animals. In addition, the AOC area is generally not available to larger animals (i.e., fox, deer, raccoons) due to the presence of the fence.

Off-Facility and Off-Site uplands are generally residential yards; in addition, High Terrace Floodplain Forests are located in undeveloped areas along the River, at elevations above the Alluvial Red Maple Swamp and Shrub Swamps. At elevations above High Terrace Floodplain Forests, White Pine-Oak Forests are generally the dominant cover type. Wildlife (or signs of their presence) noted by NAI in Off-Facility and Off-Site High Terrace Floodplain Forest uplands included eastern cottontail, gray squirrel, and birds; garter snakes and shrews are also expected in these types of habitats. Wildlife in White Pine-Oak Forests are expected to include birds, squirrel, chipmunks, deer, and invertebrates (e.g., earthworms, sowbugs).

- The Neponset River. NAI describes the Neponset River as approximately "20 ft in width and 2 ft deep" with "primarily cobble, gravel and boulder" substrate "until it reaches Wetland 1," where it primarily migrates through a sandy substrate. Between the railroad bridge and South Street, the River "follows a riffle and run coarse." Downstream of the culvert, the "riverbed is cobble and gravel until it reaches Lewis Pond, where it meanders through an emergent and submergent marsh with sand, gravel, and organic substrates." NAI documented caddisflies, larval dragonflies, and midge larvae, as well as mollusks (including bivalves) and gastropods in the River.

- The Neponset River Floodplain. FEMA (1988) for the Neponset River depicts the 100-year floodplain to be approximately 60 to 450 ft wide (Figure 5 in NAI's Report, included in Appendix C). The floodplain encompasses most of the mapped wetlands, as well as portions of other properties along the River. According to NAI, flood elevations for the vicinity of the Site (from upstream of the industrial portions of the Site to Lewis Pond) range from 144 ft (NGVD) in Lewis Pond to 173 ft near Wetland 2.

5.0 NATURE AND EXTENT OF ANALYTES DETECTED

This section describes the observed nature and extent of analytes[27] at the Site based on the results of chemical laboratory analyses, as well as field screening and observation. For discussion of the significance of analyte distribution with regard to analyte transport and fate, the reader is referred to Section 6.0 of this Report.

The presence and distribution of analytes at the Site generally correlates with manufacturing operations that have occurred on portions of the Site over at least the past 100 years, and possibly dating back to the late 17th century. The principal analytes observed at the Site during the RI are elevated pH (defined as pH greater than 9 s.u.)[28], metals, PAHs, and aromatic volatile organic compounds (AVOCs).

In summary, the predominance of analytes that likely represent possible soil contaminants observed at the Site during the RI resides below the capped portion of the AOC. Key exceptions include:

- The detection of metals and PAHs in the industrial portion of the Site east of South Street, generally east of Building No. 3; and

- The detection of a limited number of metals (primarily arsenic) and PAHs in the southerly portion of the railroad ROW.

pH was found to be elevated in deeper soils in and just downgradient of the AOC.

The predominant groundwater analytes at relatively elevated concentrations were found to reside in an area beneath the central portion of the AOC and the former mill building, extending to the wetland/former mill tailrace area in the vicinity of the Neponset River to the west-northwest. Historical releases of sodium hydroxide appear to have resulted in the formation of a plume of significantly elevated pH in this area. Although the original sodium hydroxide source was eliminated approximately 20 years ago with termination of manufacturing activities, a DAPL[29] plume of sodium hydroxide appears to continue to reside generally beneath and proximate to the central portion of the westerly-extending wing of the former mill building (where the former

[27] The term "analyte" as used in this Section, refers generally to chemicals detected above human health or ecological COPC screening levels through analysis of environmental samples obtained at the Site completed pursuant to the QAPP. Some of the analytes detected at the Site are most likely present as contaminants attributable to the industrial history of the Site; others may represent naturally occurring or background conditions.

[28] Elevated pH is considered pH greater than 9 s.u.; this is based on a literature review of ambient conditions in natural groundwater as presented in Krauskopf (1979).

[29] The term DAPL – dense aqueous phase liquid – was introduced in Section 4.4.3.2, and refers to that portion of the aqueous phase sodium hydroxide liquid released historically to the subsurface at the Site which has a pH above 12.5. As described in more detail in this section, a liquid with a pH above about 12.5 exhibits a higher viscosity and density than ambient groundwater.

sodium hydroxide ASTs and the former bleachery were located). The DAPL appears to be a residual source of elevated pH.

A number of metals were found in groundwater at elevated concentrations, most of which correlate with the presence of elevated pH. Accordingly, this may be more the result of dissolution of at least a portion of these metals from soils occurring at background concentrations, rather than representing actual "contaminated" source soil. The area of elevated pH in groundwater also contains elevated concentrations of PAHs and AVOCs.

Potential sediment and surface water impacts from Site-related analyte discharges from groundwater, surface water / overland flow are evident in the former mill tailrace, where elevated pH, metals, PAHs, and AVOCs were detected. Asbestos was also detected in surface water and sediment within the former mill tailrace. Otherwise, detections of metals and PAHs in Neponset River sediments, Neponset floodplain sediments, and Lewis Pond at apparently elevated concentrations are generally limited (AVOCs were not detected); asbestos detections were limited in floodplain sediments, but more prevalent in Lewis Pond sediments.

Impacts to the Neponset River at concentrations greater than Human Health and Ecological COPC screening levels appear limited.

The following subsections provide a description of the distribution of various analytes in greater detail. The reader is urged to refer back to the above summary discussion to help place the following detailed discussion in context. In addition, the following subsections are not written to stand alone, but assume that the reader will refer to the tables and figures while reading this section.

5.1 Distribution of Analytes in Soil

As described in Section 5.1.4.3 of the QAPP, in the EDRA Report, and in Section 2.4 above, the Site was apportioned into several horizontal "strata" (areas) on the basis of general historical use and the probability of environmental impact for each area. In addition, two primary vertical strata ("upper" - 0 to 1 foot bgs, and "lower" – greater than 1 foot bgs) were identified on the basis of risk assessment requirements for sampling of soil from each of the horizontal strata.

It is noted that composite soil samples were collected as part of the Phase 1B RI at co-located earthworm sample locations. The analytical results from these composite soil sample locations are presented in Tables 11B through 11D; however, these sample locations are not depicted on the contaminant distribution figures for soil (Figures 16 through 40), and are not discussed in the text of Section 5.1 as these were composite soil samples collected from broad areas of the Site. These samples were collected specifically for further evaluation of the ecological risk in conjunction with earthworm sampling conducted as part of the Phase 1B RI, and these data have been incorporated in ecological risk assessment analyses. Concentrations of metals and PAHs observed in these composite samples were generally similar to those observed in other soil samples from the same general areas.

Tables 11A through 11E and 12A through 12E compare the soil analytical results to COPC screening levels used in the BHHRA and BERA. Two COPC screening levels were developed for the soil data: a human health screening level and an ecological screening level:

- The human health COPC screening level is the lower of the MCP Method 2 S-1 (used as a screening level for the direct contact pathway) standards applicable in a GW-1 setting and the USEPA Region IX Preliminary Remediation Goals (PRGs);

- The ecological COPEC screening level is the lowest of the Oak Ridge National Laboratory (ORNL) Ecological Toxicological Benchmarks and the USEPA Ecological Soil Screening Levels.

The following discussion regarding soil data compares soil concentrations to human health COPC screening levels. For presentation purposes, the data are not compared to ecological COPECs in the following text; however, Tables 11A through 11E and 12A through 12E do compare the soil analytical results to the ecological screening levels. It should be emphasized that an exceedence of a human health or ecological COPEC screening level may indicate potential risk; however, such an exceedance does not necessarily indicate that the effects would be exhibited by receptors under Site-specific conditions. Risks from soil analytes are evaluated in the BERA and BHHRA, summarized in Sections 7.0 and 8.0 of this Report. Typically, when data are considered in the context of actual Site-specific criteria, these COPC screening levels are shown to be conservative and lower than final approved cleanup standards, at least for many parameters.

A comparison of metals and PAH results to background soil concentrations is not presented herein. As agreed to with USEPA, soil background data will be collected only if necessary. This will be determined after completion of the risk calculations in the BHHRA. However, several metals including aluminum, cobalt, copper, and iron were detected in many or all of the soil samples collected at the Site at concentrations in excess of their respective human health COPC screening levels. Because of the common occurrence of these metals in natural soil and the fact that USEPA Region I risk assessment guidance [(USEPAReg1, 1999); and personal communication between MCA (the Project Risk Assessor) and USEPA Region I risk assessor, Sarah Levinson)] does not endorse quantitative evaluation of risk for aluminum, cobalt, copper, and iron, detections of these metals at concentrations in excess of the human health COPC screening levels may not be significant. For consistency, the distribution of these metals in soil is presented herein; however, their occurrence in Site soils is not likely significant for risk assessment purposes.

The above discussion notwithstanding, although arsenic is present in many of the soil samples collected at the Site, this may be largely due to the presence of naturally occurring background concentrations of arsenic. The presence of arsenic in natural soils is well documented. The MADEP-published background concentration for arsenic is 17 mg/kg. With the exception of four soil samples collected from the former railroad area and one sample collected from the

AOC, the relative ubiquitous presence of arsenic in soil samples collected from the Site is, in our professional opinion, suggestive of background soil conditions. Nevertheless, for consistency, the distribution of arsenic concentrations detected in soil samples collected from the Site is discussed herein and these concentrations are compared to human health COPC screening levels (the USEPA Region IX PRG).

5.1.1 Distribution of Analytes in Upper Soils (0 to 1 ft bgs)

The principal analytes detected in upper soil[30] samples are metals (including aluminum, arsenic, chromium, iron, lead, manganese, and vanadium), PAHs, and AVOCs. Tables 11A through 11E summarize the analytical data for the upper 1 foot of soil from the Site and compare these data to the human health and ecological COPCs. The observed distribution of analytes in upper soil is discussed further in the following subsections.

5.1.1.1 Results of Field Screening of Upper Soils

In accordance with Section 8.2 of the QAPP and SOP S-1669E (4.0), PID headspace screening of soil samples collected during subsurface exploration at the Site was performed. These results are presented on the soil boring and monitoring well logs included in Appendix B.

5.1.1.2 Distribution of pH in Upper Soils

Soil pH was measured in the field in approximately 11 upper soil samples collected during drilling within the wetland/former mill tailrace area, downgradient of the AOC[31]. As discussed in the Phase 1A and 1B DURs, because pH is considered a definitive data parameter, field QA/QC was performed, and pH was assessed for usability.

As summarized in Table 11A, the pH of upper soil samples ranged from approximately 4.5 to 7.5 s.u., well within a range indicative of natural soil conditions.

5.1.1.3 Distribution of Inorganic Parameters in Upper Soils

A total of 24 inorganic parameters, including 19 metals, four cations (calcium, magnesium, potassium, and sodium), and WAD cyanide were analyzed by USEPA-approved methods in 56 shallow soil samples collected at the Site (not including the 15 composite soil samples collected at the co-located earthworm sampling locations). The results from these analyses are presented in Table 11B. Each of the metals analyzed was detected in one or more of the surficial soil samples collected during the RI. Metals including barium, beryllium, cadmium, copper, nickel,

[30] Upper soils are not of concern within the AOC, given that the AOC is covered with a soil cap (consisting of six inches of clean topsoil, placed over 24 inches of clean sand) or asphalt cap constructed after industrial activities in this area of the Site had long since ceased. Therefore, the term "upper soil" refers to the non-AOC portions of the Site.

[31] Measurements of pH in upper soil were not performed within the AOC because of the presence of the soil and asphalt cap in this area.

selenium, silver, and thallium were not detected in surficial soil at concentrations above their respective human health COPC screening levels.

Antimony, cobalt, mercury, WAD cyanide, and zinc were detected at concentrations above their respective human health COPC screening levels; however, these inorganic parameters were detected in isolated areas of the Site and were detected at concentrations in excess of the human health COPC screening level in less than 5% of the shallow soil samples. Therefore, these metals are not considered to be significant potential contaminants in shallow soil.

Metals including aluminum, arsenic, chromium, iron, lead, manganese, and vanadium were detected in surface soils at concentrations above their respective human health COPC screening levels in greater than 5% of the surficial soil samples collected from the Site. Figures 16 to 22 illustrate the distribution of these metals. As previously discussed, a comparison of metals results to background soil concentrations is not presented herein. Because of the common occurrence of these metals in natural soil, detections at concentrations in excess of the human health COPC screening levels may not be significant.

5.1.1.4 Distribution of SVOCs in Upper Soils

As summarized in Table 11C, 56 soil samples were collected from 0 to 1 feet bgs and submitted to WHGEL for analysis of SVOCs during the RI. In general, PAHs were detected with greater frequency than non-PAH SVOCs in upper soil samples. Non-PAH SVOCs were not detected at concentrations exceeding applicable human health COPC screening levels in upper soil samples from the Site.

PAHs detected at concentrations above applicable human health COPC screening levels in upper soils include: benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, and naphthalene. Upper soil samples where individual PAH concentrations exceeded their respective human health COPC screening levels were located in each horizontal stratum at the Site; however, as depicted on Figure 23, the highest concentrations of total PAHs (above 100,000 µg/kg) were detected in upper soil from borings SB-04 and SB-05 within the former railroad ROW; SB-09, SB-17, SB-18, SB-20, SB-21, and SB-26 within the industrial area east of South Street; and SB-30 located in the areas peripheral to former manufacturing activities. Figure 24 illustrates the distribution of benzo(a)pyrene as an example of the distribution of the higher molecular weight PAHs. Figure 25 and 26 illustrate the distribution of 2-methylnaphthalene and naphthalene as examples of the distribution of the lower molecular weight PAHs.

5.1.1.5 Distribution of VOCs in Upper Soils

As described in Section 2.4 of this report, and in accordance with Section 8.2 of the QAPP, a subset of soil samples collected during the RI was submitted for analysis for VOCs by USEPA SW-846 Method 8260B. As shown in Table 11D, of the 13 upper soil samples submitted for VOC analyses during the RI, only one sample contained concentrations of VOCs above the

respective human health COPC screening level (trichloroethylene [TCE] concentration was 170 µg/kg in sample SS-09 / 04-23-01 located at the SB-09 soil boring location). The remaining upper soil samples did not contain VOCs at concentrations exceeding their respective human health COPC screening levels.

5.1.1.6 Distribution of PCBs and Pesticides in Upper Soils

As described in the EDRA Report and in Section 5.1.3.2.b of the QAPP, PCBs and pesticides were not anticipated to be COPCs based on the history of the Site; however, a subset of soil samples from the Site were submitted for PCB and pesticide analyses for confirmation that these compounds are not COPCs. As summarized in Table 11E, a total of four upper soil samples (from borings SB-09, SB-21, SB-25, and SB-26, located on the industrial area east of South Street) were submitted for analysis of PCBs and pesticides during the RI.

PCBs identified as Aroclor 1260 were detected above the analytical reporting limit in one upper soil sample, the sample from soil boring SB-25 (sample SS-25 / 03-29-01) at a concentration of 23 µg/kg, well below the human health COPC screening level for Aroclor 1260 of 220 µg/kg. PCBs were not detected in the other three upper soil samples from the Site submitted for PCB analyses.

Low level concentrations of pesticides were detected in each of the four upper soil samples. However, pesticide concentrations were below applicable soil human health COPC screening levels.

5.1.2 Distribution of Analytes in Lower Soils (Greater than 1 ft bgs)

5.1.2.1 Results of Field Screening of Lower Soils

In accordance with Section 8.2 of the QAPP and SOP S-1669E (4.0), PID headspace screening of soil samples collected during subsurface exploration at the Site was performed. These results are presented on the soil boring and monitoring well logs included in Appendix B.

5.1.2.2 Distribution of pH in Lower Soils

Soil pH was measured in the field in approximately 332 lower soil samples collected during drilling within the AOC and the wetland/former mill tailrace area, and downgradient / side-gradient of the AOC. As discussed in the Phase 1A and Phase 1B DURs, pH is considered a definitive data parameter, field QA/QC was performed, and pH was assessed for usability.

In general, soil pH correlates with pH measurements made on groundwater samples obtained from the Site, as discussed in Section 5.2.1.2, below. As summarized in Table 12A, pH measurements were made on soil within and downgradient of the AOC. The highest pH measurements recorded (ranging from approximately 12.7 to 13.2 s.u.) were measured in subsurface soil samples at depths ranging from about 25 to 30 ft bgs, collected from borings SH-

01R, located within the soil-capped portion of the AOC, and at depths ranging from about 30 to 32 ft bgs from boring SH-07D, located on the asphalt-capped portion of the AOC.

Elevated pH measurements (greater than 9 s.u.) were recorded in soil from various depths within and downgradient of the AOC, ranging from relatively shallow depths (less than 5 feet bgs) in a number of locations (including, but not limited to just below the floor within the former mill building and in borings within the AOC), to depths greater than 40 feet bgs also within borings within and just downgradient of the AOC.

5.1.2.3 Distribution of Inorganic Parameters in Lower Soils

Similar to upper soil, 24 inorganic parameters, including 19 metals, four cations (calcium, magnesium, potassium, and sodium), and WAD cyanide were analyzed by USEPA-approved methods in 77 soil samples collected from depths greater than one foot bgs at the Site during the Phase 1A RI. Results of analysis for inorganic parameters in lower soil are summarized in Table 12B.

With the exception of silver, each of the metals analyzed was detected in one or more of the subsurface soil samples collected during the RI. Cobalt, nickel, selenium, and WAD cyanide were not detected above their respective human health COPC screening levels in subsurface soil at the Site.

Antimony, beryllium, cadmium, mercury, and thallium were detected at concentrations above their respective human health COPC screening levels in one or more horizontal strata at the Site; however, these compounds were detected in isolated areas and were detected above their human health COPC screening levels in less than 5% of the subsurface soil samples collected at the Site and are therefore unlikely to be significant sources of contamination.

Aluminum, arsenic, barium, chromium, copper, iron, lead, manganese, vanadium and zinc were detected in subsurface soils at concentrations exceeding their respective human health COPC screening levels. Figures 27 to 36 illustrate the distribution of these metals. As previously discussed, a comparison of metals results to background soil concentrations is not presented herein. Because of the common occurrence of these metals in natural soil, detections at concentrations in excess of the human health COPC screening levels may not be significant.

5.1.2.4 Distribution of SVOCs in Lower Soils

A total of 77 subsurface soil samples were collected for SVOC analysis during the RI. Results of SVOC analyses on lower soils are summarized in Table 12C.

Only one non-PAH SVOC, dibenzofuran, was detected at concentrations exceeding the applicable human health COPC screening level. Dibenzofuran was detected in three soil samples collected from borings SB-09, SB-14, and SB-53 at concentrations exceeding the human health COPC screening level of 15,000 µg/kg.

A number of PAHs were also detected in at least one subsurface soil sample from the Site at concentrations exceeding applicable human health COPC screening levels including: acenaphthylene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, 2-methylnaphthalene, naphthalene, and pyrene. PAH concentrations in excess of the human health COPC screening levels were detected in subsurface soil samples from each horizontal stratum at the Site.

Total PAH concentrations in subsurface soils from the industrial area east of South Street range from approximately 20 to 1,150,000 µg/kg. As depicted on Figure 37, elevated concentrations of total PAHs (greater than 26,000 µg/kg [32]) are evident in three seemingly isolated areas on this portion of the Site: in the SB-09 location; in the southern portion of the industrial area (in the vicinity of SB-14 and SB-15); and in the central portion of the industrial area (in the vicinity of SB-18, UST-1, and UST-2). In the industrial area west of South Street, including the AOC, total PAH concentrations range up to approximately 6,400,000 µg/kg. As shown on Figure 37, elevated concentrations of total PAHs are evident in samples from boring SB-45, located within the center of the soil-capped portion of the AOC; borings SB-52 and SB-53, located within and just outside the soil-capped portion of the AOC adjacent to the former mill building; and in borings SB-48 and SB-49, located just outside the asphalt-capped portion of the AOC.

In addition, total PAH concentrations in lower soil samples generally range up to approximately 12,000 µg/kg in soil from the former Lower Mill/Union Pond and the former railroad ROW. Detected total PAH concentrations in subsurface soil from areas peripheral to former manufacturing activities generally range up to approximately 2,000 µg/kg; and up to 3,600 µg/kg in soil from residential/undeveloped areas. Figure 38 illustrates the distribution of benzo(a)pyrene as an example of the distribution of the higher molecular weight PAHs. Figures 39 and 40 illustrate the distribution of 2-methylnaphthalene and naphthalene, as example of the distribution of the lower molecular weight PAHs.

5.1.2.5 Distribution of VOCs in Lower Soils

As summarized in Table 12D, 70 lower soil samples were submitted for analysis of VOCs during the RI. VOCs were not detected above the analytical reporting limit in approximately 30% (22) of the lower samples.

Although detectable concentrations of a number of VOCs were measured in approximately 70% of the lower soil samples collected during the RI, the only VOCs detected at concentrations exceeding human health COPC screening levels were TCE at a concentration of 4,500 µg/kg in one soil sample collected from SB-09; and the AVOCs: benzene, toluene, m/p-xylene, o-xylene, and styrene in one soil sample collected from SB-53.

[32] The concentration of 26,000 µg/kg represents the approximate sum of the MADEP-published background concentrations for PAHs (MADEP, 2002).

Soil samples from borings completed in the vicinity of soil boring SB-09 (SB-10/10A, SB-19, and SB-20) did not exhibit detectable concentrations of TCE, suggesting that the concentration detected in SB-09 is limited to a small area. This is further supported by the lack of detection of TCE, except at low concentrations, in groundwater at the Site.

The AVOCs detected in the soil sample from SB-53, collected from below the groundwater table within the fill unit (from 19 to 23 feet bgs) generally correlate with detected concentrations of AVOCs in groundwater in the vicinity of this boring (as discussed in Section 5.2.3.3 of this Report). In addition, during the drilling of SB-53, petroleum staining was noted and elevated PID readings were recorded beginning at approximately 19 feet.

5.1.2.6 Distribution of EPH/VPH in Lower Soils

A total of 23 subsurface soil samples from the Site were submitted for analysis of EPH/VPH by an approved MADEP method (MADEP, 1998) during the RI. As indicated in Section 8.2 of the QAPP, targeted soil samples were submitted for analysis of EPH/VPH due to their proximity to former hydrocarbon UST/AST areas. VPH/EPH results are included in Table 12D.

Detectable concentrations of one or more hydrocarbon fractions were present in subsurface soil samples collected from borings SB-17, SB-25, SB-48, SB-48A, SB-49, SB-50, SB-51, and UST-1 through UST-6. Total EPH concentrations range from 7.4 to 5,100 mg/kg in the subsurface samples. VPH compounds were only detected in subsurface soil from four soil borings, SB-25, UST-1, UST-2, and UST-6, and were generally detected at lower concentrations, ranging from 5.9 to 73 mg/kg.

The highest total EPH concentrations, approximately 1,080 to 5,100 mg/kg, were detected in samples from soil borings SB-48A, SB-51, and UST-6, located within the asphalt-capped portion of the AOC in the vicinity of the former No. 6 oil USTs, and consisted primarily of C_{11}-C_{22} aromatic hydrocarbons, C_{19}-C_{36} aliphatic hydrocarbons, and C_9-C_{18} aliphatic hydrocarbons (i.e., heavier molecular weight hydrocarbons).

5.1.2.7 Distribution of PCBs and Pesticides in Lower Soils

As summarized in Table 12E, a total of 11 lower soil samples (from borings SB-13A, SB-19, SB-22, SB-26, SB-41, SB-42, SB-46, SB-47, SB-49, SB-53, and SB-56) were submitted for analyses for PCBs and pesticides. PCBs were not detected above the analytical reporting limit in any of these soil samples.

Pesticides were not detected in samples collected from three soil borings, SB-19, SB-26, and SB-56. The remaining lower soil samples exhibited detected pesticides, but at concentrations below human health COPC screening levels.

5.2 Distribution of Analytes in Groundwater

The USEPA Region IX PRGs for Tapwater Ingestion (Region IX Tap Water PRGs) and the USEPA Vapor Intrusion Screening Values were selected as benchmarks of comparison for groundwater analyte concentrations, as they were used to select COPCs for inclusion in the BHHRA. For presentation purposes, analyte concentrations are compared only to the Region IX Tap Water PRGs in the text of this Report; however, Tables 13A to 13F and Figures 80 to 88 also include comparisons of relevant groundwater sample analytical results to the USEPA Vapor Intrusion Screening Values.

As noted in the introduction to Section 5.0, with a few limited exceptions that appear primarily associated with background conditions, the occurrence of groundwater analytes at relatively elevated concentrations is confined to the AOC and areas immediately downgradient of the AOC. No potable or non-potable wells exist within 500 feet of the Site, and as will be discussed in Section 6.0, contaminated groundwater at the Site discharges to surface water in the vicinity of the former mill tailrace, and does not represent a migration threat to downgradient areas.

5.2.1 Groundwater Geochemistry

5.2.1.1 Results of Field and Laboratory Screening of Groundwater

In accordance with SOP S-1669F, field screening of groundwater samples for specific conductance, ORP, DO, turbidity and temperature was performed during groundwater sampling. The results of field screening are summarized in Table 13A and are discussed below. The implications of the distribution of these parameters with respect to the biodegradation of analytes are described further in Section 6.0. Results are also provided in the Groundwater Field Sampling Summary Forms, included in Appendix B.

In addition to field screening, a total of six groundwater samples were submitted for screening-level laboratory analysis of density using ASTM Method D-4052 and kinematic viscosity by ASTM Method D-445. As discussed in Section 2.3.4.1 above, samples were collected by SHA on November 28, December 11, and December 13, 2001 and submitted to EAI; analyses were completed by CCCI[33]. Samples were selected to represent a range of groundwater with pH values greater than 9 s.u. in order to characterize the density and viscosity of groundwater with these elevated pH conditions. The results of these six analyses for density and kinematic viscosity are presented in Table 13B and are discussed in Sections 5.2.1.1.c and 5.2.1.1.d below; pH data collected during the groundwater sampling rounds is presented in Table 13C.

The field screening results presented below indicate a predictable pattern with regard to their relative concentrations and the distribution of groundwater analytes. As will be discussed in greater detail in Section 6.0, the distribution of pH in groundwater is a good indicator of the

[33] These samples were not anticipated in the QAPP and were submitted to EAI/CCCI for analyses because WHGEL did not have the capability to perform these analyses.

occurrence of groundwater contamination at this Site. In general, groundwater with elevated pH conditions (greater than 9.0 s.u.) exhibits relatively elevated specific conductance measurements, low dissolved oxygen concentrations, and low oxidation-reduction potentials. As groundwater pH increases, density and viscosity measurements also increase.

5.2.1.1.a Dissolved Oxygen

The concentration of DO measured in Site groundwater ranged from 0 to 9.6 mg/L. The expected maximum DO concentration for groundwater is approximately 11 to 16 mg/L (Drever, 1988), based on water in equilibrium with atmospheric oxygen at a temperature of 8 to 10 degrees Centigrade (°C).

As depicted in Figures K-3a through K-3f, included in Appendix K, DO values appear to decrease with increasing pH. In addition, groundwater collected from monitoring wells screened in deep stratigraphic units (e.g. glacial till or bedrock) generally has lower DO values than groundwater collected from shallower stratigraphic units (e.g., fill or ice contact sand / sand & gravel) for a given pH range. During the three RI groundwater sampling rounds, the average[34] DO value for groundwater from wells with pH less than 9 s.u. was 3.0 mg/L. In general, groundwater with pH greater than 9 s.u. is anoxic with an average DO value of approximately 0.5 mg/L or less.

5.2.1.1.b Oxidation-Reduction Potential

ORP is an indicator of the oxidation state of groundwater. The ORP values measured in groundwater samples collected during the RI exhibited a large range from -565 millivolts (mV) to 349 mV. Typically, a large range in values was also observed for groundwater from a given depth level, and for groundwater samples within and outside the plume of elevated pH. However, based on average[34] measured ORP values, several general observations (similar to those observed with DO) are apparent:

- As depicted on Appendix Figures K-4a through K-4c, ORP decreases with depth, with average ORP values of approximately 28, -13, and -27 mV for groundwater from shallow, deep, and bedrock monitoring wells, respectively; and

- As depicted on Figure K-4d through K4f included in Appendix K, and as summarized in Tables 13A and 13C, ORP values observed in groundwater samples collected during the RI generally exhibit an inverse relationship with pH. The average ORP of groundwater samples with pH less than 9 s.u. is approximately 80 mV; the average ORP of

[34] Averages presented for DO and ORP were based on all groundwater samples collected during the RI investigation, which results in heavier weight being placed on sample locations from which samples were collected during all three sampling groundwater sampling rounds than those locations where groundwater samples were collected in only one or two groundwater sampling rounds.

groundwater samples with pH values between 9 and 12.5 s.u. is approximately -55 mV; and the average ORP of groundwater samples with pH values greater than 12.5 s.u. is -361 mV.

The above observations demonstrate that, in general, the inverse relationships of ORP and pH and ORP and depth are reflective of groundwater that is more removed from the surface oxygenated environment in equilibrium with the atmosphere, and more affected by interaction with the subsurface including reduced species which consume oxygen and generally drive the ORP to lower values, and interaction with sodium hydroxide which causes higher pHs.

Appendix figures K-9a through K-9f depict the relationship between DO and ORP. In general, DO is the primary control of redox conditions at relatively high ORP values; whereas, at lower ORP values DO is closer to zero and redox conditions are typically controlled by other dissolved constituents such as nitrate, sulfate, iron, and carbon dioxide.[35] While these figures show varying degrees of scatter, in general, plots of ORP versus DO for the 2001, 2002, and 2003 sampling events and by the shallow, deep, and bedrock wells appear to show a general correlation between ORP and DO. In particular the plot of ORP versus DO for the 2002 sampling event (Figure K-9e) depicts a relatively good correlation between DO and ORP. This figure also demonstrates that as DO drops from approximately 10 mg/L to approximately 1 mg/L the ORP only drops slightly, and at DO values below approximately 1 mg/L the ORP decreases significantly. This non-linear relationship between DO and ORP is consistent with DO being a primary control of redox conditions at relatively high ORP values, while at lower ORP values DO is close to zero and redox conditions are controlled by other dissolved constituents.

5.2.1.1.c ***Density***

As indicated above, six groundwater samples were analyzed by CCCI for screening-level laboratory analysis of density. Density results are presented in g/cm^3 relative to the density of water at 20° C (which is 0.99823 g/cm^3 [Weast, 1982]). As presented in Table 13B and depicted on Figure K-6, included in Appendix K, the density of the six groundwater samples from the Site with elevated pH ranged from 1.0007 g/cm^3 (essentially equivalent to that of water) for pH values of 9.2 and 9.6, to 1.0674 g/cm^3 for a pH of 14.0. A positive relationship between pH and density is apparent, most significantly, density increases as pH increases and increases at a much greater rate between a pH of 13.4 and 14.

5.2.1.1.d ***Kinematic Viscosity***

Six groundwater samples were also analyzed by CCCI for screening-level laboratory analysis of kinematic viscosity. The kinematic viscosity of water at 20° C is 1.0019 Centipoise (Weast, 1982). As presented in Table 13B, the six groundwater samples from the Site with elevated pH exhibited kinematic viscosity values ranging from 1.0041 Centipoise (essentially equivalent to

[35] Weidemeir et al, "Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater," September 1998.

that of water) for pH values of 9.2 and 9.6, to 1.3652 Centipoise for a pH of 14.0. As depicted in Figure K-7, included in Appendix K, similar to density, there is a strong positive relationship between pH and kinematic viscosity, and most notably, viscosity markedly increases above a pH of approximately 12.5 s.u.

5.2.1.1.e Other Field Screening Parameters

Plots of turbidity and temperature versus pH are included as Appendix Figures K-5 and K-1. Neither of these parameters appears to correlate with pH. A plot of specific conductance versus pH is included as Appendix Figure K-2. Specific conductance appears to correlate well with pH.

5.2.1.2 Results of Field Measurements of pH in Groundwater

The presence of Site-related pH contamination in groundwater was measured in the field during the RI groundwater sampling rounds. As discussed in the Phase 1A DUR and Phase 1B DUR, because pH is considered a definitive data parameter, field QA/QC was performed and assessed for usability.

As depicted on Figures 41 through 43 and summarized in Table 13C, a distinct plume of elevated pH (greater than 9 s.u.) is present within and downgradient of the AOC in shallow and deep overburden, and bedrock groundwater. The pH measurements within this plume ranged from approximately 9 to 14 s.u. The DAPL portion of the elevated pH plume is limited in lateral and vertical extent to groundwater from deep overburden (and shallow bedrock in one location) within the central portion of the soil and asphalt-capped AOC. DAPL conditions were observed in groundwater samples collected from monitoring wells SH-01D, SH-01R, and SH-02D within the soil-capped portion of the AOC, and SH-06D and SH-07D, within the asphalt-capped portion of the AOC. As discussed in Sections 5.2.1.1.c and 5.2.1.1.d above, groundwater with pH greater than 12.5 s.u. exhibited a markedly increased density and kinematic viscosity; based on this fact, and the observed distribution of elevated pH, groundwater with pH greater than 12.5 s.u. appears to act as a DAPL.

A clear pH demarcation between DAPL and non-DAPL fluids is not apparent given the data available in the RI. As discussed in Section 5.2.1.1c and depicted on Figure K-6, while density increases as pH increases, density increases at a much greater rate between a pH of 13.4 and 14s.u. Notably, density contrasts are apparent in Figure F-6 at pHs of approximately 11.9 s.u. Therefore, it could be argued that the demarcation between DAPL and non-DAPL fluids is between a pH of 13.4 and 11.9. However, pH conditions in shallow monitoring wells downgradient of the area of high pH fluids are as high as 12.0 s.u. (pH in groundwater from monitoring well SH-05S), indicating that the downward density gradient in fluids with pH of 12.0 s.u. is insufficient to overcome the upward hydraulic gradients in areas downgradient of the highest pH groundwater. Conversely, pH conditions in deep overburden at the SH-02D location were observed to be as high as 12.6 s.u. Hence, we chose a pH of 12.5 as a convenient indicator of DAPL conditions. Further discussion regarding the transport and fate of the DAPL plume is presented in Section 6.0.

The pH measurements for shallow groundwater outside of the plume of elevated pH typically range from approximately 5.2 to 8.8 s.u., with an average (arithmetic mean) of approximately 6.4 s.u. The approximate average pH value observed during the three groundwater sampling rounds performed during the RI from presumed background location, SH-23S, is approximately 6.1 s.u. The pH measurements for deep overburden groundwater outside of the plume of elevated pH range from approximately 5.6 to 7.2, and average approximately 6.6 s.u. The pH measurements for bedrock groundwater outside of the plume of elevated pH range from approximately 6.7 to 8.5 s.u, and average approximately 7.4 s.u.

The area of DAPL is considered to represent the current extent of residual high pH source material. Based on the mapped locations of the DAPL shown on Figures 41 through 43, the original sources appear to have included the caustic soda storage tanks and former cotton processing areas in the southern portion of the former mill building fronting along South Street and the former bleachery extending to the west. During operation of the cotton bleaching and mercerizing process, sodium hydroxide was received by the facility at a 50% solution (approximate pH of 15.2 s.u., density of approximately 1.43 g/cm^3, and viscosity of approximately 36.24 centipoise), this solution was subsequently diluted in a variety of mixing tanks to a 14% solution used in the mercerizing process (approximate pH of 14.6 s.u., density of approximately 1.16 g/cm^3, and viscosity of approximately 2.56 centipoise), and a 3% solution used in the bleaching process (approximate pH of 13.9 s.u., density of approximately 1.03 g/cm^3, and viscosity of approximately 1.17 centipoise)[36].

5.2.1.3 Results of Water Quality Parameter Analyses

Water quality parameters, including alkalinity, chloride, nitrate, sulfate, TKN, and the major cations were measured in groundwater samples from the shallow, deep, and bedrock monitoring wells. These data are summarized in Table 13D. As depicted on Figures K-35 through K-39 (included in Appendix K), in general, alkalinity appeared to exhibit a positive correlation with pH, whereas chloride, nitrate, sulfate, and TKN did not. Of the major cations, potassium, and sodium appear to be positively correlated with pH; calcium and magnesium do not (as shown in Figures K-27, K-30, K-17 and K-23 in Appendix K).

Trilinear diagrams showing the relative proportions of cations (Ca, Mg, and the sum of sodium and potassium [Na+K]) and anions (Cl, SO_4, and alkalinity [which is presented on the diagram as the sum of carbonate and bicarbonate {CO_3+HCO_3}, but also includes hydroxide]) in samples from shallow, deep and bedrock monitoring wells have been included as Figures 44 through 46, respectively. The variation in major ion concentrations is likely attributable to several factors, including reactions with Site analytes (including pH) and with formation materials. The

[36] The approximate pH values of the 50%, 14%, and 3% sodium hydroxide solutions presented herein were calculated based on the molar concentrations of NaOH in these solutions. The density and viscosity values presented for these solutions were obtained from Lide, 1999. However, Lide, 1999 did not present density and viscosity data for NaOH solutions greater than 50%; therefore, we have utilized the density and viscosity data presented in Lide, 199 for a 40% NaOH solution. The density and viscosity for a 50% NaOH solution are likely higher than the values presented herein.

discussion presented in this subsection provides a general overview of the geochemical composition of Site groundwater, including a brief spatial analysis of water quality at the Site and a comparison of the concentrations of the various ions to the pH of the groundwater.

The concentrations of ions in shallow groundwater from the monitoring location upgradient of the Site, SH-23S, as well as the locations up/sidegradient of the AOC (including SH-10S and SH-18S through SH-22S) and locations in the down/sidegradient residential properties (including SH-24S, SH-27S, and SH-28S), are relatively dilute (average total ion concentration of approximately 10 milliequivalents per liter [meq/L]), and are composed (on a meq/L-basis) of approximately 50 to 80 percent (%) Cl, 5 to 30% alkalinity (plotted as CO_3+HCO_3), and 0 to 30% SO_4; and 40 to 70% Na+K, 20 to 40% Ca, and 10 to 20% Mg. This composition is thought to reflect that of background in shallow overburden groundwater with varying degrees of impact from application of road salt (sodium chloride [NaCl]).

The composition of ions in shallow groundwater from locations west of South Street within the AOC and downgradient of the AOC suggests a relationship between ion concentration/composition and pH. Groundwater from these wells can generally be classified into two groups based on cation and anion concentrations. The concentration of total ions in groundwater from monitoring wells SH-01S, SH-04S through SH-07S, SH-9S, SH-15S, SH-16S, SH-25S, and SH-26S, is the highest observed in shallow groundwater (with a total ion concentrations ranging from approximately 7.5 to 70.9 milliequivalents per liter (meq/L) and an average of 30.7 meq/L) and is typically dominated by Na and alkalinity, presumably resulting from the historical use (and release) of sodium hydroxide. The groundwater from a majority of these well locations exhibits pH values greater than 9.0 s.u. The concentration of total ions in groundwater from monitoring wells SH-02S, SH-03S, SH-08S, SH-11S, SH-12S, SH-13S, SH-14S, and SH-17S ranges from 2.8 meq/L to 23.5 meq/L, with an average of 13.1 meq/L and is typically dominated by Ca+Mg and alkalinity. The groundwater from a majority of these well locations exhibits pH values less than 9.0 s.u.

The groundwater from deep and bedrock wells can generally be classified into three groups based on cation and anion concentrations; two are relatively dominated by Ca+Mg and Cl+SO_4, and the other by Na+K and CO_3+HCO_3. Groundwater from deep monitoring wells dominated by Ca+Mg and Cl+SO_4 (SH-02R, SH-03D, SH-04D, SH-05D/R-A/R-B, SH-06R-A/B, S-12D, SH-14D, SH-15D, SH-17R, SH-19R, SH-24R, SH-25D, SH-27D, and SH-28D) typically has a pH less than approximately 9.0 s.u. and is characterized by relatively dilute total ion concentrations, averaging approximately 9.2 meq/L. A second group of wells (SH-18D, SH-19D) is also dominated by Ca+Mg and Cl+SO_4; however, this group is characterized by slightly higher Na and Cl than the first group, presumably from the use of road salt application in these areas. A third group of wells is dominated by Na+K and CO_3+HCO_3 is from deep overburden and bedrock wells within the AOC and the former mill tailrace (SH-01D/R, SH-02D, SH-06D, SH-07D, SH-08D, SH-09D, SH-17D, SH-27R, and SH-28R). These wells exhibit the most elevated total ion concentrations, with a maximum of approximately 3,250 meq/L and an average of 799 meq/L. pH values average 11.75 s.u.

With the exception of the group of deep overburden (till) wells impacted by road salt usage, there does not appear to be an observable difference between the concentration/composition of ions in groundwater from the deep overburden (till) wells and the bedrock wells.

5.2.2 Background Groundwater Concentrations

As planned in the QAPP (based on its location upgradient of known Site-related sources of contamination) and as confirmed by the results of chemical analyses, for the purposes of this discussion, SH-23S represents a background location for groundwater sampling performed during the RI.

5.2.2.1 Inorganic Parameters in Background Groundwater

The groundwater samples from monitoring well SH-23S were analyzed for the same list of metals as other groundwater samples collected during the RI groundwater sampling rounds. Aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, sodium, thallium, vanadium, and zinc were detected above the RL in groundwater collected from SH-23S in one or more of the groundwater sampling rounds performed during the RI. The concentrations of all but three metals detected in groundwater samples from well SH-23S are below the applicable USEPA Region IX Tap Water PRG; the concentrations of arsenic (with a concentration ranging from 0.71 to 0.82 micrograms per liter [µg/L]), manganese (with a concentration of 102 µg/L, from the September 2001 groundwater sampling round), and thallium (with a concentration of 0.56 µg/L, from the September 2001 groundwater sampling round) exceeded USEPA Region IX Tap Water PRGs of 0.045 µg/L, 88 µg/L, and 0.52 µg/L respectively.

5.2.2.2 VOCs and SVOCs in Background Groundwater

No VOCs were detected in the groundwater samples collected during the RI groundwater sampling rounds from the background monitoring well SH-23S.

One PAH, dibenz[a,h]anthracene, was detected in groundwater from SH-23S, from the groundwater sample collected during the May 2002 groundwater sampling round, at a concentration of 0.053 µg/L, slightly above the USEPA Region IX PRG for dibenz[a,h]anthracene of 0.0092 µg/L.

5.2.3 Results of Chemical Analysis of Groundwater

5.2.3.1 Distribution of Inorganic Parameters in Groundwater

5.2.3.1.a Metals

As summarized in Table 13D, metals are the predominant parameters detected in groundwater. Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron,

lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc were detected in one or more groundwater samples collected during the three groundwater sampling rounds performed during the RI.

Concentrations of aluminum, antimony, arsenic, chromium, copper, iron, lead, manganese, nickel, and vanadium were detected at concentrations above their respective Region IX Tap Water PRGs and were detected in more than three locations in groundwater samples collected during the three groundwater sampling rounds. Figures 47 through 76 depict the spatial distribution of these metals as compared to the Region IX Tap Water PRGs. Relationships between various metals and pH are presented in Appendix Figures K-11 to K-34. The following observations are noted with regard to the correlation[8] of specific metals versus pH:

- The following metals appear to exhibit a relatively strong correlation with pH which in turn suggests that these metals may not necessarily be present in source soils as "contaminants". Rather, at least a portion of these metals may be present in groundwater as a result of dissolution of naturally occurring concentrations of metals in source soils: aluminum, antimony, arsenic, copper, nickel, and vanadium;

- The following metals exhibit a relatively weak correlation with pH and their elevated presence is therefore more suggestive of elevated source soil concentrations: chromium and lead; and

- The following metals exhibit a weak correlation with pH and are likely controlled by oxidation state, rather than pH or source area concentrations: iron and manganese.

Other metals detected in groundwater samples including: barium, beryllium, cadmium, cobalt, mercury, selenium, silver, thallium, and zinc were either not detected at concentrations above the Region IX Tap Water PRGs, or only a few of the groundwater samples had concentrations of these metals in excess of the Region IX Tap Water PRGs, and are therefore unlikely to be related to historic Site activities or due to elevated pH conditions mobilizing metals present in Site soils.

The distribution of the major cations (calcium, magnesium, potassium, and sodium) is discussed with the water quality parameters in Section 5.2.1.3.f.

5.2.3.1.b ***WAD Cyanide***

As presented in Table 13D, WAD cyanide was detected in groundwater from two monitoring wells at the Site (SH-10S and SH-14D) both at concentrations of 6.8 µg/L, above the Region IX Tap Water PRG for WAD cyanide of 0.62 µg/L.

[8] The correlation coefficient is a statistic that quantifies the strength of the relationship between two variables and is calculated by dividing the covariance by the two population standard deviations (Berthouex and Brown, 1994).

As discussed in the Phase 1A DUR, approximately 25% of the analytical results from the September 2001 groundwater sampling round for this parameter were rejected due to the complex nature of the groundwater from these locations (which exhibited high pH, high specific conductance, and visual observation of color and foaming)[37]. In addition, the achieved reporting limit for WAD cyanide in groundwater was 5 µg/L, consistent with the low-level standard in the calibration curve for this method. This reporting limit exceeded the Region IX PRG for WAD cyanide.

WAD cyanide was not detected above the analytical reporting limit in samples collected from the May 2002 or November 2003 groundwater sampling rounds. Based on results of WAD cyanide in soil (described in Sections 5.1.1.3 and 5.1.2.3, above), surface water (described in Section 5.3.3.1.c below), and sediment (described in Section 5.4.3.1, below), and the limited detection of WAD cyanide in groundwater from the Site, this parameter is not likely related to historic Site activities.

5.2.3.2 Distribution of SVOCs in Groundwater

As summarized in Table 13E, only three non-PAH SVOCs were detected in groundwater at concentrations above the Region IX Tap Water PRGs during one or more of the RI groundwater sampling rounds: concentrations of 4-methylphenol exceeded the Region IX Tap Water PRG (18 µg/L) in four locations (SH-01D, SH-01R, SH-02D, and SH-03S at concentrations ranging from 21 to 94 µg/L), concentrations of carbazole exceeded the Region IX Tap Water PRG (3.4 µg/L) in three locations (SH-01R, SH-02D, and SH-08D at concentrations ranging from 3.9 to 22 µg/L), and concentrations of bis(2-ethylhexyl)phthalate exceeded the Region IX Tap Water PRG (4.8 µg/L) in two location (SH-06S and SH-14S at concentrations of 12 and 110 µg/L, respectively). Of the non-PAH SVOCs analyzed for in groundwater samples collected during the RI groundwater sampling rounds, none were detected at concentrations in excess of the applicable USEPA Vapor Intrusion Screening Values.

A number of PAHs were detected in groundwater from the Site at concentrations exceeding the Region IX Tap Water PRG, including acenaphthene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, and pyrene. Although detected above the analytical reporting limit in one or more groundwater samples, no Region IX Tap Water PRG exists for the following PAHs: acenaphthylene, benzo[g,h,i]perylene, 2-methylnaphthalene, and phenanthrene. Total PAH concentrations range from below the analytical reporting limit to 4,277 µg/L. On average, naphthalene and 2-methylnaphthalene constitute approximately 51% of the total PAH concentration; in samples with greater than 50 µg/L total PAHs, naphthalene and 2-methylnaphthalene constitute approximately 85% of the total PAH concentration. As depicted in Figures 77 through 79, in general, elevated PAH concentrations (greater than approximately 50 µg/L) were detected in groundwater from wells within the soil- and asphalt-capped portions of the AOC and wells

[37] As indicated in Section 3.1.1.2 of the Phase 1A DUR, the complex groundwater matrix likely contributed to observed matrix interferences that resulted in rejection and estimation of data.

located within the downgradient wetland/former mill tailrace area. In general, groundwater samples with the concentrations above 50 µg/L total PAHs were collected from locations within the elevated pH plume. It is likely that the elevated PAH contamination is simply co-located with the pH rather than correlated with elevated pH as are some metals.

The distribution of 2-methylnaphthalene and naphthalene are presented on Figures 83 to 88. Additionally, the distribution of benzo(a)pyrene is presented on Figures 80 to 82 as an example of the general distribution of the higher molecular weigh PAHs.

5.2.3.3 Distribution of VOCs in Groundwater

Limited VOC contamination was detected in groundwater from the Site. VOC concentrations in groundwater from the three RI groundwater sampling rounds are summarized in Table 13F. Concentrations of total VOCs in groundwater ranged from below the analytical reporting limit to 3,500 µg/L (SH-01R during the May 2002 groundwater sampling round). The dominant VOCs detected in groundwater were AVOCs, primarily benzene, toluene, ethylbenzene, and total xylenes (collectively, the "BTEX" compounds). As summarized in Table 13F, concentrations of VOCs exceeding applicable Region IX Tap Water PRGs or USEPA Vapor Intrusion Screening Values were primarily located within the soil and asphalt capped portions of the AOC and the downgradient wetland / former mill tailrace area.

The distribution of total AVOCs are depicted in Figures 89, 90 and 91 for shallow, deep, and bedrock groundwater, respectively. As depicted on these Figures, the AVOC plume in groundwater is primarily located within and downgradient of the AOC.

A summary of the AVOCs detected in groundwater, their maximum observed concentrations, their average (geometric mean) concentrations, and a tally of their occurrence in the shallow, deep, and bedrock monitoring wells at concentrations in excess of their respective Region IX Tap Water PRGs is presented in the table below:

AVOC	USEPA Region IX Tap Water PRG	Maximum Reported Concentration (µg/L)	Geometric Mean of Detected Results (µg/L)	Number of locations where one or more groundwater samples exceed Region IX Tap Water PRG		
				Shallow wells	Deep wells	Bedrock wells
Benzene	0.34	810	8.5	11	6	3
Toluene	72	1,200	26	0	3	1
Ethylbenzene	2.9	400	24	4	5	1
Xylene (total)	21	820	37	2	5	1
Styrene	160	320	60	0	1	1

Only two chlorinated volatile organic compounds (CVOCs) were detected at concentrations in excess of their respective Region IX Tap Water PRGs in groundwater samples collected during the three groundwater sampling rounds: methylene chloride and TCE. Methylene chloride was

detected at concentrations up to 14 µg/L and in excess of the Region IX Tap Water PRG (4.3 µg/L) in groundwater samples from only one monitoring well (SH-01R). TCE was detected at concentrations (up to 5.1 µg/L) in excess of the Region IX Tap Water PRG (0.028 µg/L) in groundwater samples from three shallow monitoring wells (SH-20S, SH-22S, and SH-25S), four deep monitoring wells (SH-03D, SH-05D, SH-25D, and SH-27D), and five bedrock monitoring wells (SH-02R, SH-06R-A, SH-06R-B, SH-27R, and SH-28R).

Only two other VOCs (those VOCs not included as AVOCs or CVOCs) were detected at concentrations in excess of their respective Region IX Tap Water PRGs in groundwater samples collected during the three groundwater sampling rounds: acetone and methyl tertiary butyl ether (MTBE). Acetone was detected at concentrations up to 200 µg/L and above the Region IX Tap Water PRG (61 µg/L) in groundwater samples from three deep monitoring wells (SH-01D, SH-06D, and SH-07D) and one bedrock monitoring well (SH-02R) in one or more of the groundwater sampling rounds. MTBE was detected at concentrations up to 40 µg/L and above the Region IX Tap Water PRG (13 µg/L) in one deep monitoring well (SH-07D) and one shallow monitoring well (SH-09S).

5.3 Distribution of Analytes in Surface Water

5.3.1 Selection of Surface Water Sampling Locations

As anticipated in Section 8.4 of the QAPP, SHA established six Site surface water sampling locations (designated SW-102, SW-103, SW-105, SW-106, SW-107, and SW-108[38]) over the general length of Neponset River as it runs through the Site and the former mill tail race. In addition, five surface water reference locations (designated SWR-1 through SWR-5) were established upstream of the Site in the Neponset River between the Blackburn and Union Dams to provide background concentrations for comparison. Surface water sampling locations are depicted on Figure 6.

5.3.2 Surface Water Geochemistry

5.3.2.1 Results of Field Screening of Surface Water

In accordance with SOP S-1669G, field screening of surface water samples for specific conductance, temperature, DO, ORP, and depth of flow was performed during the March surface water reconnaissance and the two rounds of surface water sampling. The results of field screening are summarized in Table 14A, presented on the Field Sampling Summary forms included in Appendix B-5, and are discussed below.

[38] Note in accordance with Section 8.4 of the QAPP, surface water sampling stations are not numbered consecutively; staff gauges are numbered consecutively.

5.3.2.1.a Specific Conductance

Specific conductance measured in surface water samples from the Neponset River (SW-102, SW-103, SW-105, SW-108, and the SWR-series reference area samples) ranges from approximately 260 µS/cm to 390 µS/cm. No notable difference between surface water samples collected from the Neponset River downstream of the Site and those from reference locations upstream of industrial portions of the Site was observed. In general, specific conductance measurements made in March and April 2001 were lower than those made in August 2001.

The specific conductance values measured in surface water from the former mill tailrace area (locations SW-106 and SW-107) were elevated relative to those measured in surface water from the Neponset River, ranging from 300 to 1,700 µS/cm. Overall, measurements made on surface water from SW-106, the most upstream location in the former mill tail race, were the most elevated, ranging from 420 µS/cm in March, to 800 µS/cm in April, to 1,700 µS/cm in August (all in 2001).

5.3.2.1.b Dissolved Oxygen

The concentration of DO measured in surface water from locations upstream and downstream in the Neponset River ranges from 6.7 to 13.6 mg/L. In general, in all locations, lower DO measurements were made on surface water collected during the August 2001 sampling round; for example, DO measurements of 13.5, 11.6, and 7.9 mg/L were made on surface water from SW-103 in March, April, and August 2001, respectively, with lower values typically associated with periods of relatively quiescent surface water (resulting from the lower flow rates).

Surface water from locations SW-106 and SW-107 in the former mill tailrace exhibited DO levels of 5.2 and 2.6 mg/L, respectively in August 2001; in March 2001, DO levels in SW-106 and SW-107 were 8.5 and 10.7 mg/L, respectively, more in the range of those measured in surface water from the Neponset River (from SW- and SWR-series locations). In April 2001, DO levels were similar to those measured in August in SW-106 (5.3 mg/L); however, DO levels measured in surface water from SW-107 during the April sampling round were similar to those in the River (9.5 mg/L).

5.3.2.1.c Oxidation-Reduction Potential

The average ORP values measured in surface water from the Neponset River reference locations upstream of the industrial portions of the Site was approximately 227 mV. In general, ORP values measured in surface water from locations SW-102, SW-103, and SW-108, exhibited an average of approximately 231 mV, similar to those measured in Neponset River reference locations. In general, lower ORP values were recorded during the August sampling round than during March or April.

Lower ORP values were measured in surface water from one location within the Neponset River, SW-105, and the two surface water sampling locations within the former mill tailrace, SW-106

and SW-107. ORP measurements in these three locations ranged from 60 to 220 mV, depending on the measurement date.

The general decrease in ORP values in surface water within the groundwater discharge zone downgradient of the Site is generally attributed to the effects of oxidation-reduction reactions whereby surface water reacts/equilibrates with formation constituents (e.g., reduced iron, manganese, and sulfur, and organic compounds) resulting in a increasingly reduced state with increased residence time.

5.3.2.1.d Temperature

Temperature measurements ranged from approximately 3.7°C to 23.3°C for surface water from reference locations upstream in the Neponset River, with an average of approximately 11°C. Temperature measurements of surface water samples from downstream in the Neponset River ranged from 3.3 to 24°C, also with an average of approximately 11°C.

5.3.2.2 Results of Field Measurements of pH in Surface Water

pH measurements of surface water were collected during the surface water reconnaissance on March 20, 2001, and during the two surface water sampling rounds completed in April and August 2001. In general, pH measurements made during the August sampling round were higher than those made in March and April. August pH measurements are included on Figure 41.

The pH of surface water reference samples collected upstream of the industrial portions of the Site (SWR-series locations) ranged from approximately 5.5 to 7.0 s.u. over the three measurement dates.

The pH measurements of surface water from three sampling stations adjacent to and downstream of the Site, SW-102, SW-103, and SW-108, ranged from 6.2 to 7.2 s.u., well within the range of the SWR-series reference samples. A slightly elevated pH measurement, 8.4 s.u. was measured in surface water from SW-105 (SW-105 has the highest pH of all the River locations on each of the sampling dates), located downgradient of the end of the Neponset River culvert during the August sampling round (pH measurements were 7.5 and 6.9 s.u. in March and April 2001).

Surface water from sampling stations SW-106 and SW-107, located within the former mill tailrace, exhibited elevated pH measurements. Consistently, the highest pH measurements, ranging from 9.3 to 10.0 s.u., were measured in surface water from the furthest upstream sampling station in the former mill tailrace, SW-106.

Based on the similarity in pH between the reference area surface water samples and the most downstream surface water sample SW-108, the effect of elevated pH on surface water appears to be primarily limited to the former mill tailrace.

5.3.3 Results of Chemical Analysis of Site and Reference Area Surface Water Samples

As described in Section 2.5 of this report and consistent with Section 8.4 of the QAPP, two rounds of surface water samples were collected from 11 surface water quality sampling stations established at the Site. The first sampling round was completed on April 4 and 5, 2001, under spring (typically high) flow conditions in the Neponset River; and the second sampling round was completed on August 1 and 2, 2001, under summer (typically low) flow conditions.

5.3.3.1 Distribution of Inorganic Parameters in Surface Water

The analytical results from the two surface water sampling rounds are compared to Human Health and Ecological COPC screening levels. As presented in Tables 14C through 14E, the Region IX Tap Water PRG represents the human health COPC screening level. The ecological COPEC screening level is the lower of the Great Lakes Water Quality Initiative (GLWQI) Tier II methodology values or the USEPA National Recommended Surface Water Quality Criteria (SWQC).

The Region IX Tap Water PRGs were not initially included as ARARs in the development of the surface water PALs. The PALs were the basis for the data usability assessments performed in the data usability reports. Although the majority of the surface water PALs were met for non-detected results (i.e., reporting limits [RLs] achieved were less than or equal to the PAL), some analytes were reported as non-detected results with RLs greater than the PAL or greater than the Region IX Tap Water PRG. The use of the Region IX Tap Water PRG as a screening value in the RI Report resulted in several non-detected compounds exceeding screening levels because the RLs exceeded the Region IX Tap Water PRGs (even if they met the PALs). Situations where analytical reporting limits exceed COPC screening levels are underlined in Tables 14C, 14D, and 14E.

A summary of the issues that resulted in sample-specific RLs for surface water not meeting applicable COPC screening levels is presented below. Though the majority of the surface water PALs were met for non-detected results (i.e., RLs achieved were less than or equal to the PAL), some compounds/analytes were reported as non-detected results with RLs greater than the PAL or greater than the applicable COPC screening levels.

- Non-detected results for the following 17 analytes in the surface water samples slightly exceeded the PALs or COPC screening levels but are considered acceptable because risk assessors use ½ of the RL in quantitative risk assessment (½ of the RL was less than the PAL or PRG, whichever was lower, in all cases). Refer to BHHRA and BERA documents for further discussion regarding use of non-detect values in risk assessment.

    - Inorganic Parameters: Silver (total and dissolved)
    - Organic Parameters:
        - VOCs: Methylene chloride

- SVOCs: Benzo(a)pyrene, Benzyl alcohol, bis(2-Chloroethyoxy)methane, Carbazole, 4-Chloro-3-methylphenol, 4-Chloroaniline, 4-Chlorophenyl-phenylether, Dibenzofuran, 2,4-Dinitrophenol, 2,6-Dinitrotoluene, Di-n-octylphthalate, 2-Methylphenol, 4-Methylphenol, 3-Nitroaniline, and 2-Nitrophenol

- Non-detected results for the following 29 analytes in all surface water samples exceeded the PALs or applicable COPC screening levels due to sensitivity limitations of the USEPA analytical methods used for analysis:

  - Inorganic Parameters: Weak Acid Dissociable Cyanide and Arsenic (total and dissolved)
  - Organic Parameters:
    - VOCs: Benzene, Bromodichloromethane, Bromomethane, Carbon tetrachloride (acceptable compared to PAL but exceeds PRG), Chloroform, Dibromochloromethane, 1,2-Dichloroethane, 1,2-Dichloropropane, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,1,2,2-Tetrachloroethane, Tetrachloroethene, 1,1,2-Trichloroethane, Trichloroethene, and Vinyl Chloride
    - SVOCs: bis(2-Chloroethyl)ether, bis(2-Chloroisopropyl)ether, 1,4-Dichlorobenzene, 3,3'-Dichlorobenzidine, 4,6-Dinitro-2-methylphenol, Hexachlorobenzene, Hexachlorobutadiene, Nitrobenzene, N-Nitroso-di-n-propylamine, Pentachlorophenol, 1,2,4-Trichlorobenzene, and 2,4,6-Trichlorophenol

- Non-detected results for the following three compounds in several surface water samples were reported at elevated RLs due to quality control issues (initial calibration outside QAPP criteria) that resulted in raising the RL during data validation. Data users are directed to the Phase 1A and Phase 1B Data Validation Reports for further details on QC issues that affected the RLs for the following analytes/compounds:

  - Inorganic Parameters: None
  - Organic Parameters:
    - VOCs: None
    - SVOCs: Benzoic acid, 4,6-Dintiro-2-methylphenol (also method limitation), and Pentachlorophenol (also method limitation)

Non-detected results for Dibenz(a,h)anthracene in several surface water samples were reported at RLs that met the QAPP PAL requirements but exceeded the applicable COPC screening levels because the QAPP did not identify the need for lower RLs when initially written. This is a limitation based on the original QAPP requirements rather than a method limitation.

5.3.3.1.a ***Metals***

Surface water samples collected during the RI from downstream and upstream (reference) locations within the Neponset River, as well as from the two former mill tailrace sampling locations were analyzed for dissolved and total metals. Both sets of metals results are presented in Table 14C.

Total and dissolved antimony, total and dissolved beryllium, dissolved cadmium, dissolved cobalt, total and dissolved silver, and total and dissolved thallium were not detected at concentrations exceeding the analytical reporting limit in any of the surface water samples collected from upstream or downstream in the Neponset River during the April or August sampling rounds. Dissolved chromium, total and dissolved mercury, dissolved nickel, total and dissolved selenium, and dissolved zinc were detected in one or more surface water samples, but at concentrations below applicable human health and ecological COPC screening levels.

As summarized in Table 14C, metals concentrations for dissolved and total metals detected in surface water from downstream in the Neponset River (from locations SW-102, SW-103, SW-105, and SW-108) were generally within the range of the concentrations detected in surface water reference samples collected upstream in the Neponset River (SWR-1 through SWR-5) during both the April and August 2001 sampling rounds. An exception to this observation was the concentration of dissolved iron in the sample collected from SW-105 during the August 2001 sampling round, which was detected at a concentration of 1.28 mg/L, exceeding the ecological COPC screening level of 1.0 mg/L and the Human COPC screening level of 1.1 mg/L. The concentration of total iron detected in the sample from SW-105 in August 2001 (0.555 mg/L) was lower than the dissolved concentration and lower than the human health and ecological COPC screening levels. Concentrations of dissolved iron in other surface water samples were below the human health and ecological COPC screening levels, ranging from approximately 0.105 to 0.214 mg/L.

Also as summarized in Table 14C, concentrations of metals detected in one or more surface water samples from the former mill tailrace (SW-106 and SW-107) exceeded the range of background concentrations represented by the surface water samples upstream in the Neponset River, as well as applicable human health and/or ecological COPC screening levels for a number of dissolved and total metals, including dissolved and total aluminum, dissolved and total arsenic, dissolved and total barium, total chromium, total cobalt, dissolved and total copper, dissolved and total iron, dissolved and total lead, dissolved and total manganese, total nickel, dissolved and total vanadium, and total zinc. Elevated detections of metals at concentrations above the human health and/or ecological COPC screening levels in the former mill tailrace is consistent with the presumption that this feature is the primary discharge area for groundwater from the Site, as described in Section 4.4.2.1 of this Report.

5.3.3.1.b Major Cations

Total and dissolved calcium, magnesium, potassium, and sodium were detected in each of the surface water samples collected during the RI. Human health and ecological COPC screening levels do not exist for these compounds. In general, the concentrations of these compounds in surface water collected from sampling locations downstream in the Neponset River (SW-102, SW-103, SW-105, and SW-108) were consistent with the range of concentrations detected in samples from the surface water reference samples collected upstream in the Neponset River. Elevated concentrations of major cations occur within the former mill tailrace (SW-106 and SW-107). Major cation concentrations are summarized in Table 14C.

5.3.3.1.c WAD Cyanide

As summarized in Table 14C, WAD cyanide was not detected above the analytical reporting limit (approximately 0.005 mg/L) in surface water from the five surface water reference locations or the six sampling locations within the Neponset River or former mill tailrace during the April and August sampling rounds.

5.3.3.1.d TOC

TOC concentrations detected in surface water samples from the Neponset River (SW-102, SW-103, SW-105, and SW-108) ranged from 3.9 to 5.7 mg/L, similar to the range of TOC observed in the surface water reference locations (4.2 to 6.1 mg/L). Elevated TOC concentrations were generally observed in surface water samples obtained from the former mill tailrace, ranging from 2.0 mg/L in SW-106 (collected in August 2001) to 50 mg/L in SW-106 (in April 2001). TOC results of surface water samples from the Site are presented in Table 7C.

5.3.3.2 Distribution of SVOCs in Surface Water

As summarized in Table 14D, the only SVOCs detected in surface water samples collected during the April or August 2001 sampling rounds at concentrations exceeding human health or ecological COPC screening levels were PAHs in surface water from the sampling locations within the former mill tailrace (SW-106 and SW-107).

PAHs were not detected above the analytical reporting limit in surface water collected from the Neponset River during the April 2001 sampling round. As depicted on Figure 77: September 2001, total PAH concentrations in surface water collected from the Neponset River during the August 2001 sampling round, adjacent to or downstream of the Site, range 0.07 to 0.13 µg/L however these concentrations were not above applicable human health or ecological COPC screening levels.

5.3.3.3 Distribution of VOCs in Surface Water

As summarized in Table 14E, VOCs were not detected above the analytical reporting limit in surface water samples from the April 2001 sampling round. Three VOCs (acetone, 2-butanone, and toluene) were detected above the reporting limit in surface water samples collected during the August 2001 sampling round; however, none of the VOCs was detected at concentrations in excess of the human health or ecological screening levels.

5.3.3.4 Distribution of Asbestos in Surface Water

Asbestos was detected in surface water samples collected from the two sampling stations located within the former mill tailrace, SW-106 and SW-107, during the Phase 1A RI. Asbestos concentrations[39] in surface water from sampling location SW-106 were 49.3 and 1,780 million fibers per liter (MFL) during the April and August 2001 sampling rounds, respectively; and 103.6 and 5,920 MFL in surface water from SW-107 during the April and August 2001 sampling rounds, respectively. Asbestos in the samples from SW-106 and SW-107 was primarily identified as chrysotile,[40] with one exception: the asbestos in surface water collected during the April sampling round from SW-107 was identified as chrysotile / amosite[41].

Asbestos fibers longer than 10 microns (µm) were not detected in other surface water samples collected from the Neponset River downstream of the Site, or in the five Neponset River reference samples at levels greater than the asbestos reporting limits (which ranged from 0.3 to 0.93 MFL).

Asbestos fibers (identified as chrysotile / tremolite[42]) longer than 5 µm were detected in surface water from SW-105, at a concentration of 0.6 MFL, and from SW-108, at a concentration of 0.3 MFL during the April 2001 sampling round (asbestos fibers of any length were not detected in surface water from these locations during the August 2001 sampling round). In addition, asbestos fibers (identified as chrysotile) longer than 5 µm were detected in surface water from two Neponset River reference locations, SWR-3 and SWR-4, during the April sampling round at concentrations of 0.3 MFL (asbestos fibers of any length were not detected in surface water from these two locations during the August sampling round).

Asbestos results are presented in Table 14F.

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[39] Asbestos values greater for fibers longer than 10 µm are discussed. Results from IATL (summarized in Table 14F) are provided for fibers longer than 10 µm, as well as for fibers longer than 5 µm.

[40] Chrysotile is defined in Bates and Jackson, ed. (1984) as "a white, gray, or greenish mineral of the serpentine group: $Mg_3Si_2O_5(OH)_4$. It is a fibrous, silky variety of serpentine, and constitutes the most important type of asbestos."

[41] Amosite is defined in Bates and Jackson, ed. (1984) as "a commercial term for an iron-rich, asbestiform variety of amphibole occurring in long fibers. It may consist of orthorhombic amphibole (anthophyllite or gedrite) or of a monoclinic amphibole (cummingtonite or grunerite)."

[42] Tremolite is defined in Bates and Jackson, ed. (1984) as "a white to dark gray monoclinic mineral of the amphibole group: $Ca_2Mg_5Si_8O_{22}(OH)_2$. It occurs in long blade-shaped or short stout prismatic crystals, and also in columnar or fibrous masses … It is a constituent of much commercial talc."

5.4 Distribution of Analytes in Sediment

Consistent with Section 8.3 of the QAPP, Sections 3.3, 3.4, and 3.6 of the Phase 1B-1 Work Plan, and Sections 3.6 and 3.7 of the Phase 1B-2 Work Plan a total of 112 sediment samples were collected from the Neponset River, former mill tailrace area, Lewis Pond, the floodplain of the Neponset River, Norwood Pond sediment reference area, Stoughton sediment reference area, Walpole sediment reference area, and floodplain sediment reference area between July 2001 and August 2003. Samples were submitted to WHGEL for chemical analyses. Since pH is considered a definitive data parameter, the pH of sediment samples was also measured in the field.

5.4.1 Results of Physical Analyses of Site and Reference Area Sediment Samples

5.4.1.1 Neponset River Sediments

Sediment samples were collected from downstream in the Neponset River (designated "NR-") on July 25 and 26, 2001, and were submitted to WHGEL for chemical analyses, as well as analysis for grain size, percent solids and TOC. In addition, a total of five sediment reference samples were collected upstream of the Site within the Neponset River during RI. Reference sediment samples (designated "SedRN-") were collected and submitted for analysis of grain size and TOC on July 26, 2001; reference sediment samples were collected from these same locations and submitted to WHGEL for chemical analyses on May 24, 2002.

The following observations were noted when grain size and TOC data from the Neponset River reference locations were compared to grain size and TOC data for sediment samples collected downstream in the River (grain size results for sediment are included in Table 6B; TOC results are presented in Table 7B):

- Sediments from downstream in the Neponset River are dominated by sand (up to 99.5%) and gravel (up to approximately 60%) and are typically described as fine to coarse sand and gravel. On average, reference sediments from upstream in the Neponset River are slightly coarser grained, consisting of generally greater than 50% (up to 76%) gravel and lesser amounts of sand. Reference sediments are described as gravel with some fine to coarse sand. No measurable amount of silt or clay was documented in any samples from the Neponset River.

- The average TOC of the samples collected from sediment sampling locations downstream in the Neponset River is approximately 26,000 mg/kg (2.6%). The average TOC of Neponset River reference samples is lower, approximately 2,600 mg/kg (0.26 %).

- The average percent solids in samples collected from downstream Neponset River sediments is 79%; upstream Neponset River reference locations exhibited an average percent solids content of approximately 82%.

Overall, the match between the upstream and downstream reaches of the Neponset River is judged to be good.

5.4.1.2 Former Mill Tailrace Sediments

As depicted on Figure 7, five sediment samples were collected from the former mill tailrace, located downgradient of the industrial portions of the Site. Two of these samples, TR-1 and TR-2 were collected from the area of "new fill" within the tailrace area, excavated and replaced during the 1992 RA; TR-3 was approximately located at the boundary of the previously excavated area; and samples TR-4 and TR-5 were collected from the tailrace beyond the area impacted by the 1992 RA.

The TR-series samples were collected on July 25, 2001, and were submitted for chemical analyses, as well as for analysis of grain size, percent solids and TOC. These sediment samples exhibited the following physical characteristics:

- Sediments from the former mill tailrace are dominated by sand (48% on average), with lesser amounts of silt (35% on average) and clay (14% on average). These sediments are typically described as silty sand or silt.

- The average TOC of the sediment samples collected from the former mill tailrace is approximately 53,000 mg/kg (5.3%).

- The average percent solids in samples collected from the former mill tailrace is 48%.

5.4.1.3 Lewis Pond Sediments

5.4.1.3.a Physical Characterization

In accordance with Section 8.3.1 of the QAPP, during a reconnaissance survey completed on July 26, 2001, the depth of water and the thickness of sediments within Lewis Pond were estimated. The thickness of sediments in Lewis Pond was estimated based on the penetration resistance encountered while manually advancing a rod through the sediment at each of the ten sampling locations established along three transects across the Pond.

In general, the thickness of sediment in Lewis Pond ranges from approximately 2 to 2.5 ft along the northernmost transect (just upstream of the dam at West Street, LP-08 through LP-10) to between approximately 3.5 and greater than 5.5 ft along the two transects located within the center and southern portion of Lewis Pond (LP-01 through LP-07).

5.4.1.3.b TOC and Grain Size

In accordance with Section 8.3.2 of the QAPP, sediment samples were collected from ten locations (designated LP-01 through LP-10) along three transects across Lewis Pond as indicated

on Figure 7. On July 30 and 31, 2001, a sample from the upper approximately 0.5 ft of sediment was collected from each sampling location and submitted for chemical analyses, as well as analysis for grain size, percent solids and TOC.

In addition, as described in Section 2.6.3 of this Report, three reference areas were chosen as candidates to provide "background" for Lewis Pond during the reconnaissance sediment sampling performed in conjunction with the initial portion of the Phase 1A RI. These three reference areas consisted of ponds selected with concurrence from USEPA and M&E based on watershed development and general morphology characteristics, and were located in Stoughton, Norwood, and Walpole, Massachusetts. In November 2001, approximately 30 samples (approximately 10 from each potential reference area) were collected for the purpose of comparing the physical and chemical characteristics of the sediment in the reference area with the same characteristics of the sediment in Lewis Pond. Lewis Pond and reference area samples were submitted for analysis of grain size, percent solids and TOC[43].

Grain size and TOC data from the three candidate reference areas were compared to grain size and TOC data collected from Lewis Pond. This information is summarized in Table 6B. Upon comparison, Lower Pond was considered a suitable match for a sediment reference area. The sediment grain size, TOC and percent solids from the Lewis Pond sediments appear most similar to sediments from Lower Pond in Norwood. The average percentage of sand is relatively similar (25% sand in the Lewis Pond sediments compared to 32% sand in the Norwood sediments); the average percentage of fines is also relatively similar (74% in the Lewis Pond sediments compared to 63% in the Norwood samples); and the TOC concentrations were also relatively similar (average approximately 10% in samples from both locations). As detailed in the May 13, 2002 Monthly Progress Report, observations of Lower Pond indicated similar depositional and vegetative characteristics as well as similar land use/watershed development characteristics as Lewis Pond.

5.4.1.4 Floodplain Sediments

In general accordance with Section 8.3.3 of the QAPP, a total of ten sediment reference samples were collected from the floodplain of the Neponset River, upstream of the Site between the Blackburn Dam and the former railroad ROW (Figure 7). These floodplain sediment reference samples were collected contemporaneously with sediments from the floodplain of the Neponset River downstream of the industrial portions of the Site. Samples were collected on October 9 and 10, 2001, and submitted for chemical analyses, as well as analysis for grain size, percent solids and TOC.

The following observations were noted when grain size and TOC data from floodplain sediments upstream and downstream of the industrial portions of the Site (as presented in Tables 6B and 7B) are compared:

[43] Samples collected from Lewis Pond between July 30 and 31, 2001 were also submitted for chemical analyses.

- Sediments from the Neponset River floodplain are dominated by sand (ranging from approximately 28% to 62%) and silt (up to approximately 72%) and are generally described as clayey silt with some fine sand and variable amounts of organic matter. Floodplain reference sediments are also generally described as clayey silt with some fine sand or sand with some silt and variable amounts of organic matter (sand content ranges from 5.7 to 76%, silt and clay content ranges from 23 to 94%).

- The average TOC content of the floodplain sediment samples is approximately 54,000 mg/kg (5.4%). The average TOC content of floodplain sediment reference samples is approximately 85,000 mg/kg (8.5 %).

- The average percent solids of floodplain sediments samples is 80%; floodplain reference samples exhibited an average percent solids content of approximately 59%.

Overall, the match is judged to be good.

5.4.2 Results of Field Measurements of pH in Sediment

5.4.2.1 Neponset River Sediments

As presented in Table 15A, the pH of sediment samples collected from the Neponset River ranged from approximately 6.0 to 7.8 s.u. Sediment samples from reference areas upstream in the Neponset River exhibited pHs ranging from 5.4 to 6.6 s.u. Only three locations within the Neponset River exhibited pH measurements slightly greater than the range observed in the reference area samples: NR-5, NR-6, and NR-8, with pHs of 7.1, 7.8, and 7.5 s.u., respectively. However, NR-5A and NR-8, when sampled on December 18, 2002, both exhibited a pH measurement of 6.2 s.u.

5.4.2.2 Former Mill Tailrace Sediments

The nine sediment samples collected from within the former mill tailrace exhibited pH measurements ranging from 7.0 to 10.3 s.u.

5.4.2.3 Lewis Pond Sediments

Sediment samples collected from Lewis Pond were well within the expected range of pH for sediments, ranging from 5.4 to 7.0 s.u.

5.4.2.4 Floodplain Sediments

As presented in Table 15A, the pH of floodplain sediment samples collected from reference areas within the Neponset River upstream of the industrial portion of the Site suggest slightly acidic conditions, ranging from 3.9 to 5.9 s.u. Similarly, floodplain sediment samples collected downstream of the Site also suggest slightly acidic conditions, ranging from 4.1 to 6.7 s.u.

5.4.3 Results of Chemical Analyses of Site and Reference Area Sediment Samples – Metals and SVOCs

To compare the on-Site sediment data (FP-, NR-, and LP- designations) to the corresponding reference area data (FPR-, SedRN-, and SedNwd- designations), each data set was reduced to include only those analytes that were present at concentrations above the USEPA Region IX Residential Soil PRG standards or ecological screening levels in one or more on-Site sample. Even with this simplifying step, considering the number of remaining analytes of potential interest at each of the three on-Site sampling areas, a standard discussion of results quickly becomes intractable. To assist with placing the results in context, and to facilitate an overall understanding of the findings, a simple statistical analysis was performed, as follows:

1. The distribution of the data was reviewed for each analyte, and a simple comparison of means and medians was performed. Our assessment indicated that the data more closely patterned a log-normal distribution, as would be expected with environmental data of this type.

2. The data sets were transformed by taking the natural logarithm of each analyte concentration.[44]

3. The mean (arithmetic average) log-transformed concentration and standard deviation for each analyte were calculated for each reference area.[45]

4. The mean log-transformed analyte concentrations of the corresponding reference area were subtracted from the log-transformed analyte concentrations of individual on-Site sediment samples.

5. The differences were then divided then by the standard deviation of the associated reference area samples.[46]

The resulting values were tabulated to indicate the relative number of standard deviations that the on-Site analyte concentrations were above or below the mean analyte concentration in the corresponding reference area. Positive numbers indicate that the on-Site analyte concentration exceeded the mean analyte concentration of the corresponding reference area. For illustrative purposes, those on-Site analyte concentrations that exceeded the mean reference area analyte concentration by three or more positive standard deviations have been shaded. This is not intended to pre-judge whether concentrations of analytes detected are Site-related or not, or to imply there is risk or not; rather it is a reasonable benchmark to describe possible "outliers"

[44] In cases where the analyte concentration was less than the laboratory reporting limit, one-half the value of the reporting limit was assumed.
[45] In cases where duplicate reference area samples were collected, the lowest concentrations were conservatively assumed.
[46] In cases where duplicate or multiple on-Site samples were collected, the highest concentrations were conservatively assumed.

when Site data are compared to reference area data. Note that this analysis was not completed for the former mill tailrace sediments since no applicable direct reference area exists. A discussion of former mill tailrace sediment sample results follows the discussion of other sediment sample results.

For additional information, including comparisons of observed concentrations to the USEPA Region IX Residential Soil PRG Standards or ecological screening levels for all sediment samples, please refer to Tables 15B through 15D.

5.4.4 Neponset River Sediments

Metals: As shown below, only the concentrations of lead in sediment samples NR-5A, NR-7 and NR-8, and copper in sediment sample NR-8 were greater than three standard deviations above the mean concentration detected at the reference area.

	NR-1	NR-2	NR-3	NR-4	NR-5	NR-5A	NR-6	NR-7	NR-8
Arsenic	0.48	-0.52	-0.4	0.18	0.29	2.3	0.06	0.93	1.4
Cadmium	1.2	-0.99	-0.6	-0.88	-0.44	2.3	0.31	0.72	-0.16
Copper	1.3	-0.05	1.6	-0.49	-0.67	2.7	0.68	2.4	4.7
Iron	0.27	-0.43	2.6	-0.26	-1.2	1.4	0.18	0.64	2.9
Lead	2.6	-0.46	0.29	-0.02	0.47	5.4	0.82	4.1	6.3
Manganese	-0.82	-0.74	0.16	-1.7	-0.62	-1.4	0	0.36	0.33
Vanadium	0.54	-0.35	1.8	-0.49	-1.3	1.5	-0.04	0.44	1.5

PAHs: As shown below, one or more PAHs were detected in the on-Site samples at concentrations greater than three standard deviations above the mean of the reference area samples from each of the Neponset River sediment sample locations except NR-2.

	NR-1	NR-2	NR-3	NR-4	NR-5	NR-5A	NR-6	NR-7	NR-8
Acenaphthene	5.2	1.1	3.9	4.8	9.5	4.9	10.9	7.1	7.7
Anthracene	2.5	1.4	1.3	1.8	2.1	1.9	4.2	3.8	3.1
Benzo(a)anthracene	2.1	1.5	1.1	1.5	1.6	1.5	3.2	2.8	2.2
Benzo(a)pyrene	2	1.5	1.2	1.5	1.4	1.6	3.3	2.9	2.1
Benzo(b)fluoranthene	2.7	1.8	1.4	2	2.1	1.8	4.5	3.8	3
Benzo(g,h,i)perylene	2	1.5	1.2	1	0.98	1.6	2.9	2.8	2
Benzo(k)fluoranthene	2	1.4	1	1.6	1.4	1.7	3.3	3.2	2.1
Chrysene	2.4	1.7	1.4	1.5	1.7	1.8	3.8	3.4	2.5
Dibenz(a,h)anthracene	2.3	1.4	0.88	1	0.99	1.6	3.8	3.6	2.5
Fluoranthene	2.2	1.5	1.3	1.8	1.8	1.7	3.3	3.4	2.5
Fluorene	4.6	2.2	2.6	2.6	5	2.9	6.4	4.9	4.9
Indeno(1,2,3-cd)pyrene	2.1	1.5	1.2	1.1	1.1	1.6	3.1	3	2.2
Methylnaphthalene (2)-	1.8	0.28	1.6	0.92	3.5	1.1	1.8	1.5	0.55
Naphthalene	2.3	1	3	1.8	6.4	3.1	3.1	3.5	1.7
Phenanthrene	2.7	1.8	1.6	2	2.3	1.9	3.4	3.3	2.8
Pyrene	2.3	1.6	1.3	1.7	1.7	1.8	3.1	3.1	2.4

5.4.5 Lewis Pond Sediments

Metals: As shown below, the concentrations of antimony and chromium detected in sediment sample LP-01, the concentrations of antimony, chromium, lead, and nickel detected in sediment sample LP-06, and the concentration of silver in sediment sample LP-02 were greater than three standard deviations above the mean of the samples collected in the reference area.

	LP-01	LP-02	LP-03	LP-04	LP-05	LP-06	LP-07	LP-08	LP-09	LP-10
Aluminum	-0.59	0.21	-0.09	-0.38	0.2	0.37	-0.74	-0.01	-0.32	0.06
Antimony	7.3	2.3	0	0.19	2	4.2	2.3	0.19	1.2	0.36
Arsenic	-0.43	1.7	0.03	-0.46	-0.07	1.4	-0.7	-0.27	-0.48	-0.04
Cadmium	0.34	1.1	0.77	0.98	1.3	0.79	0.51	1	0.61	1.5
Chromium (total)	4.4	1.7	1.2	0.67	2.8	5.6	1.7	1.6	1.7	1.8
Copper	0.63	0.71	0.51	0.5	1.2	1.54	0.09	0.66	0.26	0.93
Iron	-0.37	-0.47	-1.1	-0.37	-0.67	0.13	-0.88	-0.19	-0.16	-0.18
Lead	0.85	0.58	0.57	0.34	1.3	3	0.21	0.49	-0.13	0.5
Manganese	0.54	-0.33	-1.6	-1.1	-1.9	-1.2	-0.96	0.68	-0.07	0.52
Mercury (total)	-0.25	0.16	0.05	-0.16	0.32	0.55	-0.44	-0.16	-0.41	-0.1
Nickel	1.8	0.87	0.52	0.59	2.29	6.3	0.64	1.5	0.6	1.4
Silver	0.68	3	0.54	0.64	1.5	0.5	0.3	0.64	0.28	0.71
Vanadium	-0.57	1	0.4	-0.27	0.24	0.03	-0.81	-0.19	-0.59	-0.04
Zinc	0.17	-0.19	-0.48	0.49	0.04	0.64	-0.02	0.54	0.38	0.89

PAHs: As shown below, no PAHs were detected at concentrations greater than three standard deviations above the mean of the reference area samples.

	LP-01	LP-02	LP-03	LP-04	LP-05	LP-06	LP-07	LP-08	LP-09	LP-10
Acenaphthene	-0.14	-1.7	-2.1	0.31	-1.5	-0.14	-0.24	-0.6	-1.2	-0.35
Anthracene	0.46	-1	-1.3	0.23	-0.71	0.8	0.37	-0.39	-1.2	0.13
Benzo(a)anthracene	0.36	-1.1	-1.4	0.03	-0.94	0.69	-0.13	-0.49	-1.1	0.1
Benzo(a)pyrene	-0.02	-1.3	-1.6	-0.29	-0.81	0.56	-0.45	-0.62	-0.81	-0.29
Benzo(b)fluoranthene	-0.03	-1	-1	-0.03	-0.38	0.48	-0.2	-0.03	-0.45	0.45
Benzo(g,h,i)perylene	-0.18	-1.7	-1.9	-1.3	-1.8	-0.63	-1.9	-1.4	-1.8	-0.67
Benzo(k)fluoranthene	-0.11	-1	-1.6	-0.43	-0.5	0.51	-0.29	-0.29	-0.5	0.51
Chrysene	0.01	-1.2	-1.2	-0.34	-0.98	0.47	-0.63	-0.63	-0.79	-0.1
Dibenz(a,h)anthracene	-0.19	-1.04	-1.5	-1.2	-1.8	-0.02	-1.3	-1.2	-1.3	-1.2
Fluoranthene	-0.05	-1.5	-1.7	-0.53	-1.2	0.27	-0.89	-0.95	-1.3	-0.12
Fluorene	-0.15	-1.4	-1.8	0.09	-0.94	-0.01	-0.21	-0.32	-1.1	-0.21
Indeno(1,2,3-cd)pyrene	-0.31	-1.4	-1.4	-1.2	-1.5	-0.34	-1.7	-1.1	-1.5	-0.9
2-Methylnaphthalene	1.1	0.31	0.21	0.56	0.77	0.77	0.48	0.31	-0.08	0.56
Naphthalene	2.3	0.78	0.66	1	1.4	1.3	0.72	0.83	0.4	1

5.4.6 Floodplain Sediments

Metals: As shown below, ten metals were detected at concentrations greater than three standard deviations above the mean of the samples collected in the reference area. A large number of these exceedances occur at location FP-09.

	FP-01	FP-02	FP-03	FP-04	FP-05	FP-06	FP-08	FP-09	FP-10
Aluminum	-0.79	-0.22	-0.13	0.69	-0.23	0.17	0.73	0.19	0.1
Antimony	-0.41	-0.61	-0.25	-0.25	2.8	-0.07	-0.37	8.7	7
Arsenic	0.82	1.7	0.35	1.3	2	0.69	1.1	3.5	1.5
Cadmium	1.1	0.9	0.08	0.24	3.8	2.1	-0.88	5.1	-0.4
Chromium (total)	0.12	1.3	-0.06	1.4	2.5	2.07	2.4	6.8	1.8
Copper	1.5	0.89	1.9	-0.04	1.2	0.37	0.08	2.2	0.24
Iron	4.3	1.02	4.3	0.14	1.1	0.63	0.44	3.6	0.87
Lead	2.3	1.3	0.15	0.75	2.9	2.6	0.58	3	1.2
Manganese	4	2.5	2.4	0.93	2.7	1.2	0.34	0.5	0.31
Mercury (total)	1.2	1.1	0.16	1.8	2.5	3.1	0.4	3.8	1
Nickel	1.1	3.1	5.8	0.29	1.9	1.1	0.19	2.9	0.62
Vanadium	0.9	0.57	0.34	-0.14	0.52	-0.76	0.76	1.4	1.2
Zinc	1.9	1.9	0.97	0.9	3.4	2.8	-0.31	4.1	0.19

PAHs: As shown below, the concentrations of acenaphthene, anthracene, fluorene, and 2-methylnaphthalene detected in sediment sample FP-06, and the concentration of 2-methylnaphthalene detected in sediment sample FP-09 were greater than three standard deviations above the mean of the reference area samples.

	FP-01	FP-02	FP-03	FP-04	FP-05	FP-06	FP-08	FP-09	FP-10
Acenaphthene	1.6	0.35	1.1	0.81	2.1	5.4	-0.48	1.5	0.61
Anthracene	1.5	0.55	1.3	0.97	1.6	3	0.08	1.45	0.4
Benzo(a)anthracene	1.5	0.54	1.3	1	1.5	2.5	0.21	1.6	0.46
Benzo(a)pyrene	1.4	0.49	1.3	1.05	1.5	2.2	0.16	1.3	0.41
Benzo(b)fluoranthene	1.2	0.44	1.3	0.91	1.5	2.1	0.27	1.3	0.44
Benzo(g,h,i)perylene	1.5	0.88	1.4	1	2.2	2.3	0.07	1.9	0.37
Benzo(k)fluoranthene	1.3	0.37	1.2	1.1	1.4	2	0.27	1.4	0.57
Chrysene	1.3	0.44	1.1	0.95	1.3	2	0.27	1.2	0.46
Dibenz(a,h)anthracene	1.6	0.75	1.5	1.2	2.4	2.5	0.14	2.2	0.45
Fluoranthene	1.2	0.39	1.2	0.97	1.3	2.4	0.23	1.2	0.46
Fluorene	1	0.13	1.5	0.63	1.3	3.2	-0.12	1.5	0.17
Indeno(1,2,3-cd)pyrene	1.5	0.71	1.4	1.2	2.3	2.3	0.18	2.1	0.47
Methylnaphthalene (2-)	0.85	0.02	0.8	0.45	1.7	2.8	0.66	4	0.77
Phenanthrene	1	0.27	1	0.8	1.2	2.5	0.19	1.1	0.39
Pyrene	1.4	0.5	1.2	0.97	1.4	2.3	0.15	1.1	0.39

5.4.6.1 Former Mill Tailrace Sediments

The results of laboratory analysis of former mill tailrace sediments for inorganic parameters are included in Table 15B. Arsenic and iron were detected in the sediment samples collected from the former mill tailrace at concentrations ranging from 1.5 to 9.3 mg/kg and 7,320 to 19,100 mg/kg, respectively, exceeding the human health COPC screening levels for these metals (0.39 and 2,300 mg/kg, respectively). Samples collected from the TR-3, TR-4, and TR-5 locations also exceeded the Ecological COPCs for arsenic. Arsenic and iron were the only compounds detected in excess of their human health COPC screening levels in the most upgradient tailrace sediment samples, TR-1 and TR-2. Lead was detected at a concentration in excess of the ecological COPC screening level in sample TR-2.

A number of other metals were detected in sediment from sampling locations TR-3, TR-4, and TR-5, including: aluminum, cadmium, chromium, copper, lead, manganese, nickel, and zinc at concentrations exceeding applicable human health and/or ecological COPC screening levels for sediment. In addition, mercury was detected in sample TR-5 at a concentration of 0.16 mg/kg, just above the ecological COPC screening level of 0.15 mg/kg.

WAD cyanide was not detected at concentrations above the reporting limit in any of the TR-series sediment samples.

The results of SVOC analysis on sediment from the former mill tailrace are included in Table 15C. Total PAH concentrations in TR-series samples ranged from 1,772 µg/kg in TR-01 to 53,960 µg/kg in TR-4. Comparatively, the concentrations of PAHs in former mill tailrace sediments (particularly in the furthest downgradient samples TR-3, TR-4, and TR-5) were elevated relative to sediment in the Neponset River; on average, the total concentration of PAHs in sediments from the former mill tailrace is approximately 18,840 µg/kg. Total PAH concentrations are depicted on Figure 93. Detectable concentrations of all of the PAHs were measured in each of the TR-series sediment samples. Ecological COPC screening levels were exceeded for all of the PAHs with screening levels in one or more of the sediment samples collected from the former mill tailrace. Concentrations of one to all five of the compounds: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded their respective human health COPC screening levels in the samples collected from locations TR-2, TR-3, TR-4, and TR-5.

5.4.6.1.a Floodplain Sediments

Detectable concentrations of PAHs were also measured in each of the FP-series floodplain sediment samples. Total PAH concentrations in FP-series samples ranged from 1,518 µg/kg in FP-08 to 10,512 µg/kg in FP-05, with the exception of FP-06 (with a concentration of 51,179 µg/kg). On average, the total concentration of PAHs in sediments collected from 0 to 1 ft bgs in the Neponset River floodplain downgradient of the Site was approximately 9,950 µg/kg. Detectable concentrations of PAHs were also present in nine of the ten floodplain reference sediment samples. Total PAH concentrations in FPR-series samples ranged from below the

analytical reporting limit in the sample collected from FPR-03 to approximately 16,832 µg/kg in the sample collected from FPR-08. On average, the total concentration of PAHs in sediments from the Neponset River floodplain reference locations was approximately 3,440 µg/kg. Figure 93 depicts the distribution of total PAHs in sediments.

In comparison, the concentrations of SVOCs and PAHs in floodplain sediment samples from the Neponset River downgradient of industrial portions of the Site are elevated in the sample from FP-06 only, relative to floodplain reference areas upgradient of the Site. As presented in Table 15C, all of the PAHs with human health or ecological screening levels were detected at concentrations greater than their respective ecological COPC screening levels in the sediment sample collected from the FP-06 sample location. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected at concentrations greater than their respective human health COPC screening levels in the sediment sample collected from the FP-06 sample location.

5.4.7 Distribution of VOCs in Sediment

5.4.7.1.a Neponset River Sediments

As indicated in Table 15D, VOCs were not detected above analytical reporting limits in any of the sediment samples collected from the Neponset River. VOCs were not detected above human health or ecological COPC screening levels in any of the Neponset River reference area sediment samples.

5.4.7.1.b Lewis Pond Sediments

VOCs were not detected above human health or ecological COPC screening levels in any sediment samples from Lewis Pond.

5.4.7.1.c Floodplain Sediments

VOCs were not detected above human health or ecological COPC screening levels in any floodplain or floodplain reference area sediment samples.

5.4.7.1.d Former Mill Tailrace Sediments

VOCs were not detected above human health or ecological COPC screening levels in any former mill tailrace sediment samples.

5.4.8 Distribution of Asbestos in Sediment

5.4.8.1.a Neponset River Sediments

As indicated in Table 15E and depicted on Figure 92, asbestos was not detected in concentrations above the analytical reporting limit and human health COPC screening levels of 1% in sediments from the Neponset River. The laboratory reported "trace" amounts of asbestos (less than 1%) in NR-1, NR-3, NR-4, NR-6, NR-7, and NR-8. As indicated in Table 15E, the analytical data report identified the trace amounts of asbestos in samples NR-4, NR-6, and NR-8 as primarily chrysotile, and the trace amounts of asbestos in samples NR-1, NR-3, and NR-7 as primarily actinolite[47]. Asbestos results were non-detect for reference sediment samples from upstream in the Neponset River.

5.4.8.1.b Lewis Pond Sediments

As indicated in Table 15E and depicted on Figure 92, of the ten sediment samples submitted for analysis of asbestos from Lewis Pond, nine exhibited asbestos concentrations above the human health COPC screening level of 1%. Reported concentrations of asbestos in sediment from Lewis Pond ranged from less than 1% (trace) in the sample from LP-02 to more than 15% in the sample from LP-01. The analytical data report identified the asbestos in the samples from Lewis Pond as primarily chrysotile.

5.4.8.1.c Floodplain Sediments

Asbestos was detected at two floodplain sediment sample locations at concentrations greater than the human health COPC screening level of 1%. These two sediment locations, FP-05 and FP-09, exhibited concentrations of 2% and 3.9%, and were identified as primarily chrysotile. Trace concentrations of asbestos (less than or equal to 1%, also identified as chrysotile) were detected in the remaining floodplain sediment samples. Sediment samples were collected from 1 to 3 ft bgs at locations FP-05, FP-06, and FP-09 on August 5, 2003. Concentrations of asbestos in samples collected from the 1 to 3 ft bgs depth interval were all below 1%.

Asbestos was not detected in concentrations above the analytical reporting limit of 1% in floodplain reference sediment samples collected from the floodplain of the Neponset River upstream of the industrial portions of the Site. However, with the exception of FPR-03, trace concentrations of asbestos (less than 1%, identified as chrysotile) were noted in the floodplain reference area samples.

[47] Actinolite is defined in Bates and Jackson, ed. (1984) as "a bright-green or grayish-green monoclinic mineral of the amphibole group: $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$. It occurs in slender needlelike crystals and in fibrous form in metamorphic rocks."

5.4.8.1.d Former Mill Tailrace Sediments

As depicted on Figure 92, three of the five surficial sediment samples collected from the former mill tailrace, TR-3, TR-4, and TR-5, exhibited asbestos concentrations above the human health COPC screening level of 1%. Samples from the eastern portion of the tailrace (TR-1 and TR-2), located within the portion of the tailrace excavated during the 1992 RA, did not exhibit asbestos concentrations above the analytical reporting limit of 1% (trace amounts [less than 1%] of asbestos were noted). Asbestos concentrations in sample TR-3, collected at the approximate downgradient boundary of the area excavated during the 1992 RA, and samples TR-4 and TR-5, collected downgradient of this formerly excavated area, ranged from 1.8% in TR-3, to 7.5% in TR-5, and 8.5% in TR-4, exceeding the human health COPC screening level for asbestos of 1%. Vertical profiling of sediment at TR-3, TR-4 and TR-5 on August 6 and 7, 2003 exhibited asbestos concentrations above 1% from approximately 0 to 3 ft bgs. Concentrations were 3% at TR-3, 3.5% at TR-5, and 5% at TR-4. As indicated in Table 15E, the analytical data report identified the asbestos in the tailrace samples as primarily chrysotile, although TR-4 was identified as chrysotile / amosite.

5.5 Results of Air Monitoring during RI Activities

As indicated in Section 3 (IV)(D) of the SOW, extensive air sampling was completed prior to the 1992 RA and data generated during the RA indicated that the Site is not a source of airborne contamination. Consistent with Section 3 (IV)(D) of the SOW, "Further investigation into the impact the Site may have on surrounding air is not warranted" and was not performed during the Phase 1A RI. Rather, in accordance with Section 3 (IV)(D) of the SOW, air quality was monitored during the intrusive field activities.

PID and aerosol monitoring of ambient (breathing-zone) air for VOCs and respirable dust was completed during drilling, installing monitoring wells, and soil sampling. In addition, monitoring with a combustible gas indicator (CGI) meter with hydrogen sulfide and carbon monoxide sensor was completed whenever drilling activities were carried out within the AOC. PID, aerosol levels, and CGI results were below the action levels established in Table 4 of the Health and Safety Plan (HASP)[48] throughout intrusive Phase 1A field work.

In addition to these air monitoring activities, personal air samples were collected and analyzed for asbestos content for health and safety purposes during the initial few days of drilling within the AOC by Axiom Partners, Inc. (Axiom). Full-shift air sampling was performed to determine the eight-hour time weighted average (TWA) asbestos exposure and "excursion samples" were collected to represent short-term (30 minute) asbestos exposure levels. A copy of Axiom's summary report is provided in Appendix J. Axiom's report indicates "no asbestos fibers were identified in any of the personal air samples." Therefore, Axiom indicated "no airborne asbestos exposure occurred during the sampling period" and "a negative exposure assessment to airborne asbestos has been established for the tasks and work practices referenced herein."

[48] The HASP was included in the Work Plan, approved by USEPA on October 24, 2000.

Also in accordance with Section 3 (IV)(D) of the SOW, "collection of on-Site meteorological data, including ambient temperature, wind speed, wind direction, and barometric pressure" was also completed, as discussed in Section 4.2.2 of this Report.

5.6 Ecological Samples

The distribution of parameters in the ecological samples including: fish tissue, bioaccumulated invertebrates, earthworm tissue, and sediment toxicity tests are presented in Tables 16A through 19. For discussions related to these matrices, refer to the BERA and BHHRA Reports.

6.0 ANALYTE SOURCES, TRANSPORT AND FATE

Based on the known history of Site operations, observed analyte[49] distribution, chemical and physical properties of the analytes detected above human health or ecological COPC screening levels at the Site, and Site hydrogeology, the primary analyte source area at the Site is the AOC. Within the AOC are soils with residual metals and organics emplaced during the long industrial history of the Site which appear to be the source of groundwater contamination that extends westerly to the former mill tailrace. This is also the location of the DAPL plume of high pH sodium hydroxide that is the source of high pH groundwater that also extends to the former mill tailrace. The high pH condition, combined with other related geochemical factors, appears to be mobilizing naturally occurring metals from soils within this area as well.

Residual metals and organics derived from the long industrial history of the Site also appear to be present in soils located primarily in industrial areas of the Site and the former railroad ROW east of South Street. Groundwater east of South Street is unaffected by releases of sodium hydroxide, and the occurrence of analytes above human health or ecological COPC screening levels within groundwater east of South Street is considerably less than within groundwater beneath and downgradient of the AOC. Accordingly, the mobility of metals and organics within soils in this area appears to be limited.

Based on the data discussed in Section 5.0, the principal mechanism for subsurface transport of analytes at the Site is migration with flowing groundwater (i.e., dissolved aqueous phase transport). The available data indicate that groundwater from the Site currently discharges primarily to the former mill tailrace area. Available data also indicate that groundwater from the Site may also have historically or may periodically discharge to the Neponset River upgradient of the former mill tailrace. Therefore, associated analytes dissolved in groundwater also discharge to the former mill tailrace area and the Neponset River upstream of the former mill tailrace. Historically, overland flow of analytes to the former mill tailrace and to the Neponset River also may have occurred.

Uptake of analytes present in Site media by biota is acknowledged as a pathway for analyte transport. The processes of biotic uptake of Site analytes includes the bioaccumulation and potential biomagnification from lower trophic organisms to higher trophic organisms that are exposed to soil, groundwater, surface water, and sediment. These processes are complex and outside the scope of the discussion presented in this Section. However, these processes are discussed in the BERA and BHHRA.

[49] The term "analyte" as used in this Section, refers generally to chemicals detected above human health or ecological COPC screening levels through analysis of environmental samples obtained at the Site completed pursuant to the QAPP and, in this regard, carries the same meaning as in Section 5.0. Some of the analytes detected at the Site are most likely present as contaminants attributable to the industrial history of the Site; others may represent naturally occurring or background conditions.

6.1 Analyte Source Areas

This subsection is intended to provide a summary of the characteristics of the principal identified on-Site analyte source areas drawn from the data presented in Section 5.0, as required by Section 3 (I)(1) of the SOW. This discussion is not intended to be exhaustive, but rather to provide an overview of the key general chemical characteristics of the principal analytes (e.g., pH, metals, PAHs, and AVOCs), including the identity, location, physical characteristics, and known history of the source areas. More specific information relative to historical context is provided in the EDRA.

6.1.1 Elevated pH Conditions

As described in Section 5.0, a relatively extensive area of elevated pH conditions (greater than 9 s.u.) was observed in soil and groundwater in the vicinity and downgradient of the soil- and asphalt-capped portions of the AOC. Elevated pH was observed from depths just below the ground surface in the vicinity of the former mill building to approximately 70 feet bgs. Downgradient of the AOC, elevated pH measurements were recorded in the wetland/former mill tailrace area in soils and groundwater to a depth of approximately 50 feet bgs. Given the distribution of elevated pH conditions, the original sources appear to have included: the caustic soda storage tanks and former cotton processing areas in the southern portion of the former mill building fronting along South Street, and the former bleachery extending to the west. The mixing area and former Settling Basin Nos. 1 and 2 are not anticipated to have contributed significantly to the elevated pH conditions based on the distribution of elevated pH conditions observed at the Site (i.e., Settling Basin Nos. 1 and 2 are generally located side- and downgradient, respectively, of the most elevated pH conditions).

Based on information presented in the EDRA, approximately 1,000 to 3,000 gallons per day of 50% sodium hydroxide solution was used and stored at the Site between approximately 1947 and 1984. This yields a total volume on the order of 1×10^7 gallons of 50% sodium hydroxide solution used/stored at the Site during that 37-year period. Assuming this solution has a specific gravity of approximately 1.5, based on available Material Safety Data Sheet (MSDS) information for 50% sodium hydroxide solutions, it is estimated that a total mass of sodium hydroxide on the order of 1×10^8 pounds (1×10^{11} grams) was used/stored at the Site between 1947 and 1984.

As indicated in Sections 5.2.1.1.c and 5.2.1.1.d, the specific gravity and viscosity of aqueous solutions increase with increasing sodium hydroxide concentration (and consequently increasing pH). As depicted on Appendix Figures K-6 and K-7, groundwater with a pH of approximately 12.5 s.u. exhibits a slightly increased specific gravity and viscosity measurements. This increase in specific gravity and viscosity is even greater at pH of greater than 13.5 s.u. As a result, highly concentrated sodium hydroxide solutions behave differently than more dilute, lower pH groundwater. These highly concentrated, high pH fluids will tend to migrate downward in the subsurface generally under the influence of gravity.

DAPL appears to be present within the glacial till and shallow bedrock in the vicinity of the former bleachery once located in the wing of the former mill building extending to the west. This is best illustrated by review of the areas noted with pH conditions above 12.5 as noted on the cross-sections included as Figures 11A to 11D, and the pH distribution maps included as Figures 41 to 43. The maximum observed pH measurements were observed in groundwater samples from deep overburden/bedrock wells SH-01D (14.1 s.u.), SH-01R (13.9 s.u.), SH-02D (12.6 s.u.), SH-06D (13.1 s.u.), and SH-07D (13.8 s.u.). As indicated on the referenced figures, the downgradient extent of DAPL conditions appears to be limited. Since the DAPL has been emplaced for at least 20 years, and perhaps over 50 years, its mobility also appears limited.

As currently defined, the extent of DAPL occupies an area of approximately 25,000 ft^2 (see Figures 41 through 43). Conservatively assuming a uniform DAPL thickness of 50 ft (equivalent to the approximate DAPL thickness observed at well triplet SH-01S/D/R) and an average porosity of 0.20 for the glacial till and shallow bedrock, within which DAPL is observed, yields a total volume of approximately 2.5×10^5 cubic feet (ft^3) of DAPL observed in the subsurface. The average pH of the maximum-observed pH values from groundwater samples collected from within the DAPL plume is approximately 13.8 s.u. This implies a mass of sodium hydroxide in the subsurface of approximately 4.0×10^5 pounds (1.8×10^8 grams). As further discussed below in Section 6.2.1, this DAPL serves as a passive source of sodium hydroxide that appears to be undergoing dissolution/dilution by ambient groundwater such that the plume emanating from the DAPL has a pH of approximately 12 s.u.

6.1.2 Inorganic Analytes

As discussed in Section 5.0, the inorganic analytes detected at concentrations greater than the human health COPC screening levels are metals including: aluminum, arsenic, chromium, iron, lead, manganese, and vanadium in surface soils; and aluminum, arsenic, barium, chromium, copper, iron, lead, manganese, vanadium, and zinc in subsurface (deeper than 1 foot) soils. These inorganic analytes in soil are located primarily within the AOC and the industrial area east of South Street. The primary inorganic analytes detected at concentrations greater than the human health COPC screening levels in groundwater are also metals and include: aluminum, antimony, arsenic, chromium, copper, iron, lead, manganese, nickel, and vanadium. With few exceptions (e.g., arsenic, iron, and manganese), what appear to be Site-related inorganic analytes in groundwater are located primarily within and downgradient of the AOC, which suggests that the metals observed in soil in the industrial area east of South Street are not a significant source of the elevated metals concentrations observed in groundwater at the Site.

To assess the relative importance of groundwater chemistry (i.e., elevated pH) in the mobility of metal analytes at the Site, the distribution of selected metals in groundwater was compared to the distribution of elevated pH conditions in groundwater and the distribution of these metals in soil. A summary of the results of these comparisons is provided below.

- **Aluminum** – Aluminum was detected in surface and subsurface soil samples at concentrations above the human health COPC screening level (7,600 mg/kg) in 21 soil

samples collected from all of the horizontal strata at the Site. This is not unexpected since aluminum is a key constituent of naturally occurring soils. The highest concentrations of aluminum were observed in soil samples collected from the Industrial Area East of South Street and the Gleason Court Properties. Aluminum was detected at concentrations greater than Region IX Tap Water PRG (3,600 µg/L) in groundwater samples collected from three shallow, five deep and one bedrock monitoring well, all located within the elevated pH plume at the Site. As discussed in Section 5.2.3.1.a, aluminum concentrations in groundwater appear to show a relatively strong positive correlation with pH. The absence of significantly elevated aluminum concentrations in groundwater in the vicinity of the highest soil concentrations and the strong positive correlation of aluminum with pH, suggests that the presence of elevated concentrations of aluminum in groundwater is attributable to elevated pH conditions mobilizing aluminum present in Site soils most likely at background conditions since there is no record of aluminum use at the Site historically;

- **Antimony** – Antimony was detected at concentrations above the human health COPC screening level (3.1 mg/kg) in only one surface and three subsurface soil samples collected from the Site. However, antimony was detected at concentrations above the Region IX Tap Water PRG (1.5 µg/L) in groundwater samples collected from 16 monitoring wells located primarily within the elevated pH plume. As discussed in Section 5.2.3.1.a, antimony concentrations in groundwater appear to show a moderate positive correlation with pH. The absence of areas of the Site exhibiting significantly elevated antimony concentrations in soil suggests that the presence of elevated concentrations of antimony in groundwater is attributable to elevated pH conditions mobilizing antimony present at background concentrations in Site soils.

- **Arsenic** – Arsenic was detected at concentrations above the human health COPC screening level in all of the soil samples collected from the Site. Arsenic was detected at concentrations exceeding the Region IX Tap Water PRG (0.045 µg/L) in groundwater samples collected from all of the monitoring wells and well points at the Site, including the background groundwater samples collected from SH-23S. The Site-wide presence of arsenic in groundwater at concentrations above the Region IX Tap Water PRG including the upgradient groundwater samples is considered to represent an underlying background condition; however, the presence of arsenic at more elevated concentrations in and downgradient of the AOC is not. As discussed in Section 5.2.3.1.a, arsenic concentrations in groundwater appear to show a relatively strong positive correlation with pH. The presence of arsenic in groundwater at concentrations significantly elevated above the Region IX Tap Water PRG (and the apparent underlying background condition) is more likely attributable to elevated pH conditions mobilizing arsenic present in Site soils. Arsenic concentrations may also be influenced by oxidation state

- **Chromium** – Chromium (total) was detected at concentrations above the human health COPC screening level in only three upper and six lower soil samples collected at the Site. Chromium (total) was detected at concentrations exceeding the Region IX Tap Water

PRG (11 µg/L for hexavalent chromium) in groundwater samples from nine shallow, seven deep, and one bedrock monitoring well. As discussed in Section 5.2.3.1.a, the correlation of chromium concentration with pH is weak; however, with a few exceptions, groundwater samples with chromium concentrations in excess of the Region IX Tap Water PRG are located within the plume of elevated pH. In general, the higher concentrations of chromium detected in groundwater are generally observed near and downgradient of relatively elevated concentrations of chromium in soil suggesting that its presence in groundwater is attributable to its distribution in soil, with elevated pH conditions potentially as a secondary control.

- **Copper** – Copper was detected at concentrations in excess of the human health COPC screening level in only four soil samples collected from the Site, from locations within the soil- capped portions of the AOC. Copper was detected at concentrations exceeding the Region IX Tap Water PRG (150 µg/L) in groundwater samples collected from two deep and one bedrock wells located within the high pH plume at the Site. As discussed in Section 5.2.3.1.a, copper concentrations in groundwater appear to show a relatively strong positive correlation with pH. In general, the highest concentrations of copper detected in groundwater are also in the general vicinity of relatively elevated concentrations of copper in soil, suggesting that elevated pH conditions are mobilizing residual copper contamination present in AOC soils.

- **Iron** – Iron was detected at concentrations in excess of the human health COPC screening level (2,300 mg/kg) in all of the soil samples collected from the Site. The highest concentrations of iron were generally observed in samples collected from the soil- and asphalt-capped portions of the AOC and the industrial areas east of South Street. Iron was detected at concentrations exceeding the Region IX Tap Water PRG (1,100 µg/L) in groundwater from 34 monitoring wells at the Site. Typically, the highest concentrations of iron were detected in groundwater from monitoring wells downgradient of the industrial area east of South Street and within the AOC. As discussed in Section 5.2.3.1.a, iron concentrations in groundwater do not appear to correlate with pH. The solubility of iron is controlled by its oxidation state. The more reduced (Fe^{2+}) species of iron is generally more soluble than the more oxidized (Fe^{3+}) form of iron (Krauskopf, 1979. Therefore, the principal control on iron concentration in groundwater is most likely oxidation state, with elevated iron concentrations in soil and/or pH potentially as secondary controls.

- **Lead** – Lead was detected at concentrations above the human health COPC screening level (300 mg/kg) in three surface and 11 subsurface soil samples and is likely related to historic Site activities. Elevated concentrations of lead in soil were generally observed in samples collected from the soil- and asphalt-capped portions of the AOC, the industrial area east of South Street, and a residential property located on Gleason Court. For comparative purposes, lead concentrations in groundwater were compared to the USEPA MCL because there is no Region IX PRG. Lead was detected at concentrations exceeding its MCL (15 µg/L) in groundwater samples collected from 11 groundwater

wells located within the AOC and in the vicinity of the former mill tailrace. The highest observed concentrations of lead in shallow groundwater are located in the general vicinity of relatively high lead in subsurface soil; however, there are other areas of high lead soil which do not appear to have associated high lead in groundwater. Lead concentrations in groundwater do not appear to correlate with pH. The presence of lead in groundwater appears to be controlled, at least in part, by the presence of residual lead concentrations present in AOC soils.

- **Manganese** – Manganese was detected at concentrations above the human health COPC screening level (180 mg/kg) in 30 surface and 36 subsurface soil samples. Manganese was detected at concentrations exceeding the Region IX Tap Water PRG (88 µg/L) in groundwater samples from 29 wells. Typically, the highest concentrations of manganese were detected in groundwater from monitoring wells downgradient of the industrial area east of South Street and within the AOC. In general, manganese concentrations in groundwater do not appear to correlate with pH. Manganese concentrations are somewhat elevated in soil near and upgradient of higher concentration manganese groundwater areas; however, other areas of high manganese soil concentrations do not have related high manganese groundwater concentrations. The solubility of manganese is controlled by its oxidation state. The more reduced (Mn^{2+}) species of iron is generally more soluble than the more oxidized (Mn^{3+}/Mn^{4+}) forms of iron (Krauskopf, 1979). Therefore, the principal control on manganese concentration in groundwater may be oxidation state, with elevated manganese concentrations in soil and/or pH potentially as secondary controls.

- **Nickel** – Nickel was not detected at concentrations above the human health COPC screening level (160 mg/kg) in any of the soil samples collected from the Site. However, concentrations of nickel above the ecological COPC screening level (30 mg/kg) were observed in six soil samples located within the soil- and asphalt-capped portions of the AOC and the industrial area east of South Street. Nickel was detected at concentrations exceeding the Region IX Tap Water PRG (73 µg/L) in groundwater samples collected from seven monitoring wells primarily located within the elevated pH plume at the Site. As discussed in Section 5.2.3.1.a, nickel concentrations in groundwater appear to show a relatively strong positive correlation with pH. In general, the highest concentrations of nickel detected in groundwater are in the general vicinity of relatively elevated concentrations of nickel in soil suggesting that elevated pH conditions are mobilizing nickel concentrations present in AOC soils.

- **Vanadium** – Vanadium was detected at concentrations above the human health COPC screening level (7.8 mg/kg) in all but one surface and subsurface soil samples collected from the Site, and is not likely related to historic Site activities based on information presented in the EDRA. Vanadium was detected at concentrations exceeding the Region IX Tap Water PRG (3.6 µg/L) in groundwater samples from 18 monitoring wells located within the elevated pH plume at the Site. As discussed in Section 5.2.3.1.a, vanadium concentrations in groundwater appear to show a relatively strong positive correlation with

pH. The absence of areas of the Site exhibiting significantly elevated vanadium concentrations in soil suggests that the presence of elevated concentrations of vanadium in groundwater is attributable to elevated pH conditions mobilizing vanadium present at background concentrations in Site soils.

Based on the foregoing discussion the following chart summarizes the primary controls to the distribution and mobility of metals in groundwater at the Site, elevated above likely background conditions.

Analyte	pH	AOC Soil Concentrations	Oxidation State
Aluminum	X		
Antimony	X		
Arsenic	X		X
Chromium	X	X	
Copper	X	X	
Iron			X
Lead		X	
Manganese			X
Nickel	X	X	
Vanadium	X		

6.1.3 Organic Analytes

As discussed in Section 5.0, the primary organic analytes in groundwater that are likely related to historic Site activities are PAHs and AVOCs. A number of PAHs were detected in groundwater at concentrations exceeding their respective Region IX Tap Water PRGs including: acenaphthene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, fluorene, indeno[1,2,3-cd]pyrene, naphthalene, and pyrene. Although detected above the analytical reporting limit in one or more groundwater samples, no Region IX Tap Water PRG exists for the following PAHs: acenaphthylene, benzo[g,h,i]perylene, 2-methylnaphthalene, and phenanthrene. Total PAH concentrations in groundwater were observed to be most elevated within the plume of elevated pH, ranging up to approximately 4,277 µg/L within the DAPL. Total PAH concentrations in groundwater outside the plume of elevated pH were generally below 19 µg/L. Concentrations of individual PAHs detected in groundwater are below the solubilities for these compounds in water as listed in Knox et al. (1993).

The ratios of the concentrations of the lighter molecular weight PAHs (i.e., naphthalene and 2-methylnaphthalene) to the concentrations of total PAHs detected in groundwater are greater than about 0.5 with few exceptions (e.g., SH-21S), and in most cases where elevated concentrations of total PAHs were detected, these ratios are greater than 0.85, indicating a preponderance of lighter weight PAHs in groundwater relative to heavier weight PAHs. These ratios are consistent with the middle to heavier molecular weight PAHs (e.g., higher molecular weight than 2-

methylnaphthalene) being relatively insoluble and generally less mobile in groundwater than the lighter molecular weight PAHs (which are generally more soluble and more mobile).

Total PAH concentrations in subsurface soils from the industrial area east of South Street range from approximately 0.1 to 1,150 mg/kg. However, groundwater from wells located just downgradient of the industrial area east of South Street indicate total PAH concentrations of less than 1 µg/L, suggesting that, similar to metals, the PAHs detected in soil in this area are generally stable and are not actively leaching to groundwater. For instance, PAHs were not detected above analytical reporting limits in groundwater samples collected from shallow monitoring well SH-22S, located proximate to an area where PAHs in lower soil samples exceed 100,000 µg/kg. PAHs were detected at a maximum concentration of 13 µg/L in groundwater samples collected from shallow monitoring well SH-21S in an area where total PAH concentrations in lower soil samples exceeds 100,000 µg/kg.

Concentrations of PAHs in shallow groundwater from monitoring wells on the industrial area east of South Street, and groundwater data collected from monitoring well SH-19D suggests that deep groundwater (e.g. groundwater within the relatively low hydraulic conductivity glacial till unit near the glacial till / bedrock interface) has not been appreciably impacted by PAHs in this area. Given the absence or relatively low concentration of total PAHs in shallow groundwater in the vicinity of monitoring wells SH-21S and SH-22S, it is unlikely that PAHs would be detected above 50 µg/L in deep groundwater in these areas. Further, while monitoring well SH-19D is not located within an area where total PAH concentrations in lower soil samples were elevated, it is located less than 120 feet downgradient of an area where concentrations of total PAHs in lower soil samples exceed 100,000 µg/kg, and where total PAHs were not detected above analytical reporting limits in shallow groundwater. Notably, PAHs were not detected above the analytical reporting limit in groundwater samples collected from monitoring well SH-19D suggesting that deep groundwater has not been appreciably impacted by PAHs on the industrial area east of South Street.

In the industrial area west of South Street, including the AOC, total PAH concentrations in subsurface soils range from approximately 0.1 to 6,400 mg/kg. In general, the distribution of analytes in AOC soils is relatively heterogeneous, presumably reflecting varying historical fill placement. Nevertheless, based on the distribution of PAHs in soil and groundwater, the AOC soils, as well as the areas formerly containing a number of petroleum-related ASTs and USTs in the industrial area west of South Street, appear to be the predominant sources of PAHs in groundwater at the Site.

AVOCs were generally not detected in soil at concentrations above their respective human health or ecological COPC screening levels, with the exception of one soil sample collected from below the groundwater table within the fill unit (from 19 to 23 feet bgs) at SB-53, which generally correlates with detected concentrations of AVOCs in groundwater in the vicinity of this boring. AVOCs detected in groundwater at concentrations exceeding their respective Region IX Tap Water PRGs and USEPA Vapor Intrusion Screening Values consist of BTEX and styrene.

Elevated concentrations of AVOCs (primarily BTEX) were only detected in groundwater samples collected from within the elevated pH plume.

Ratios of the concentrations of total BTEX in groundwater samples collected during the 2003 groundwater sampling round relative to the concentrations of total VOCs (BTEX/VOCs) in groundwater from locations where AVOCs were detected, range from 0.1 to 1, with an average of 0.8 indicating that in general, BTEX dominates the chemical signature of the VOCs. Ratios of the concentrations of benzene and toluene (BT) in groundwater samples collected during the 2003 groundwater sampling round relative to the concentrations of BTEX (BT/BTEX) range from approximately 0.4 to 1.0, with an average of approximately 0.8 for groundwater samples collected from the soil-capped portion of the AOC (SH-01S/D/R, SH-02D/R, SH-03S) and a portion of the downgradient wetland area (SH-04S, SH-15S, WP-06, and WP-07). With the exception of one well (SH-07D with a BT/BTEX ratio of 1.0), the observed BT/BTEX ratios in groundwater samples collected from the asphalt-capped portion of the AOC (wells SH-06S, SH-07S, SH-08D) and two down / sidegradient wells (SH-17D and SH-17R) range from 0.1 to 0.5, with an average of 0.3. These ratios suggest the presence of a lighter petroleum hydrocarbon (e.g., gasoline, naphtha) source in the soil-capped portion of the AOC, and a heavier petroleum hydrocarbon (e.g., diesel, fuel oil) source in the asphalt-capped portion of the AOC. Both lighter and heavier petroleum hydrocarbons were used and stored at the Site at various locations over the long industrial history of the Site. Refer to the EDRA for additional information on petroleum hydrocarbon usage and storage at the Site.

6.2 Analyte Transport and Fate in Groundwater

Conservative solutes dissolved in groundwater (i.e., those not subject to reaction / adsorption with porous media and/or biological decay) will be transported with flowing groundwater by the process of advection at velocities similar to the average groundwater seepage velocity. Since groundwater moves at velocities that are both greater and less than the average groundwater seepage velocity, solute-containing groundwater also travels at differing velocities causing mixing with non-solute-containing groundwater at the leading edge of flow. This mixing is referred to as mechanical dispersion and includes both longitudinal dispersion (i.e., mixing in the direction of the flow path) and transverse dispersion (i.e., mixing in directions normal to the flow path). In addition, solutes will tend to move from areas of greater concentration toward areas of lesser concentration by the process of molecular diffusion as long as a concentration gradient exists.

Since the effects of molecular diffusion and mechanical dispersion cannot be separated in flowing groundwater, the combined effect of these processes is referred to as hydrodynamic dispersion. Transport by hydrodynamic dispersion is typically minor compared to transport by advection; however, hydrodynamic dispersion may account for spreading of solute-containing groundwater in directions other than directly downgradient of a contaminant source area. Hydrodynamic dispersion will tend to lower analyte concentrations by dilution but will not lower overall analyte mass.

Numerous other abiotic and biotic attenuation mechanisms affect solutes dissolved in groundwater and tend to decrease their migration rates, concentrations, and overall mass. Potentially significant abiotic attenuation mechanisms at this Site include sorption/desorption on mineral surfaces or organic matter, ion exchange on clays or other mineral surfaces, oxidation/reduction reactions (many of which are commonly biologically mediated), and dissolution/precipitation. Biodegradation (or biological transformation) is a potentially significant biotic attenuation mechanism for organic analytes at this Site, including potential organo-metallic compounds. The rates and by-products of biodegradation can be highly variable depending on the nature of the analytes present, the species of microorganisms, availability of nutrients, and general groundwater chemistry. However, the presence of elevated pH conditions at the Site may limit/prevent microbial activity since most microorganisms are not able to survive at pH values greater than 9.5 s.u. or less than 4.0 s.u. (Knox et al., 1993).

Sorption is a process in which ions or molecules dissolved in water (solutes) become attached to the surfaces (or near-surface parts) of solid materials, either temporarily or permanently. Thus, solutes in groundwater can be sorbed either to the solid materials that comprise an aquifer or to particles suspended in groundwater. Release of sorbed chemicals to water is termed desorption. For nonionic organic analytes, adsorption typically occurs onto the organic carbon fraction of the aquifer. Ion exchange is a specific type of sorption that occurs when ions attached to the surface of a solid are replaced by ions present in groundwater. Typically, ion exchange occurs on clay surfaces that exhibit a charge deficiency requiring the accumulation of ions near the solid/liquid interface to neutralize the surface charge. Ion exchange occurs when the ions present in solution can more efficiently neutralize the surface charge than those ions already adsorbed to the surface. Sorption by adsorption and/or ion exchange tends to slow or retard the advective velocity at which solutes migrate.

Oxidation/reduction (redox) reactions take place when electrons are exchanged. In these reactions, oxidation (loss of electrons) of certain elements is accompanied by the reduction (gain of electrons) of other elements. Oxidation/reduction reactions may affect the solubility of the participating elements and resulting species/complexes causing increased/decreased concentrations in groundwater depending on redox potential (pE)[50] and pH. Inorganic analytes can occur as many species, the existence and solubility of which is a function of pH and pE. Precipitation reactions result in minerals being formed from ions that are dissolved in water, while dissolution reactions result in ions being released into water by dissolving minerals.

The potential significance of these various attenuation mechanisms with respect to the various analytes present in groundwater at the Site is described in the following subsections as applicable.

[50] Redox potential (pE) is an indication of the tendency of a solution to donate electrons. Solutions with a low redox potential tend to donate electrons; whereas, solutions with a high redox potential would tend to gain electrons.

6.2.1 Elevated pH Conditions

As indicated in Section 6.1.1, DAPL appears to be present within the glacial till and shallow bedrock in the vicinity of the old mill bleachery, and appears to be undergoing dissolution / dilution by ambient groundwater such that the plume emanating from the DAPL has a pH of approximately 12 s.u. Because DAPL is an aqueous phase liquid, it likely occupies most of the pores spaces and fractures in the glacial till and bedrock aquifer, limiting groundwater flow through the DAPL mass. The density contrast between DAPL and ambient groundwater likely inhibits mixing of DAPL and ambient groundwater in a manner similar to that of a salt water / fresh water interface in coastal aquifers. Density contrasts between salt water and fresh water often result in a relatively distinct boundary between salt water and freshwater with a mixing zone (or zone of diffusion) that is relatively thin with respect to the overall thickness of the fresh-water lens (Fetter, 1994). Similarly, we expect that there is a relatively distinct boundary between DAPL and ambient groundwater at the Site with limited mixing between the DAPL and ambient groundwater occurring on the fringes of the DAPL plume.

The downgradient extent of DAPL conditions in the deep and bedrock groundwater appears to be limited, with groundwater in wells approximately 60 to 130 ft sidegradient/downgradient of SH-02D and SH-06D exhibiting pH measurements below DAPL conditions in deep monitoring wells SH-03D, SH-05D, and SH-17D (pH conditions ranging from 7.2 to 10.9 s.u.) and bedrock monitoring wells SH-02R, SH-05R-A, SH-05R-B, SH-06R-A, SH-06R-B, and SH-17R (pH conditions ranging from 6.7 to 10.0 s.u.).

Shallow groundwater exhibits a different pattern in distribution of pH, and DAPL conditions are not observed in shallow groundwater. Elevated pH conditions in shallow groundwater extend down to the groundwater discharge point in the vicinity of the former mill tailrace.

Unlike DAPL, groundwater exhibiting pH measurements less than about 12.5 s.u. has a density and viscosity sufficiently similar to ambient groundwater such that it generally behaves hydraulically similar to ambient groundwater. As such, this elevated pH groundwater will be more strongly influenced by the vertically upward hydraulic gradients between the glacial till and the overlying sand/sand and gravel observed in downgradient portions of the Site than would DAPL exhibiting a relatively higher density. These upward hydraulic gradients induce a vertically upward component of groundwater flow explaining the absence of elevated pH groundwater within the underlying glacial till in downgradient portions of the Site. This is well illustrated by the groundwater contour plan shown on the vertical geologic cross-sections included as Figures 11A and 11B.

6.2.1.1 Potential Attenuation Mechanisms

Although ion exchange and oxidation/reduction reactions may result in some attenuation of the pH observed in groundwater at the Site, the effects of these processes are anticipated to be limited considering the extremely elevated pH conditions observed within the plume of elevated pH and the mass of sodium hydroxide source material potentially present in the subsurface.

Therefore, the primary attenuation mechanisms for the elevated pH conditions observed at the Site are considered to be dissolution/dilution of the sodium hydroxide as DAPL by ambient groundwater; and dilution of the elevated pH plume emanating from the DAPL by infiltrating precipitation, lower pH groundwater, and, ultimately, surface water. Further evaluation of dissolution/dilution of DAPL by ambient groundwater is discussed below in association with the estimation of analyte flux.

6.2.1.2 Transport Velocities and Travel Times

Since groundwater exhibiting pH measurements less than about 12.5 s.u. will behave hydraulically similar to ambient groundwater, and sodium hydroxide mass attenuation/removal mechanisms are considered relatively insignificant, the migration of elevated pH conditions (i.e., transport of sodium hydroxide mass) is anticipated to be relatively conservative and at similar rates to the average groundwater seepage velocity. A primary flowpath[51] for elevated pH groundwater emanating from the DAPL source area appears to be within the glacial till from near deep overburden well SH-06D to a distance about one-half way between well SH-06D and well couplet SH-05S/D (approximately 65 ft from SH-06D), then within the shallow overburden to the discharge area in the vicinity of the former mill tailrace, approximately 150 ft downgradient of SH-05S (approximately 215 ft in shallow overburden). This results in a total flowpath length of about 280 ft from the downgradient extent of DAPL conditions to the discharge area. This flow path is illustrated on Figure 11B.

As indicated in Section 4.0, assuming an average (geometric mean) hydraulic conductivity for the glacial till of 0.39 ft/day, an average horizontal hydraulic gradient of 0.016 ft/ft for the deep overburden groundwater, and a porosity of 0.20 for the glacial till yields an average horizontal seepage velocity within the glacial till of approximately 0.03 ft/day or approximately 11 ft/yr. This seepage velocity implies an advective travel time of about 5.7 years for elevated pH groundwater (i.e., less than 12.5 s.u.) emanating from the downgradient extent of the DAPL to travel within the glacial till to about half the distance between SH-06D and SH-05S, about where groundwater is anticipated to discharge from the glacial till into the overlying sand/sand and gravel under the influence of vertically upward hydraulic gradients and the downward dipping morphology of the glacial till. Notably, comparing this transport rate to the likely 20 to 57 year-old emplacement of DAPL, indicates that the pH conditions observed in the glacial till are likely well evolved (at steady-state), and that the pH of the groundwater in the glacial till downgradient of the DAPL source area is unlikely to substantially increase in the future.

Transport velocities for groundwater exhibiting elevated pH within the shallow overburden (i.e., fill and sand/sand and gravel) are anticipated to be significantly higher than those within the glacial till based on the higher hydraulic conductivity values estimated for the shallow

[51] Soil pH measurements collected during installation of monitoring wells and soil borings downgradient of SH-06D suggest that some residual pH impacts remain within the glacial till downgradient of SH-06D. However, groundwater elevation measurements and groundwater analytical data suggest that the majority of groundwater traveling along this flowpath discharges from the glacial till unit to the sand and gravel unit in this general vicinity.

overburden. As indicated in Section 4.0, the average hydraulic conductivity values estimated for the shallow saturated overburden materials present at the Site are approximately 17 ft/day for the fill materials and 5.2 ft/day for the sand/sand and gravel. The average saturated thicknesses of these individual units from wells in the presumed flow path of groundwater in this area (wells SH-05S, SH-15S, and SH-26S) are about 2.7 ft for the fill materials and 13.7 ft for the sand/sand and gravel. Based on these average (geometric mean) hydraulic conductivity values and saturated thicknesses, an effective hydraulic conductivity of about 7.2 ft/day is estimated for the shallow saturated overburden in the vicinity of the elevated pH groundwater plume using the following relationship:

$$K_{eff} = \sum_i \frac{K_i b_i}{b_T}$$

where:

K_{eff}	=	Effective hydraulic conductivity of overburden soils;
K_i	=	Average hydraulic conductivity of stratigraphic unit i;
b_i	=	Average saturated thickness of stratigraphic unit i; and
b_T	=	Total saturated thickness.

Assuming an effective hydraulic conductivity value of 7.2 ft/day, an average horizontal hydraulic gradient of 0.019 ft/ft for the shallow overburden groundwater, and a porosity of 0.30 yields an average horizontal seepage velocity within the shallow overburden of approximately 0.46 ft/day or approximately 170 ft/yr. This seepage velocity implies an advective travel time of about 1.3 years for elevated pH groundwater to travel within the shallow overburden from a point half the distance between SH-06D and SH-05S to the discharge area in the vicinity of the former mill tailrace.

Based on the foregoing, a total travel time of approximately 7 years is estimated for elevated pH groundwater emanating from the downgradient extent of the DAPL to reach the discharge area in the vicinity of the former mill tailrace. Given the potential length of time that DAPL may have been present in the subsurface (i.e., up to about 57 years), this travel time estimate is consistent with the presence of elevated pH conditions in the vicinity of the former mill tailrace, and implies a currently steady-state scenario.

6.2.1.3 Estimation of Analyte Mass Flux

In general, analyte flux is estimated by first calculating the volume of groundwater passing through a cross-sectional area per unit of time, and then multiplying this volumetric flux by the concentration of the analyte in groundwater. Estimation of the analyte mass flux in Site groundwater requires establishing a reference flow-through cross-sectional area. The hypothetical cross-sectional area selected for this Site is between wells SH-04S and SH-16S, which is approximately 225 ft wide (slightly greater than the maximum width of sodium hydroxide plume as currently defined) by an average saturated shallow overburden thickness of

16.5 feet. This hypothetical cross-sectional area (area *"A"*) is downgradient of the known and suspected source areas, but upgradient of potential receptors, namely the former mill tailrace area. Given the general co-location of elevated concentrations of inorganic and organic analytes with elevated pH conditions, this is an appropriate cross-sectional area for estimating mass fluxes of inorganic and organic analytes as well.

Assuming an effective hydraulic conductivity of 7.2 ft/day for the shallow saturated overburden and an average horizontal hydraulic gradient of approximately 0.019 ft/ft results in a total groundwater flux of approximately 510 ft^3/day through the selected reference flow-through cross-sectional area using the following relationship:

$$Q = K_{eff}\, i_h\, A$$

where:

Q	=	Volumetric discharge;
K_{eff}	=	Effective hydraulic conductivity of shallow overburden soils;
i_h	=	Average horizontal hydraulic gradient; and
A	=	Cross-sectional area.

Assuming that the average pH of the groundwater passing through the reference flow-through cross-sectional area is 11.7 s.u. (based on the average pH of wells SH-04S, SH-05S, SH-15S, SH-26S, WP-06, and WP-07), yields a mass flux of sodium hydroxide on the order of 6.4 lbs/day (2,900 grams/day). Using this mass flux rate, the sodium hydroxide plume could persist in excess of 170 years based on the mass of sodium hydroxide estimated from the extent of observed DAPL, as noted in Section 6.1.1. Migration of groundwater across area *A* at an average pH less than 11.7 s.u., and/or the presence of more DAPL than estimated in Section 6.1.1, are both considered possible. These uncertainties imply that the plume of elevated pH could potentially persist in excess of 170 years.

It is noted that the above analysis focuses on transport in shallow groundwater. This is deemed reasonable on the basis that there are very few elevated concentrations of analytes in deep groundwater downgradient of area *A*. Further, the hydraulic conductivity of the glacial till is about 20 times lower than that of the overlying soils rendering additional mass flux through the glacial till comparatively small.

6.2.2 Inorganic Analytes

As mentioned above, the primary inorganic analytes present in groundwater at concentrations above the USEPA Region IX Tap Water PRGs are metals including aluminum, antimony, arsenic, chromium, copper, iron, manganese, lead, nickel, and vanadium. With the exception of iron, manganese, and lead the distribution of these metals in groundwater at the Site appears to be controlled, at least in part, by the distribution of elevated pH conditions in groundwater mobilizing these metals, which are present in fill soils or naturally-occurring soils. The

distribution of iron and manganese in groundwater may be primarily controlled by oxidation state, with pH potentially as a secondary control. The distribution of lead appears primarily correlated with elevated lead levels in soils.

To a lesser extent, the distribution of metals in groundwater may also be influenced by the distribution of alkalinity in groundwater. A review of Appendix Figure K-35 (alkalinity versus pH), indicates a general trend of increasing alkalinity at a pH of approximately 5 to 8 or 9 s.u., relatively constant alkalinity at pHs of approximately 8 or 9 to 12 s.u., and an approximately linear increase in alkalinity with pHs above approximately 12 s.u. The general shape of this curve is thought to represent: an increase in total dissolved carbonate species (i.e., $H_2CO_3 + HCO_3^- + CO_3^{-2}$) and/or disassociation of carbonic acid (H_2CO_3) to bicarbonate (HCO_2^-) at a pH range below approximately 8 or 9 s.u.; a relatively constant total dissolved carbonate species (and alkalinity) concentration in the mid-pH range, with bicarbonate dissociating to carbonate; and, in the pH range above approximately 12 s.u., the dissolved carbonate species are present predominately to essentially totally as carbonate, and the linear increase in alkalinity with pH (with a slope of approximately 1 to 1 log alkalinity to pH) is due to the increase in hydroxide concentration, with a relatively constant carbonate concentration.

In the pH range of approximately 8 or 9 to 12 s.u., total alkalinity is relatively constant; however, the concentration of carbonate is increasing relative to bicarbonate (and the concentration of hydroxide is still relatively low). In this pH range, carbonate complexes may have some contribution to increased metal solubility. However, at pH above approximately 12 s.u., essentially all of the dissolved carbonate species in groundwater are present as carbonate (and hence there is no apparent mechanism for producing more carbonate), and the increase in alkalinity with pH is presumed to be due to increasing hydroxide concentration; hence in this pH range, hydroxide complexing is thought to predominate over carbonate complexing as the cause of observed increase of metal concentrations in groundwater.

Plots of measured concentrations of individual metals (logarithmic scale) versus recorded pHs were reviewed. These plots of individual metals versus pH are included as Appendix Figures K-11 through K-34. Although readily discernable trends were not apparent for the concentrations of lead, iron, and manganese as a function of pH, the following trends were noted:

- At pHs greater than about 11.5 s.u., for every unit increase in pH there appears to be an approximately one order of magnitude increase in the corresponding aluminum concentration;

- At pHs greater than about 12.0 s.u., for every unit increase in pH there appears to be an approximately one-half order of magnitude increase in the corresponding antimony concentration;

- At pHs greater than about 8 s.u., for every unit increase in pH there appears to be an approximately one-half order of magnitude increase in the corresponding arsenic concentration;

- At pHs greater than about 11.5 s.u., for every unit increase in pH there appears to be an approximately one-half order of magnitude increase in the corresponding chromium concentration;

- At pHs greater than about 11 s.u., for every unit increase in pH there appears to be an approximately one-half order of magnitude increase in the corresponding copper concentration;

- At pHs greater than about 11.0 s.u., for every unit increase in pH there appears to be an approximately one-half order of magnitude increase in the corresponding nickel concentration; and

- At pHs greater than about 9.0 s.u., for every unit increase in pH there appears to be an approximately one-half order of magnitude increase in the corresponding vanadium concentration.

As discussed in the preceding sections, data show that the plume of elevated pH is sourced by the dissolution/dilution of DAPL and that the plume is likely migrating conservatively. If the dissolution/dilution of the DAPL, which typically exhibits the most elevated metals concentrations, was also the primary source of the elevated concentrations of metals observed in the downgradient plume of elevated pH and the metals were migrating conservatively (and assuming dilution alone), then the observed metal concentrations would exhibit an order of magnitude decrease with every unit decrease in pH. As indicated above and depicted as Appendix Figures K-11 through K-34, although this relationship is observed for aluminum, the remaining metals showing a discernable trend with pH (i.e., antimony, arsenic, chromium, copper, nickel, vanadium) exhibit somewhat less than one order of magnitude decreases in concentration with unit decreases in pH. This observation supports that these metals are not behaving conservatively (and dilution is not the only mechanism at work), and suggests that additional metals are being dissolved in groundwater along the flowpath of the elevated pH plume, likely from residually-contaminated fill soils as well as, from naturally-occurring soils.

6.2.2.1 Potential Attenuation Mechanisms

Metals can be present in groundwater as several species depending on environmental conditions (e.g., pH, pE), and as these conditions change, the metal speciation may change as well. As the metal speciation changes, the significance of potential attenuation mechanisms changes as well. Most metals generally occur in solution as cations (e.g. Pb^{2+}, Cu^{2+}, Ni^{2+}), the hydroxides of which generally become increasingly insoluble as the pH increases in the range of approximately 8 to 10 s.u. However, many of these metal hydroxides have solubility minima at pHs ranging from 8 to 12 (Knox et al., 1993), above which the solubility of the metal hydroxides increase. The increase in solubility is typically due to the formation of metal hydroxide complexes. At near-neutral pHs, the solubility of most metals (i.e., present as cations in solution) is limited by precipitation as, or co-precipitation with, an oxide, hydroxide, carbonate or phosphate mineral, or by sorption to hydrous metal oxides, clay, or organic matter. However, higher valency (e.g.,

three positive charges or more) metals (e.g., arsenic, chromium, vanadium) are commonly in solution as oxyanions (e.g., AsO_4^{3-}, CrO_4^{3-}), which tend to become less strongly sorbed as the pH increases, and therefore may be relatively mobile depending on redox conditions (Allen et al., 1993).

Sorption by ion exchange on clays or other mineral surfaces, oxidation/reduction reactions (potentially biologically mediated at pHs closer to neutral), and dissolution/precipitation are identified as potentially significant attenuation mechanisms at this Site. These processes are generally reversible, dependent on pH and/or pE, and may retard the rate at which metals are transported in groundwater. Biodegradation of organo-metallic compounds (if present) may be a potential biotic attenuation mechanism for metals at the Site; however, as previously mentioned, the presence of significantly elevated pH conditions at the Site may limit/prevent microbial activity.

As mentioned above, plots of measured concentrations of individual metals (logarithmic scale) versus recorded pHs suggest that for several metals (i.e., arsenic, chromium, copper, nickel, vanadium) additional mass is being added along the flowpath of the elevated pH plume rather than being removed. Hence, from the perspective of overall analyte mass transport, despite potentially operative analyte attenuation mechanisms, the mass of metals in groundwater does not decrease along the groundwater flow path.

6.2.2.2 Transport Velocities and Travel Times

Given the relative abundance of hydroxide (i.e., elevated pH conditions), most metals present at elevated concentrations in groundwater at the Site are likely in the form of hydroxide complexes, and may be expected to behave similar to anions. As such, their transport in groundwater is anticipated to be relatively unretarded, similar to sodium hydroxide. Therefore, as discussed in Section 6.2.1.2 above, transport velocities for metals migrating within shallow overburden groundwater (i.e., within the fill and sand/sand and gravel) are assumed to be similar to or somewhat less than the groundwater seepage velocity within the shallow overburden (approximately 170 ft/yr). Similarly, transport velocities for metals migrating within deep overburden groundwater (i.e., within the glacial till) are assumed to be similar to or somewhat less than the groundwater seepage velocity within the glacial till (approximately 11 ft/yr). Accordingly, similar travel times to those calculated for elevated pH groundwater emanating from the downgradient extent of DAPL to discharge in the vicinity of the former mill tailrace are assumed for metals migrating along this flowpath (i.e., about 7.0 years).

6.2.2.3 Estimation of Inorganic Analyte Mass Flux

Given the general correlation of elevated metals concentrations with elevated pH and the limited groundwater flux anticipated through the glacial till due to its limited hydraulic conductivity, the same reference flow-through cross-sectional area assumed for the estimation of the sodium hydroxide flux has been assumed for the estimation of the metals mass fluxes. A total groundwater flux of approximately 510 ft^3/day through the selected reference flow-through

cross-sectional area *A* was estimated in Section 6.2.1.3. For concentrations of individual metals in the groundwater, we have assumed the average concentration (of the maximum observed concentration from the three groundwater sampling rounds, as applicable) of those recorded at wells SH-04S, SH-05S, SH-15S, SH-26S, WP-06, and WP-07 (in instances where individual metals were not detected, one-half of the analytical laboratory reporting limited was used). The concentrations of metals observed in groundwater from these wells are considered representative of those within the plume of elevated pH migrating within the shallow overburden through the reference flow-through cross-sectional area and ultimately discharging in the vicinity of the former mill tailrace.

The estimated inorganic analyte mass fluxes are:

Analyte	Average Concentration (µg/L)	Estimated Flux	
		Pounds/Day	Grams/Day
Aluminum	3,700	0.1	50
Antimony	1.3	0.00004	0.02
Arsenic	38	0.001	0.6
Chromium	11	0.0004	0.2
Copper	53	0.002	0.8
Iron	3,700	0.1	50
Lead	45	0.001	0.6
Manganese	170	0.005	2
Nickel	21	0.0007	0.3
Vanadium	120	0.004	2

6.2.3 Organic Analytes

As mentioned above, the primary organic analytes in groundwater that are likely related to historic Site activities are PAHs and AVOCs (primarily BTEX). BTEX compounds generally represent greater than 80% of the detected VOCs at the Site, while the lighter molecular weight PAHs (i.e., naphthalene and 2-methylnaphthalene) typically account for greater than 85% of the total PAH concentration where elevated PAHs (greater than 50 µg/L) are detected. The presence of elevated concentrations of PAHs and AVOCs is correlated with the presence of elevated pH conditions in groundwater. Based on solubility and soil/water partitioning characteristics of these analytes, migration with flowing groundwater is considered a relatively more significant transport mechanism for BTEX and lighter molecular weight PAHs than for the heavier molecular weight PAHs, which tend to be relatively insoluble and are typically more strongly sorbed to soil.

While elevated pH and the presence of organic analytes appear co-located at the Site, it is not considered likely that the sodium hydroxide is somehow directly correlated with the distribution of organic analytes. To test this concept further, plots of measured concentrations of total PAHs, selected individual PAHs (e.g., naphthalene and 2-methylnaphthalene), total BTEX, and

individual BTEX compounds (logarithmic scale) versus recorded pH measurements are provided as Appendix Figures K-40 and K-48. In general, as depicted on Appendix Figures K-40 and K-48, the concentrations of both PAHs and BTEX exhibit somewhat less than one order of magnitude decreases in concentration with unit decreases in pH. This observation supports that these organic analytes are not behaving conservatively, and suggests that additional organic analytes are being dissolved in groundwater along the flowpath of the elevated pH plume, likely from the presence of these constituents as residuals in fill materials and in limited locations in native soil (i.e., in and around borings UST-5 and UST-6).

6.2.3.1 Potential Attenuation Mechanisms

Potentially significant organic analyte attenuation mechanisms include sorption and biodegradation. In general, adsorption of organic solutes is most significant onto organic carbon. The mechanism of adsorption tends to slow or retard the advective velocity at which organic solutes migrate. In general, BTEX compounds are less sorbed than PAHs, and therefore more mobile in the subsurface. Of the BTEX compounds present at the Site, benzene would tend to be the least sorbed to organic carbon, while ethylbenzene and xylenes would tend to be the most sorbed based on soil/water partitioning coefficients presented in Fetter (1999). Similarly, of the PAHs present at the Site, naphthalene would tend to be the least sorbed to organic carbon, while the heavier PAHs would tend to be more strongly sorbed.

Studies on the biodegradation of AVOCs, typically focusing on BTEX, indicate that these VOCs are readily degraded in aerobic environments (Verschueren, 1983; Caldwell et al, 1992; Tucker and Zavala, 1992). These AVOCs also appear to be amenable to degradation under anaerobic conditions with toluene being the most rapidly degraded, and benzene and ortho-xylene being relatively recalcitrant (Hutchins et al, 1991; Hilton et al, 1992). Lighter weight PAHs also appear to be amenable to biodegradation under aerobic conditions, but more recalcitrant under anaerobic conditions (Fetter, 1999). The heavier molecular weight PAHs are relatively resistant to biodegradation (Knox et al, 1993).

Quantitatively assessing the potential significance of sorption and biodegradation in retarding the rate at which organic analytes are migrating at the Site is complicated by the heterogeneous distribution of organic analytes in AOC soils and other fill materials present at the site; and the number, contents, and period of usage of the petroleum-related ASTs and USTs in the industrial area west of South Street. These potential organic analyte sources are not well defined and may exhibit a range in chemical compositions, strengths, and persistence.

A qualitative assessment of the sorption and biodegradation at the Site suggests that at least for the lighter molecular weight organic analytes, sorption and biodegradation may not be highly significant attenuation mechanisms based on the following observations:

- The presence of organic analyte ‘chemical signatures’ and relative proportions in downgradient wells (SH-04S, SH-05S, SH-15S, SH-26S, WP-06, and WP-07) similar to

more upgradient near-source wells suggests a lack of significant retardation and/or biodegradation.

- BTEX and PAHs, including those that are typically relatively immobile, have been detected in downgradient areas at elevated concentrations suggesting a lack of significant retardation and/or biodegradation relative to the rate of groundwater flow and the passage of time since release of these analytes.

- If the dissolution/dilution of the DAPL, which typically exhibits the most elevated organic analyte concentrations, was the primary source of the elevated concentrations of the organic contamination observed in the downgradient plume of elevated pH, and the organic analytes were migrating conservatively (and assuming dilution alone), then the observed concentrations of organic analytes would exhibit an order of magnitude decrease with every unit decrease in pH (each pH unit decrease representing one order of magnitude concentration decrease). The concentrations of BTEX and PAHs exhibit somewhat less than one order of magnitude decreases in concentration with unit decreases in pH. This observation suggests that additional organic analytes are being dissolved in groundwater along the flowpath of the plume of elevated pH rather than being attenuated by sorption or biodegradation.

- The presence of elevated hydroxide (OH-) concentrations (i.e., elevated pH conditions), may compete with the organic analytes for sorption sites and may limit/prevent biodegradation since most microorganisms are not able to survive at pH values greater than 9.5 s.u. or less than 4.0 s.u. (Knox et al., 1993).

- DO measurements in groundwater from numerous monitoring wells within the area of contaminated groundwater indicate generally very low DO values (typically <1 mg/L) and nitrate is generally not detected in groundwater. The oxygen depletion and absence of nitrate suggest that essentially all of the available oxygen and nitrate (if present initially) has been depleted. These anoxic and nitrate-poor conditions may further limit the potential for biodegradation of AVOCs and PAHs.

- TKN is observed sporadically at low concentrations in groundwater from numerous monitoring wells within the area of contaminated groundwater, and sulfate is generally present. The generally low to non-detected levels of TKN, and general presence of sulfate suggest that biodegradation, if occurring at all, could be nutrient limited, or limited due to inefficient use of sulfate as an oxidant in the biodegradation of the organic analytes.

With regard to higher molecular weight organic analytes for which at least sorption could be more significant, concentrations are so low in groundwater that further quantification of this is not deemed warranted.

6.2.3.2 Transport Velocities and Travel Times

In the absence of significant attenuation mechanisms, transport velocities and travel times for the lighter molecular weight organic analytes at the Site will be similar to those presented for the inorganic analytes in Section 6.2.2.2. relative to the rate of groundwater flow, and the likely age of the release (over 20 years, and likely considerably longer). Specifically, transport velocities for lighter molecular weight AVOCs and PAHs migrating within shallow overburden groundwater are assumed to be similar to or somewhat less than the groundwater seepage velocity within the shallow overburden (approximately 170 ft/yr), while transport velocities for lighter molecular weight AVOCs and PAHs migrating within deep overburden groundwater are assumed to be similar to or somewhat less than the groundwater seepage velocity within the glacial till (approximately 11 ft/yr). Accordingly, similar travel times to those calculated for elevated pH groundwater emanating from the downgradient extent of DAPL to discharge in the vicinity of the former mill tailrace are assumed for AVOCs and PAHs migrating along this flowpath as well (i.e., about 7 years).

It is noted that we have included higher molecular weight organic analytes (PAHs) in this analysis in spite of the likely greater relative retardation by sorption of PAH analytes with molecular weights greater than 2-methylnaphthalene. As noted above, concentrations of these analytes in groundwater are notably very limited and further refinement of this analysis for these heavier molecular weight analytes is therefore not deemed warranted.

6.2.3.3 Estimation of Analyte Mass Flux

Given the general co-location of elevated AVOC and PAH concentrations with elevated pH, and the limited groundwater flux anticipated through the glacial till due to its limited hydraulic conductivity, the same reference flow-through cross-sectional area *A* assumed for the estimation of sodium hydroxide flux has been assumed for the estimation of the AVOC and PAH mass fluxes. A total groundwater flux of approximately 510 ft^3/day through the selected reference flow-through cross-sectional area was estimated in Section 6.2.1.3. For concentrations of individual AVOCs and PAHs in the groundwater, we have assumed the average concentration (of the maximum observed concentration from the three groundwater sampling rounds, as applicable) of those recorded at wells SH-04S, SH-05S, SH-15S, SH-26S, WP-06, and WP-07 (in instances where individual AVOCs or PAHs were not detected, one-half of the analytical laboratory reporting limited was used). The concentrations of AVOCs and PAHs observed in groundwater from these wells are considered representative of those within the plume of elevated pH migrating within the shallow overburden through the reference flow-through cross-sectional area and ultimately discharging in the vicinity of the former mill tailrace.

The estimated organic analyte mass fluxes are:

Analyte	Assumed Average Concentration (µg/L)	Estimated Flux	
		Pounds/Day	Grams/Day
Benzene	11	0.0004	0.2
Toluene	14	0.0004	0.2
Ethylbenzene	7.3	0.0002	0.1
m,p-Xylene	10	0.0003	0.2
o-Xylene	6.7	0.0002	0.1
Styrene	5.7	0.0002	0.08

Analyte	Assumed Average Concentration (µg/L)	Estimated Flux	
		Pounds/Day	Grams/Day
Acenaphthene	7.3	0.0002	0.1
Acenaphthylene	2.6	0.00008	0.04
Benzo[a]anthracene	0.25	0.000008	0.004
Benzo[a]pyrene	0.16	0.000005	0.002
Benzo[b]fluoranthene	0.15	0.000005	0.002
Dibenz[a,h]anthracene	0.033	0.000001	0.0005
Fluorene	4.8	0.0002	0.07
2-Methylnaphthalene	28	0.0009	0.4
Naphthalene	82	0.003	1
Phenanthrene	10	0.0003	0.1
Pyrene	1.7	0.00006	0.03

6.3 Analyte Sources, Transport and Fate in Surface Water

As discussed in Section 2.6.3, SHA established six Site surface water sampling locations over the length of Neponset River as it runs through the Site and the former mill tailrace. Locations SW-102 and SW-103 are located upstream of the AOC and primary areas of contaminated groundwater. Stations SW-106 and SW-107, and to a considerably lesser degree SW-105, are located within the area considered to be a primary discharge zone for groundwater migrating across the Site, with SW-106 and SW-107 located within the former mill tailrace. SW-108 is located generally downstream of the presumed groundwater discharge zone. In addition, five surface water reference locations (designated SWR-1 through SWR-5) were established upstream of the Site in the Neponset River between the Blackburn and former Union Dams to provide background concentrations for comparison.

A principal zone for Site groundwater discharge appears to be the former mill tailrace area near SW-106 and SW-107. As mentioned in Section 4.0, the stretch of the Neponset River upstream of SW-105 to the point where it discharges from the aluminum culvert appears to be losing (i.e., groundwater is recharged by the Neponset River), and as such, is not anticipated to receive

discharge of analytes in groundwater related to historic Site activities. The area in the vicinity of SW-105 appears to be a losing stream, at least seasonally.

In general, once Site analytes enter the surface environment, they will tend to be transported and dispersed with surface water and sediment, and may be incorporated into biomass, which may result in changes in the chemical state of the analytes. Organic analytes will tend to be degraded by biological activity, and abiotic processes including photolysis. AVOCs will tend to exhibit relatively rapid attenuation once in the surface environment due to volatilization into the atmosphere. Inorganic analytes (i.e., metals) present in the surface environment generally tend to occur as metal hydroxides at pHs above 8 s.u.; whereas, in neutral to slightly acidic aqueous solutions, such as those observed in the Neponset River, metals generally occur as metal sulfides (Knox et al., 1993).

6.3.1 Elevated pH Conditions

As discussed in Section 5.0, surface water pH measurements were recorded at each sampling location on three separate occasions: March 2001, April 2001, and August 2001. In general, pH measurements made during the August sampling round were higher than those made in March and April, likely reflecting the much lower flow conditions observed in the Neponset River at that time. As discussed in Section 4.0, streamflow measurements recorded at SG-108 in April 2001 indicated a discharge of approximately 55 cfs, while those recorded in August 2001 indicated a discharge of approximately 3.8 cfs. As discussed in Section 4.0, based on drainage basin calculations, the average discharge at SW-108 was estimated to be approximately 15 cfs.

Elevated pH measurements were not observed at sampling locations upstream and downstream of the anticipated groundwater discharge zone. Surface water pH measurements recorded at upstream locations SW-102 and SW-103 ranged from 6.2 to 7.2 s.u., while those at downstream location SW-108 ranged from 6.3 to 7.0 s.u. These pH measurements are generally consistent with those recorded at the five surface water reference locations upstream of the Site, which ranged from 5.5 to 7.0 s.u.

Under the low streamflow conditions observed in August 2001, a slightly elevated pH measurement (8.4 s.u.) was recorded in surface water from SW-105, which is located within the anticipated groundwater discharge zone. Surface water pH measurements recorded at this location in March (7.5 s.u.) and April (6.9 s.u.) 2001, under higher flow conditions, were generally similar to those measured at the upstream and downstream locations.

Surface water pH measurements recorded at SW-106 and SW-107, located within the former mill tailrace, exhibited elevated pH measurements, generally greater than 8 s.u. The highest pH measurements, ranging from 9.3 to 10.0 s.u., were measured in surface water from the furthest upstream sampling station in the former mill tailrace (SW-106).

The elevated pH measurements recorded at SW-106 and SW-107, and the slightly elevated pH measurements recorded at SW-105 on one occasion are consistent with the discharge of elevated

pH groundwater in the vicinity of the former mill tailrace. However, the extent of impact within the Neponset River appears limited as evidenced by the neutral to slightly acidic pH measurements recorded at SW-108, approximately 150 feet downstream of the former mill tailrace. In addition, the highest pH measurements recorded within the former mill tailrace (i.e., up to 10 s.u.) are approximately two standard pH units lower than the those observed in the plume emanating from the sodium hydroxide (DAPL) source just upgradient of this area.

The pH effect of sodium hydroxide in surface water may be naturally reduced by the absorption of atmospheric carbon dioxide and buffering capacity of the carbonic acid/bicarbonate/carbonate system, the buffering capacity of other dissolved and particulate constituents, and precipitation (e.g., of carbonates, magnesium hydroxide, etc.). This reduction is also effected by dilution with water. There is no degradation of sodium hydroxide in waters, only loss by precipitation or through chemical buffering/neutralization. Given the limited streamflow observed in the former mill tailrace, dilution/neutralization observed within the former mill tailrace is anticipated to be primarily associated with slightly acidic precipitation, absorption of atmospheric carbon dioxide and buffering capacity of carbonates, and overland surface water flow reaching the former mill tailrace. Within the Neponset River, dilution and buffering may be the primary pH-reducing factors. A total flux of approximately 510 cubic feet per day (ft^3/day) of elevated pH groundwater was estimated in Section 6.2.1.3, which is approximately 0.011% of the streamflow measured at SW-108 in April 2001 (55 cfs) and approximately 0.15% of that measured under low flow conditions in August 2001 (3.8 cfs). This suggests a dilution factor on the order of 650 to 9,300, which data indicate is sufficient to effectively dilute/neutralize the elevated pH of the surface waters within the former mill tailrace as it discharges to the Neponset River.

6.3.2 Inorganic Analytes

As mentioned in Section 5.0, surface water samples were collected from the six Site surface water sampling locations and the five surface water reference locations on two separate occasions under relatively high streamflow conditions (April 2001) and relatively low streamflow conditions (August 2001). The samples were analyzed for both dissolved and total metals, and asbestos. In general, the concentrations of total and dissolved metals observed within the Neponset River from Site surface water sampling locations (SW-102, SW-103, SW-105, and SW-108) were consistent with those concentrations observed at the five reference locations. However, under low flow conditions in August 2001, dissolved iron was detected in surface water at SW-105 at a concentration slightly exceeding the human health and ecological COPC screening levels, which is consistent with SW-105's location within the anticipated groundwater discharge zone.

The general absence of elevated concentrations of inorganic analytes within the Neponset River is consistent with dilution factors presented in the preceding section. An analysis of groundwater discharge to surface water is presented in Section 6.3.4. In addition, these metals may also be adsorbed or precipitated in neutral to slightly acidic aqueous solutions such as those observed in the Neponset River.

Surface water samples collected from the former mill tailrace (SW-106 and SW-107) exceeded the range of background concentrations represented by the surface water samples upstream in the Neponset River, as well as applicable human health or ecological COPC screening levels for a number of dissolved and total metals, including dissolved and total aluminum, dissolved and total arsenic, dissolved and total barium, total chromium, total cobalt, dissolved and total copper, dissolved and total iron, dissolved and total lead, dissolved and total manganese, total nickel, dissolved and total vanadium, and total zinc. The presence of elevated concentrations of metals in the former mill tailrace is consistent with the assertion that this feature is currently the primary discharge area for groundwater from the Site. However, the presence of metals at elevated concentrations in monitoring well SH-04S may indicate groundwater discharges to the Neponset River in this location seasonally, or that prior to construction of the culvert and asbestos Removal Action activities, groundwater formerly discharged to the Neponset River upstream of the former mill tailrace.

As discussed in Section 5.0, asbestos fibers longer than 10 µm were also detected in surface water samples collected from the two sampling stations located within the former mill tailrace (SW-106 and SW-107). Asbestos fibers present in the samples from SW-106 and SW-107 were primarily identified as chrysotile. Given its proximity to historical sources of asbestos at the Site, the presence of asbestos in the former mill tailrace is attributed to historical (pre-RA) overland flow from these historical Site sources. Chrysotile asbestos may be soluble in acidic waters, but is generally stable in alkaline waters such as those present at the Site[52]. Asbestos fibers are generally inert and are not considered to undergo significant chemical transport or degradation, so they will tend to settle from water and be deposited in sediment, and persist in the environment for long time periods.

Low concentrations of asbestos fibers longer than 5 µm identified as chrysotile / tremolite were detected in surface water from one surface water sampling location within the Neponset River (SW-105) during the April sampling round. Asbestos fibers of any length were not present in surface water from this location during the August sampling round. In addition, asbestos fibers longer than 5 µm identified as chrysotile were detected in surface water from two Neponset River reference locations during the April sampling round. Asbestos fibers of any length were not present in surface water from these two locations during the August sampling round. Given the similarities in concentrations, type, and occurrence of asbestos at locations upstream of SW-105, Site-related asbestos impacts to the Neponset River surface water currently are considered limited, if present at all.

6.3.3 Organic Analytes

The presence of PAHs at concentrations in excess of applicable human health or ecological COPC screening levels in surface water was limited to those sampling locations within the former mill tailrace (SW-106 and SW-107). The presence of elevated concentrations of PAHs in the former mill tailrace is consistent with the conclusion that this feature is the primary discharge

[52] http://www.sante.gouv.fr/amiante/connaitre/sciences/rapportc2.htm

area for groundwater from the Site. However, the presence of PAHs and VOCs at relatively high concentrations in monitoring well SH-04S may indicate groundwater discharges to the Neponset River in this location seasonally, or that prior to construction of the culvert and asbestos Removal Action activities, groundwater formerly discharged to the Neponset River upstream of the former mill tailrace.

Although the individual PAHs present within the former mill tailrace are generally consistent with those present in groundwater at concentrations above human health or ecological COPC screening levels, the concentrations of lighter molecular weight PAHs (i.e., naphthalene and 2-methylnapthalene) relative to total PAHs are much lower, generally below 0.2. In general, the lighter molecular weight PAHs are more volatile, and more susceptible to degradation by biological activity and abiotic processes including photolysis than are the heavier molecular weight PAHs.

Dilution accounts for significantly reduced concentrations of PAHs in surface water relative to groundwater. This is evidenced by the absence of PAHs at concentrations above human health or ecological COPC screening levels at SW-108, approximately 150 feet downstream of the former mill tailrace. A groundwater discharge to surface water dilution analysis is presented in Section 6.3.4. It is also noted that several PAHs were detected at concentrations below applicable human health or ecological COPC screening levels in surface water from the upstream Neponset River reference locations. Similarities in the types and concentrations of PAHs at these upstream locations with those observed at SW-108 suggest that PAH impacts to the Neponset River surface water related to Site activities are limited, if present at all.

AVOCs were not detected above the analytical reporting limit in surface water. The absence of AVOCs in surface water is consistent with their tendency to exhibit relatively rapid attenuation once in the surface environment due to volatilization into the atmosphere.

6.3.4 Groundwater Discharge to Surface Water Dilution Analysis

Surface water human health and ecological COPC screening levels for individual metals, AVOCs, and PAHs were compared to concentrations estimated based on contaminated groundwater discharging to and mixing with surface water in the Neponset River. In this analysis, the analyte mass flux of groundwater is assumed to be diluted by the Neponset River without loss of analyte mass (e.g., by precipitation, adsorption onto sediments), and Neponset River surface water is assumed to contain no analytes prior to mixing with the groundwater. It is noted that this analysis also ignores loss of analyte mass to the former mill tailrace area, which is considered a conservative assumption since organic analytes are anticipated to volatilize and adsorb to sediments in the mill tailrace, and inorganic analytes are anticipated to precipitate within the mill tailrace as pH is neutralized.

As discussed in Section 4.0, the average discharge at SW-108 was estimated to be approximately 15 cfs. Under higher streamflow conditions in April 2001, a stream discharge of approximately 55 cfs was estimated for the Neponset River at SW-108. Under lower streamflow conditions in

August 2001, a stream discharge of approximately 3.8 cfs was estimated for the Neponset River at SW-108. Using these estimates as upper (55 cfs) and lower (3.8 cfs) end surface water flow values and the analyte mass fluxes estimated in the previous sections, a dilution analysis was completed using the following relationship:

$$C_{SW} = \frac{\Phi_{GW}}{F_{SW}}$$

where:

C_{SW} = Predicted concentration in surface water;
Φ_{GW} = Analyte mass flux in groundwater; and
F_{SW} = Surface water flow.

Even under the conservative assumptions used for the analysis, the results of the dilution analysis presented below indicate limited impact to the Neponset River with only one slight exceedence of the human health or ecological COPC screening levels (arsenic under low flow conditions). This comports well with surface water analytical data obtained during the RI.

Analyte	Concentrations in µg/L			
	High Flow Predicted Concentration	Low Flow Predicted Concentration	COPC Screening Levels	
			Human Health	Ecological
Metals				
Aluminum	0.4	6	3,600	87
Antimony	0.0002	0.002	1.5	NS
Arsenic	0.004	**0.06**	0.045	150
Chromium	0.001	0.02	11	11
Copper	0.006	0.08	150	9.0
Iron	0.4	6	1,100	1,000
Lead	0.005	0.07	15	2.5
Manganese	0.02	0.3	88	80
Nickel	0.002	0.03	73	52
Vanadium	0.01	0.2	3.6	19
AVOCs				
Benzene	0.001	0.02	0.35	46
Toluene	0.002	0.02	72	130
Ethylbenzene	0.0008	0.01	130	290
m,p-Xylene	0.001	0.02	21	1.8
o-Xylene	0.0007	0.01	21	NS
Styrene	0.0006	0.009	160	NS
PAHs				
Acenaphthene	0.0008	0.01	37	NS
Acenaphthylene	0.0003	0.004	NS	NS
Benzo(a)anthracene	0.00003	0.0004	0.092	NS
Benzo(a)pyrene	0.00002	0.0003	0.0092	0.014

Analyte	Concentrations in µg/L			
	High Flow Predicted Concentration	Low Flow Predicted Concentration	COPC Screening Levels	
			Human Health	Ecological
Benzo(b)fluoranthene	0.00002	0.0002	0.092	NS
Dibenz(a,h)anthracene	0.000004	0.00005	0.0092	NS
Fluorene	0.0005	0.008	24	3.9
2-Methylnaphthalene	0.003	0.04	NS	NS
Naphthalene	0.009	0.1	0.62	24
Phenanthrene	0.001	0.02	NS	NS
Pyrene	0.0002	0.003	18	NS

6.4 Analyte Sources, Transport and Fate in Sediment

As discussed in Section 6.3, once analytes enter the surface environment, they will tend to be transported and dispersed with surface water and sediment, and may be incorporated into biomass, which may include changes in the chemical state of the analytes. Organic analytes will tend to be degraded by biological activity, and abiotic processes including photolysis. AVOCs will tend to exhibit relatively rapid attenuation once in the surface environment due to volatilization into the atmosphere. Inorganic analytes (i.e., metals) present in sediment generally will be in a relatively insoluble inorganic form (e.g., a sulfide) in neutral to slightly acidic aqueous solutions such as those observed in the Neponset River (Knox et al., 1993).

6.4.1 Elevated pH Conditions

Elevated pH measurements ranging up to 10.3 s.u. (TR-1) were recorded in the sediment samples collected from within the former mill tailrace, which is consistent with the conclusion that this feature is the primary discharge area for groundwater from the Site. pH measurements recorded in sediment samples closer to the Neponset River were lower than those recorded at TR-1, ranging down to 7.0 s.u. at TR-5. Sediment samples collected from locations NR-6, located approximately 60 feet upstream of the former mill tailrace, and NR-8, located approximately 200 feet downstream of the former mill tailrace exhibited pHs ranging from 6.2 to 7.8 s.u. The sediment sample collected at NR-7, near the discharge point of the former mill tailrace exhibited a slightly acidic pH of 6.4, suggesting that Site-related pH impacts to the Neponset River may be limited, likely due to dilution and neutralization/buffering of elevated pH groundwater discharging to the Neponset River.

Sediment samples from reference areas upstream in the Neponset River exhibited pHs ranging from 5.4 to 6.6 s.u. The pH of floodplain sediment samples collected from reference areas within the Neponset River upstream of the industrial portion of the Site indicate moderately to slightly acidic conditions, ranging from 3.9 to 5.9 s.u. Floodplain sediment samples collected downstream of the Site indicate moderately acidic to near-neutral conditions, ranging from 4.1 to 6.7 s.u. The pH of sediment samples collected from Lower Pond located in Norwood, MA (the Lewis Pond sediment reference area) ranged from 6.0 to 7.0 s.u. Sediment samples collected

from Lewis Pond were within the expected range of pH for sediments, ranging from 5.4 to 7.0 s.u. The moderately acidic to near neutral pHs of sediment samples collected from floodplain areas and Lewis Pond downstream of the former mill tailrace suggest that elevated pH groundwater discharging to the Neponset River has little to no measurable impact on the pH of these sediments.

6.4.2 Inorganic Analytes

6.4.2.1 Former Mill Tailrace Sediments

Arsenic and iron were detected in the sediment samples collected from the former mill tailrace at concentrations ranging from 1.5 to 9.3 mg/kg and 7,320 to 19,100 mg/kg, respectively, exceeding the human health COPC screening levels for these metals (0.39 and 2,300 mg/kg, respectively). Samples collected from the TR-3, TR-4, and TR-5 locations also exceeded the Ecological COPCs for arsenic. Arsenic and iron were the only compounds detected in excess of their human health COPC screening levels in the most upgradient tailrace sediment samples, TR-1 and TR-2. Lead was detected at a concentration in excess of the ecological COPC screening level in sample TR-2.

A number of other metals were detected in sediment from sampling locations TR-3, TR-4, and TR-5, including: aluminum, cadmium, chromium, copper, lead, manganese, nickel, and zinc at concentrations exceeding applicable human health and/or ecological COPC screening levels for sediment. In addition, mercury was detected in sample TR-5 at a concentration of 0.16 mg/kg, just above the ecological COPC screening level of 0.15 mg/kg.

The distribution of elevated concentrations of these metals in sediment within the former mill tailrace is consistent with the distribution of pH in these sediments in that as the pH decreases moving toward the Neponset River, the concentrations of the metals in sediments increases. This inverse relationship between pH and metals concentrations suggests that metals are being removed (e.g., precipitation, adsorption) from solution as the pH decreases and becoming entrained in the former mill tailrace sediments, likely as a relatively insoluble inorganic form (e.g. sulfides). The AVS/SEM analyses verify this assumption. The concentration of AVS detected in sediment collected from the former mill tailrace ranges from 0.35 to 66 micromoles per gram (µmol/g); however, the detected molar concentration of AVS significantly exceeds the sum of the detected molar concentrations of the SEM for all of the tailrace sediment samples, consistent with the metals being present in a relatively insoluble form (e.g., sulfide). Concentrations of metals observed in surface water samples are typically relatively low (compared to sediment concentrations) to not detected. Furthermore, the presence of elevated metals concentrations in sediments within the former mill tailrace is consistent with the presumption that this feature is the primary discharge area for groundwater from the Site.

Three of the five surficial sediment samples collected from the former mill tailrace, TR-3, TR-4, and TR-5, exhibited asbestos concentrations above the human health COPC screening level of 1%. Samples from the eastern portion of the tailrace (TR-1 and TR-2), located within the portion

of the tailrace excavated during the 1992 RA, did not exhibit asbestos concentrations above the analytical reporting limit of 1% (trace amounts [less than 1%] of asbestos were noted). Asbestos concentrations in sample TR-3, collected at the approximate downgradient boundary of the area excavated during the 1992 RA, and samples TR-4 and TR-5, collected downgradient of this formerly excavated area, ranged from 1.8% in TR-3, to 7.5% in TR-5, and 8.5% in TR-4, exceeding the human health COPC screening level for asbestos of 1%.

Deeper sediment samples were collected at depths up to 3 ft bgs at TR-3, TR-4 and TR-5. These samples exhibited asbestos concentrations above 1%. Concentrations were 3% at TR-3, 3.5% at TR-5, and 5% at TR-4. Given its proximity to historical sources of asbestos at the Site, the presence of asbestos in the former mill tailrace sediments is attributed to pre-RA overland flow from these historical Site sources.

The occurrence of inorganic analytes in the former mill tailrace is likely attributable to various transport mechanisms. As described above, the presence of elevated metals is likely attributable to this feature being the primary discharge for groundwater from the Site (as described in Section 4.0). Metals transported with groundwater are likely deposited in sediment within the former mill tailrace by precipitation or adsorption onto sediment particle surfaces as the pH of the groundwater is adjusted by dilution and neutralization/buffering.

The presence of asbestos within the former mill tailrace indicates that overland flow and deposition of analytes is also a transport mechanism for inorganic analytes that are deposited in the former mill tailrace. Removal of sediment during the RA in the vicinity of TR-1 and TR-2 appears to have been successful in removing asbestos impacted sediments in this area. The absence of asbestos in the TR-1 and TR-2 locations (where "new fill" was emplaced during the RA) and the presence of asbestos in the TR-3, TR-4 and TR-5 locations (excavation did not occur in the vicinity of these locations) indicates that transport of asbestos from upgradient source areas to the tailrace is no longer occurring. Asbestos impacted sediments in the TR-3, TR-4 and TR-5 locations are likely related to pre-RA overland flow from historical Site sources

6.4.2.2 Neponset River Sediments

Aluminum, antimony, barium, beryllium, chromium, cobalt, mercury, nickel, selenium, silver, thallium, zinc, and WAD cyanide were not detected at concentrations above their human health or ecological COPC screening level in any of the sediment samples collected from the Neponset River. Asbestos was not detected above the analytical reporting limit in any sediments collected from the Neponset River.

Arsenic, cadmium, iron, manganese, and vanadium were detected at concentrations in excess of either the human health or ecological COPC screening levels in one or more sediment samples collected from the Neponset River; however, these metals were detected at concentrations which are less than three standard deviations of the mean concentration of the Neponset River reference

area samples, suggesting that the occurrence of these metals would not be unexpected under background conditions[53].

As presented in Section 5.4.3, concentrations of lead in samples NR-5A, NR-7, and NR-8 exceed the mean reference area concentration of lead by 4.1 to 6.3 standard deviations. The concentration of copper in sediment collected from NR-8 exceeds the mean reference area concentration of copper by approximately 4.7 standard deviations. These detections indicate that the presence of lead and copper at these locations as a result of transport from the Site cannot be ruled out.

6.4.2.3 Floodplain Sediments

Cobalt, selenium, silver, and thallium were not detected at concentrations in excess of the human health or ecological COPC screening levels in floodplain sediment samples.

Aluminum, copper, vanadium were detected at concentrations in excess of either the human health or ecological COPC screening levels in one or more sediment samples collected from the floodplain sediment samples; however, these metals were detected at concentrations that are less than three standard deviations of the mean concentration of the floodplain reference area samples, suggesting that the occurrence of these metals would not be unexpected under background conditions.

Antimony, arsenic, cadmium, chromium, iron, lead, manganese, mercury, nickel, and zinc were detected in one or more sediment samples at concentrations in excess of the human health or COPC screening levels and at concentrations that are greater than three standard deviations of the mean concentration of the floodplain reference area samples. The following observations are noted:

- Sediments collected from location FP-09 contained concentrations of antimony, arsenic, cadmium, chromium, iron, lead, mercury, and zinc greater than three standard deviations of the mean concentrations of these analytes in the floodplain reference area samples. All of these analytes were detected at concentrations in excess of their respective human health or ecological screening levels in the upgradient former mill tailrace sediments suggesting that detection of these analytes in the downstream FP-09 location could be related to transport of sediment impacted by historic Site activities in the Neponset River, and deposition of this impacted sediment in the FP-09 location.

- As presented in Section 5.4.3, isolated occurrences of concentrations of antimony, cadmium, iron, manganese, mercury, nickel, and zinc were detected in sediment samples

[53] Concentrations of analytes from on-Site sediment samples which exceed three standard deviations of the mean reference concentrations are greater than approximately 89% of reference area sediment concentrations for that analyte.

collected from locations FP-01, FP-02, FP-03, FP-05, FP-06, FP-10 at concentrations greater than three standard deviations of the mean concentration of these analytes in the floodplain reference area samples. All of these analytes were detected at concentrations in excess of their respective human health or ecological screening levels in the upgradient former mill tailrace sediments suggesting that detection of these analytes in the downstream locations could be related to transport of sediment from the Site in the Neponset River, and deposition of this impacted sediment in the isolated areas of the floodplain of the Neponset River.

Two sediment samples collected from the floodplain of the Neponset River downstream of the Site (FP-05 and FP-09) exhibited concentrations of asbestos greater than the human health COPC screening level of 1%. Asbestos was not detected at concentrations above 1% in floodplain reference sediment samples suggesting that detection of asbestos in the FP-05 and FP-09 locations could be related to transport of sediment impacted by historic Site activities in the Neponset River, and deposition of this impacted sediment in these locations.

6.4.2.4 Lewis Pond Sediments

Barium, beryllium, cobalt, selenium, thallium and WAD cyanide were not detected at concentrations above their human health or ecological COPC screening level in any of the sediment samples collected from Lewis Pond.

Aluminum, arsenic, cadmium, copper, iron, manganese, mercury, vanadium, and zinc were detected at concentrations in excess of either the human health or ecological COPC screening levels in one or more sediment samples collected from the Lewis Pond sediment samples; however, these metals were detected at concentrations that are less than three standard deviations of the mean concentration of the Lewis Pond reference area samples, suggesting that the occurrence of these metals would not be unexpected under background conditions.

Antimony, chromium, lead, nickel, and silver were detected in one or more sediment samples collected from Lewis Pond at concentrations in excess of the human health or COPC screening levels and at concentrations that are greater than three standard deviations of the mean concentration of the Lewis Pond reference area samples. The following observations are noted:

- Sediment collected from LP-01 contained concentrations of antimony and chromium greater than three standard deviations of the mean concentration of the Lewis Pond reference area samples. Antimony and chromium were detected at concentrations in excess of their respective human health or ecological screening levels in the upgradient former mill tailrace sediments suggesting that detection of these analytes in the downstream LP-01 location could be related to transport of sediment from the Site via surface water and deposition of this impacted sediment in the LP-01 location.

- Sediment collected from LP-06 contained concentrations of antimony, chromium, lead, and nickel at concentrations greater than three standard deviations of the mean

concentration of the Lewis Pond reference area samples. Antimony and chromium were detected in excess of their respective human health or ecological screening levels in the upgradient former mill tailrace sediments suggesting that detection of these analytes in the downstream LP-06 location could be related to transport of sediment impacted from the Site via surface water and deposition of this impacted sediment in the LP-06 location.

- Sediment collected from LP-02 contained concentrations of silver greater than three standard deviations of the mean concentration of the Lewis Pond reference area samples. However, silver was not detected at concentrations above the human health or ecological COPC screening level in sediments collected from the former mill tailrace, suggesting that the occurrence of silver at the LP-02 location is unlikely to be related to the Site.

Nine of the ten sediment samples from Lewis Pond exhibited asbestos concentrations greater than the human health COPC screening level of 1%. Asbestos was not detected in sediment samples collected from the Lewis Pond sediment reference area suggesting that the asbestos in sediment samples collected from Lewis Pond is likely related to transport of asbestos via surface water from on-Site sediments impacted by asbestos related to historic Site activities.

6.4.3 Organic Analytes

AVOCs were not detected at concentrations exceeding human health or ecological COPC screening levels in any of the sediment samples analyzed; therefore, the following discussion focuses on PAHs. The absence of elevated concentrations of AVOCs in sediment is consistent with their tendency to exhibit relatively rapid attenuation once in the surface environment.

6.4.3.1 Former Mill Tailrace Sediments

Ecological COPC screening levels were exceeded for each of the PAHs with screening levels in one or more of the sediment samples collected from the former mill tailrace. Concentrations of one to all five of the compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded their respective human health COPC screening levels in the samples collected from locations TR-2, TR-3, TR-4, and TR-5.

Concentrations of total PAHs observed in sediment samples collected from the former mill tailrace were highest in the furthest downgradient samples TR-3, TR-4, and TR-5, ranging up to 53,960 µg/kg; whereas, concentrations of total PAHs in the upgradient samples TR-1 and TR-2 ranged up to only 1,870 µg/kg. On average, the total concentration of PAHs in sediments from the former mill tailrace is approximately 18,840 µg/kg.

As mentioned above, sediment samples collected from within the area of the former mill tailrace excavated during the 1992 RA (TR-1 and TR-2) contained significantly lower total PAH concentrations than those sediment samples collected from the area that was not excavated during the 1992 RA. However, sediments collected from TR-1 and TR-2 still contained concentrations of PAHs in excess of the human health or ecological screening levels. This

indicates that while historical overland surface water flow to the former mill tailrace may have been a factor in the transport of PAHs to the former mill tailrace, it is possible that PAHs are being deposited in the former mill tailrace currently due to discharge of PAH-impacted groundwater to the former mill tailrace.

6.4.3.2 Neponset River Sediments

Acenaphthylene was not detected at concentrations in excess of the human health or ecological COPC screening levels in any sediment samples collected from the Neponset River.

Benzo(g,h,i)perylene was detected at concentrations in excess of the ecological screening level in sediment samples collected from the Neponset River; however, these concentrations are less than three standard deviations of the mean concentration of the Neponset River reference area samples and may be a background condition.

The remaining PAHs (all those listed on Table 15C except acenaphthylene and benzo(g,h,i)perylene) were detected at concentrations in excess of either their human health or ecological COPC screening levels and were detected at concentrations greater than three standard deviations of the mean concentration of the Neponset River reference area samples. The following observations are noted:

- Concentrations of total PAHs were present in each of the reference area sediment samples from upstream in the Neponset River, ranging up to 1,454 µg/kg at SedRN-5. Detectable concentrations of total PAHs were also present in each of the sediment samples collected from downstream in the Neponset River. Total PAH concentrations in sediment samples from NR-2, NR-3, and NR-4 ranged from 925 to 1,489 µg/kg, while those in sediment samples NR-1, NR-5, NR-7, and NR-8 ranged from 2,724 to 12,932 µg/kg. The highest total PAH concentration, 18,100 µg/kg, was detected in the sample from NR-6, which is located in the general vicinity of the presumed groundwater discharge area suggesting that the Site-related discharge of impacted groundwater and overland surface water flow to the Neponset River are possible sources of PAHs observed in NR-6.

- The elevated concentration of PAHs observed in the most downstream reference area sediment sample (SedRN-5) and the most upstream NR-series sediment sample (NR-1) may be related to sources in the general vicinity of the railroad ROW.

- The relative proportions of individual PAHs observed in sediment samples collected further downstream are generally similar to those observed in SedRN-5 and NR-1, with the exception of one of the samples collected from NR-5 where the chemical signature is dominated by naphthalene.

- As presented in Section 5.4.3, the concentrations of certain PAHs observed in sediment samples collected from the Site are greater than three standard deviations of the mean

concentration of the Neponset River reference area samples. Furthermore, individual PAH concentrations observed in sediment samples collected within and downstream of the presumed groundwater discharge area (NR-6, NR-7, and NR-8) are generally elevated relative to those collected from sediment samples from NR-2, NR-3, and NR-4.

Based on the foregoing, the distribution and relative concentration of PAHs in the Neponset River sediments appear to be potentially related to overland surface water flow from the former railroad ROW and potentially other historical Site uses (SedRN-5, and NR-1 through NR-5), and the discharge of PAH-containing groundwater to the former mill tailrace area (NR-6 through NR-8). Historical Site-related overland surface water flow to the Neponset River is a possible source of PAHs observed in downstream sediments collected from NR-6 through NR-8.

6.4.3.3 Floodplain Sediment

Acenaphthylene and naphthalene were not detected at concentrations in excess of their respective human health or ecological screening levels in sediment samples collected from the floodplain of the Neponset River.

Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene were detected at concentrations in excess of their human health or ecological COPC screening levels in one or more samples collected from the floodplain of the Neponset River; however, the concentration of these analytes was less than three standard deviations of the mean concentration of those samples collected from the floodplain reference area, suggesting that the occurrence of these PAHs would not be unexpected under background conditions.

Acenaphthene, anthracene, fluorene, and 2-methylnaphthalene were detected in sediment samples collected from FP-06 at concentrations greater than the human health or ecological screening levels for these analytes, and at concentrations greater than three standard deviations of the mean concentration of the floodplain reference area samples. 2-Methylnaphthalene was also detected at a concentration above its ecological screening level in sediments collected from FP-09, and at a concentration greater than three standard deviations of the mean concentration of the floodplain reference area samples. The following observations are noted:

- Detectable concentrations of total PAHs were present in nine of the ten floodplain reference sediment samples, with total PAH concentrations ranging up to approximately 16,830 µg/kg at FPR-08. PAHs were also detected in each of the nine FP-series floodplain sediment samples. Total PAH concentrations in shallow sediment (collected from 0 to 1 ft bgs) FP-series samples ranged from approximately 1,500 µg/kg at FP-08 to approximately 51,000 µg/kg at FP-06; however, total PAH concentrations averaged approximately 10,700 µg/kg and were typically below 10,000 µg/kg.

- As presented in Section 5.4.3, only sediment samples collected from FP-06 and FP-09 contained PAHs at concentrations in excess of three standard deviations of the mean concentration of the floodplain reference area samples. This suggests relatively limited potential Site-related impact to downstream floodplain sediments.

The occurrence of relatively elevated PAHs in sediment samples collected from FP-06 and FP-09 could be related to transport of sediment impacted by historic Site activities in the Neponset River, and deposition of this impacted sediment in these isolated areas of the floodplain of the Neponset River.

6.4.3.4 Lewis Pond Sediments

Acenaphthylene, phenanthrene, and pyrene were not detected at concentrations in excess of the human health or ecological COPC screening levels in sediment samples collected from Lewis Pond.

The remaining PAHs listed on Table 15C (excluding acenaphthylene, phenanthrene, and pyrene) were detected at concentrations in excess of either their human health or ecological COPC screening levels in one or more sediment samples collected from the Lewis Pond; however, these concentrations are less than three standard deviations of the mean concentration of the Lewis Pond reference area samples. This observation suggests that PAH concentrations in sediment samples collected from Lewis Pond are consistent with PAH concentrations in the Lewis Pond reference area, suggesting that the occurrence of PAHs at concentrations in excess of their respective human health or ecological screening levels is not likely to be related to contamination emanating from the Site.

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TABLES

TABLE 1
Summary of Monitoring Well Installation Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Well Designation	Depths and Elevations in feet													Slug Test
	Ground Surface Elevation	Screened Zone				Total Boring Depth	Total Boring Elevation	Borehole Permeability Test Depth	Estimated Depth to Bedrock	Estimated Bedrock Elevation	Completion Date	Grain Size Analyses		
		Top Depth	Bottom Depth	Top Elevation	Bottom Elevation							Sample	Depth	
SH-01S	165.4	7	22	158.4	143.4	22	143.4	-	-	-	7/16/2001	-	-	Yes
SH-01D	165.6	35.5	45.5	130.1	120.1	45.5	120.1	-	45	120.6	7/16/2001	-	-	No
SH-01R	165.2	56	66	109.2	99.2	70	95.2	-	45	120.2	7/17/2001	S-5	8-10	No
												S-8	17-19	
SH-02S	165.2	6	21	159.2	144.2	21	144.2	-	-	-	7/18/2001	-	-	Yes
SH-02D	164.1	35	45	129.1	119.1	46.5	117.6	-	45	119.1	7/19/2001	-	-	Yes
SH-02R	163.9	62	72	101.9	91.9	72	91.9	-	45	118.9	7/19/2001	S-13	40-42	Yes
SH-03S	167.1	10	25	157.1	142.1	25	142.1	-	-	-	8/1/2001	-	-	Yes
SH-03D	167.0	80	90	87.0	77.0	95	72.0	-	85.5	81.5	7/30/2001	-	-	Yes
SH-04S	149.5	3	18	146.5	131.5	18	131.5	-	-	-	2/14/2001	-	-	Yes
SH-04D	149.4	61	71	88.4	78.4	78	71.4	-	71	78.4	2/13/2001	S-4	6-8	No
												S-15	58-58.5	No
SH-05S	150.1	3	18	147.1	132.1	18.4	131.7	-	-	-	2/6/2001	-	-	Yes
SH-05D	150.0	43.1	53.1	106.9	96.9	58.2	91.8	-	-	-	2/2/2001	S-4	6-8	Yes
SH-05R-A	151.3	105.1	115.1	46.2	36.2	166	-14.7	-	80	71.3	9/12/2003	-	-	Yes
SH-05R-B	151.3	156	166	-4.7	-14.7	166	-14.7	-	80	71.3	9/12/2003	-	-	Yes
SH-06S	155.6	5	20	150.6	135.6	22	133.6	-	-	-	7/26/2001	-	-	Yes
SH-06D	155.6	37	47	118.6	108.6	57	98.6	-	45	110.6	7/26/2001	-	-	Yes
SH-06R-A	156.2	63	73	93.2	83.2	127	29.2	-	45	111.2	9/17/2003	-	-	Yes
SH-06R-B	156.2	109	119	47.2	37.2	127	29.2	-	45	111.2	9/17/2003	-	-	Yes
SH-07S	162.3	4	16	158.3	146.3	16	146.3	-	-	-	12/18/2000	-	-	Yes
SH-07D	162.3	41	51	121.3	111.3	60	102.3	-	50	112.3	6/25/2001	S-4	15-17	Yes
SH-08S	162.9	4	19	158.9	143.9	19	143.9	-	-	-	12/11/2000	S-6	10-12	No
SH-08D	162.8	25	30	137.8	132.8	52	110.8	-	50.5	112.3	6/21/2001	-	-	No
SH-09S	165.6	3	18	162.6	147.6	18	147.6	-	-	-	4/20/2001	-	-	Yes
SH-09D	165.6	24	29.5	141.6	136.1	40	125.6	-	29.5	136.1	4/19/2001	-	-	No
SH-10S	171.4	11	26	160.4	145.4	29	142.4	-	-	-	8/1/2001	-	-	Yes
SH-11S	167.6	6	21	161.6	146.6	30	137.6	-	-	-	7/27/2001	S-4	15-15.9	Yes
SH-12S	167.1	11.3	26.3	155.8	140.8	27	140.1	-	-	-	7/31/2001	-	-	Yes
SH-12D	166.7	66.2	76.2	100.5	90.5	80	86.7	-	73.5	93.2	8/1/2001	S-8	20-22	No
SH-13S	165.7	10	25	155.7	140.7	30	135.7	-	-	-	7/27/2001	-	-	Yes

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	Ground Surface Elevation	Screened Zone				Total Boring Depth	Total Boring Elevation	Borehole Permeability Test Depth	Estimated Depth to Bedrock	Estimated Bedrock Elevation	Completion Date	Grain Size Analyses		
		Top Depth	Bottom Depth	Top Elevation	Bottom Elevation							Sample	Depth	
SH-14S	150.1	3	18	147.1	132.1	18	132.1	-	-	-	3/12/2001	-	-	Yes
SH-14D	150.2	39	49	111.2	101.2	60	90.2	-	50	100.2	3/12/2001	-	-	Yes
SH-15S	146.9	3	18	143.9	128.9	18	128.9	14 - 16	-	-	2/21/2001	S-1	14-16	Yes
SH-15D	147.1	45	55	102.1	92.1	61	86.1	-	55	92.1	2/19/2001	S-13	48-48.5	Yes
SH-16S	148.8	2	12	146.8	136.8	18.5	130.3	-	11.8	137.0	1/29/2001	-	-	Yes
SH-17S	156.7	3	13	153.7	143.7	13	143.7	-	-	-	2/27/2001	S-3	11-13	Yes
SH-17D	156.5	22.2	32.2	134.3	124.3	38	118.5	-	32	124.5	8/20/2003	-	-	Yes
SH-17R	156.4	42.4	52.4	114.0	104.0	53.3	103.1	-	32	124.4	8/22/2003	-	-	Yes
SH-18S	168.1	5	20	163.1	148.1	25	143.1	-	-	-	7/24/2001	-	-	Yes
SH-18D	168.1	37.5	47.5	130.6	120.6	55	113.1	-	47.5	120.6	7/23/2001	S-6 S-11	14-15.3 43.5-45.5	Yes
SH-19S	168.6	5	20	163.6	148.6	20	148.6	-	-	-	7/11/2001	-	-	Yes
SH-19D	168.3	27	37	141.3	131.3	37	131.3	-	-	-	6/28/2001	-	-	Yes
SH-19R	168.1	49.5	59.5	118.6	108.6	60.1	108.0	-	41.3	126.8	7/11/2001	S-4 S-7	15-17 35-37	Yes
SH-20S	168.2	3.9	18.9	164.3	149.3	19.1	149.1	-	-	-	4/10/2001	-	-	No
SH-21S	165.7	4	19	161.7	146.7	19.8	145.9	-	-	-	4/16/2001	-	-	Yes
SH-22S	170.6	5	20	165.6	150.6	25	145.6	-	-	-	6/28/2001	S-6	16-17	Yes
SH-23S	169.5	3	18	166.5	151.5	18	151.5	-	-	-	3/14/2001	-	-	Yes
SH-24S	145.5	2	14	143.5	131.5	34	111.5	-	14.3	131.2	8/27/2003	-	-	Yes
SH-24R	145.7	28.5	38.5	117.2	107.2	38.7	107.0	-	14.3	131.4	8/28/2003	-	-	Yes
SH-25S	146.9	2	17	144.9	129.9	17	129.9	-	-	-	9/4/2003	-	-	Yes
SH-25D	147.1	44	54	103.1	93.1	64	83.1	-	54	93.1	9/3/2003	-	-	Yes
SH-26S	145.6	3	18	142.6	127.6	18	127.6	-	-	-	9/4/2003	-	-	Yes
SH-27S	159.5	3	18	156.5	141.5	18	141.5	-	-	-	10/24/2003	-	-	Yes
SH-27D	159.6	35	45	124.6	114.6	55	104.6	-	45	114.6	10/28/2003	-	-	Yes
SH-27R	160.0	58	68	102.0	92.0	68	92.0	-	45	115.0	11/6/2003	-	-	Yes
SH-28S	150.9	2.4	17.4	148.5	133.5	17.4	133.5	-	-	-	10/21/2003	-	-	Yes
SH-28D	150.9	44	54	106.9	96.9	54	96.9	-	-	-	10/20/2003	-	-	Yes
SH-28R	150.4	72	82	78.4	68.4	83.7	66.7	-	57	93.4	10/17/2003	-	-	Yes

TABLE 1
Summary of Monitoring Well Installation Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Well designation modifiers S, D, and R identify the aquifer zone screened:
   Shallow [S] Zone: Across the water table.
   Deep [D] Zone: In till, typically just above the overburden/bedrock contact.
   Rock [R] Zone: In bedrock, typically just below the overburden/bedrock contact.

2. "Screened Zone" refers to the vertical location below ground surface of the well screen.

3. "Total Boring Depth" refers to the depth of drilling.

4. "Estimated Depth to Bedrock" refers to the depth of top of bedrock based on observation of drill cuttings and drilling behavior. Bedrock in monitoring wells SH-01R, SH-02R, SH-17R, SH-19R, SH-24R, SH-27R, and SH-28R was cored. "-" indicates bedrock was not encountered.

5. In accordance with Standard Operating Procedure (SOP) S-1669C, monitoring wells are constructed of 2.0-inch I.D. Schedule 40 PVC. Wells were installed using either hollow stem auger drilling method; drive and wash/cased hole drilling method; rotosonic drilling method; or air/mud rotary drilling method.

6. In borings installed using either drive and wash/cased hole or hollow stem auger methods, soil samples were generally collected continuously to two feet below the bottom of fill or the top of the water table, whichever was deeper, and subsequently at five-foot intervals. Soils were collected continuously from borings installed using the rotosonic drilling method.

7. "Borehole Permeability Test" refers to borehole permeability (wick) test conducted during drilling.
   "Grain Size" refers to soil sample collected for sieve/hydrometer analyses.
   "Slug Test" refers to variable-head permeability tests completed in finished monitoring wells.

8. Refer to Table 8, Summary of Estimates of Hydraulic Conductivities by Formation Type, for further information on soils on which hydraulic conductivity/permeability tests/estimates were completed.

9. Depths indicated are approximate and represent depths (in feet [ft.]) below the ground surface.

10. See Appendices B-1 and B-2 for Soil Boring/Groundwater Monitoring Well logs.

11. Monitoring well couplet SH-05-R-A and SH-05R-B were installed in the same borehole. Monitoring well couplet SH-06R-A and SH-06R-B were installed in the same borehole.

TABLE 2A
Summary of Groundwater Sampling and Analysis Program
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Walpole, Massachusetts

Location	Sample Date	SDG Number	Analyses Performed
SH-01S	9/12/2001‡	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/21/2002	BU208B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/28/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-01D	9/12/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/22/2002	BU208A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/29/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-01R	9/13/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/22/2002	BU208A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/30/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-02S	9/12/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/24/2002	BU208B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/29/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-02D	9/13/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/23/2002	BU208A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/30/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-02R	9/12/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/16/2002	BU208B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/4/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-03S	9/11/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/16/2002	BU208B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/3/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-03D	9/12/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/23/2002	BU208B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/3/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-04S	9/11/2001	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	05/20/02‡	BU208A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/28/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-04D	9/11/2001	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/21/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/5/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-05S	9/11/2001‡	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU204	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/21/2002‡	BU208A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU208A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/29/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-05D	9/11/2001‡	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/21/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/4/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-05R-A	11/10/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-05R-B	11/11/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-06S	9/6/2001‡	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/22/2002	BU206A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/29/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-06D	9/6/2001	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/22/2002	BU206A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU206A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/29/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-06R-A	11/5/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-06R-B	11/6/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN

TABLE 2A
Summary of Groundwater Sampling and Analysis Program
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Analyses Performed
SH-07S	9/7/2001‡	BU202	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU202	VPH/EPH
	5/22/2002	BU206A	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU206A	VPH/EPH
	10/29/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-07D	9/7/2001	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/22/2002	BU206A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/30/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-08S	9/6/2001	BU201	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/21/2002‡	BU205	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/28/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-08D	9/7/2001	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/20/2002‡	BU206A	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/29/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-09S	9/7/2001‡	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/17/2002	BU206B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/31/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-09D	9/7/2001‡	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/23/2002	BU206B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/28/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-10S	9/10/2001	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/23/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/31/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-11S	9/7/2001	BU202; BU203†	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/16/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/3/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-12S	9/11/2001	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/17/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/3/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-12D	9/12/2001	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/17/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/3/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-13S	9/11/2001	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/16/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/3/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-14S	9/10/2001	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/20/2002	BU206B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/4/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-14D	9/10/2001	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/20/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/4/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-15S	9/10/2001‡	BU202	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/20/2002	BU206B	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	10/28/2003	BU211	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-15D	9/10/2001‡	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/17/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/4/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN

TABLE 2A
Summary of Groundwater Sampling and Analysis Program
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Analyses Performed
SH-16S	9/11/2001	BU203	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/17/2002	BU207	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/19/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-17S	9/6/2001	BU201	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/20/2002‡	BU205	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity,TKN
	11/19/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-17D	11/20/2003	BU211	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
	Dup.	BU211	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-17R	11/20/2003	BU211	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-18S	9/4/2001	BU201	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/15/2002	BU205	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-18D	9/4/2001	BU201	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/15/2002	BU205	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-19S	9/5/2001	BU201	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU201	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/21/2002‡	BU205	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	Dup.	BU205	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-19D	9/5/2001	BU201	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/16/2002	BU205	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-19R	9/5/2001	BU201	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/16/2002	BU205	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-20S	9/5/2001	BU201	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/17/2002	BU205	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-21S	9/6/2001	BU201	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/16/2002	BU205	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-22S	9/5/2001‡	BU201	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/17/2002	BU205	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Anions, Alkalinity, TKN
SH-23S	9/4/2001	BU201	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	5/15/2002	BU205	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TKN
	11/4/2003	BU210	Select SVOCs*, VOCs, Metals, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-24S	11/6/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-24R	11/6/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-25S	11/5/2003‡	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-25D	11/5/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-26S	10/28/2003	BU211	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-27S	11/21/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-27D	11/19/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
	Dup.	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-27R	11/20/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-28S	11/6/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-28D	11/6/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
SH-28R	11/7/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
WP-01	11/4/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
WP-02	11/4/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
WP-03	11/5/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
WP-04	11/7/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
WP-05	11/7/2003	BU209	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
WP-06	10/28/2003	BU211	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN
WP-07	10/27/2003	BU211	SVOCs, VOCs, Metals, WAD Cyanide, Anions, Alkalinity, TOC, TDS, Sulfide, TKN

TABLE 2A
Summary of Groundwater Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by SHA on the dates indicated. Refer to the field sampling summaries in Appendix B for further information.

2. "†" Sample SH-11S/09-07-01 was submitted with sample delivery group (SDG) BU203, but was batched, analyzed, reported, and invoiced with SDG BU202 by Woods Hole Group Environmental Laboratories (WHGEL).

3. "‡" A split sample was collected from this location by the United States Environmental Protection (USEPA) oversight contractor, Metcalf & Eddy (M&E).

4. Laboratory analyses were performed by WHGEL of Raynham, Massachusetts, except for total Kjeldahl nitrogen (TKN) which was performed by Groundwater Analytical, Inc. of Buzzards Bay, Massachusetts.

5. "SVOCs" indicates analysis for semi-volatile organic compounds performed by USEPA Method 8270C-EI, and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Refer to Table 13E for list of individual compounds and validated analytical results.

"Select SVOCs*" indicates analysis for bis(2-ethylhexyl)phthalate, carbazole, and PAHs performed by USEPA Method 8270C-SIM. Refer to Table 13E for list of individual compounds and validated analytical results.

"VOCs" indicates analysis for volatile organic compounds performed by USEPA Method 8260B. Refer to Table 13F for list of individual compounds and validated analytical results.

"Metals" indicates analysis for the target analyte list (TAL) of metals, including aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc performed by USEPA Methods 6010B and 6020; and analysis for mercury performed by USEPA Method 7470A. Refer to Table 13D for validated analytical results.

"WAD Cyanide" indicates analysis for weak acid dissociable cyanide performed by USEPA Method 4500-CN I. Refer to Table 13D for validated analytical results.

"Anions" indicates analysis for chloride, nitrate, and sulfate performed by USEPA Method 300.0. Refer to Table 13D for validated analytical results.

"Alkalinity" indicates analysis for alkalinity performed by USEPA Method 310.1. Refer to Table 13D for validated analytical results.

"TKN" indicates analysis for total Kjeldahl nitrogen performed by USEPA Method 351.3. Refer to Table 13D for validated analytical results.

"TOC" indicates analysis for total organic carbon performed by USEPA Method 415.1. Refer to Table 7D for validated analytical results.

"TDS" indicates analysis for total dissolved solids performed by USEPA Method 160.1. Refer to Table 13D for validated analytical results.

"Sulfide" indicates analysis for sulfide performed by USEPA Method 376.2. Refer to Table 13D for validated analytical results.

"VPH/EPH" indicates analysis for volatile petroleum hydrocarbons (VPH) and extractible petroleum compounds (EPH) performed by Massachusetts Department of Environmental Protection (MADEP) methods MADEP-VPH-98-1 and MADEP-EPH-98-1, respectively. Refer to Table 13F for list of individual analytes and validated analytical results.

6. Refer to Section 2 of the text for further explanation and discussion regarding analytical program.

7. "Dup." indicates a blind field duplicate was collected at this location on the same date as the primary sample and submitted for the listed analyses.

TABLE 2B
Summary of Soil Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Total Depth of Exploration (ft)	Sample(s) Analyzed			SDG Number	Analyses Performed
		Number	Depth Interval (ft)	Collection Date		
SH-01R	70	S-5	8 - 10	6/25/2001	BU601	Grain Size
		S-8	17 - 19	6/25/2001	BU601	Grain Size
SH-02R	72	S-13	40 - 42	6/26/2001	BU601	Grain Size
SH-04D	78	S-4	6 - 8	2/7/2001	BU601	Grain Size
		S-15	58 - 58.5	2/9/2001	BU607	Grain Size
SH-05S	18.4	S-1	6.5 - 8.5	7/24/2001	BU102A	SVOCs, VOCs, Metals, WAD Cyanide
SH-05D	58.2	S-4	6 - 8	1/30/2001	BU607	Grain Size
SH-07D	60	S-4	15 - 17	6/22/2001	BU607	Grain Size
SH-08S	19	S-6	10 - 12	12/7/2000	BU607	Grain Size
SH-15S	18	S-1	14 - 16	2/20/2001	BU601	Grain Size
SH-15D	61	S-13	48 - 48.5	2/16/2001	BU607	Grain Size
SH-17S	13	S-3	11 - 13	2/27/2001	BU607	Grain Size
SH-18S	25	S-1-2	20 - 24	7/24/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
SH-19R	60.1	S-4	15 - 17	6/27/2001	BU607	Grain Size
		S-7	35 - 37	6/27/2001	BU607	Grain Size
		S-7	35 - 37	Dup.	BU607	Grain Size
SH-22S	25	S-6	16 - 17	6/28/2001	BU607	Grain Size
SB-01	3.4	SS-01	0 - 1	5/9/2001	BU107	SVOCs, Metals, WAD Cyanide
		S-1-2	0 - 3.4	5/9/2001	BU107	SVOCs, Metals, WAD Cyanide
SB-02	2	SS-02	0 - 1	4/26/2001	BU106; BU402†	SVOCs, Metals, WAD Cyanide
SB-03	3.3	SS-03	0 - 1	5/9/2001‡	BU107	SVOCs, Metals, WAD Cyanide
		S-2	2 - 3.3	5/9/2001	BU601	Grain Size
SB-04	15	SS-04	0 - 1	3/21/2001	BU103	SVOCs, VOCs, Metals, WAD Cyanide, TOC
		S-4-5	6 - 10	3/21/2001	BU103	SVOCs, Metals, WAD Cyanide
SB-05	14.5	SS-05	0 - 1	3/19/2001	BU103	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	3/19/2001	BU103	SVOCs, Metals, WAD Cyanide
SB-06	31.3	SS-06	0 - 1	3/15/2001	BU103	SVOCs, Metals, WAD Cyanide
		S-4-5	6 - 10	3/16/2001	BU103	SVOCs, VOCs, Metals, WAD Cyanide, TOC
		S-8	14 - 16	3/16/2001	BU601	Grain Size
		S-13	24 - 26	3/16/2001	BU601	Grain Size
SB-07	10	SS-07	0 - 1	3/15/2001‡	BU103	SVOCs, VOCs, Metals, WAD Cyanide, TOC
		S-3	4 - 6	3/15/2001	BU103	SVOCs, Metals, WAD Cyanide
SB-08	9.3	SS-08	0 - 1	3/14/2001	BU103	SVOCs, Metals, WAD Cyanide
SB-08A	10	S-4-5	6 - 9.3	3/15/2001	BU103	SVOCs, Metals, WAD Cyanide
		S-5	8 - 10	3/15/2001	BU601	Grain Size
		S-5	8 - 10	Dup.	BU601	Grain Size
SB-09	10.4	SS-09	0 - 1	4/23/2001	BU106	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-2-3	2 - 6	4/23/2001	BU106	SVOCs, VOCs, Metals, WAD Cyanide
SB-10	6	SS-10	0 - 1	6/7/2001	BU110	SVOCs, Metals, WAD Cyanide
		S-3	4 - 6	6/7/2001	BU110; BU601	SVOCs, VOCs, Metals, WAD Cyanide
SB-11	16	SS-11	0 - 1	6/7/2001	BU110	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	6/7/2001	BU110	SVOCs, VOCs, Metals, WAD Cyanide
SB-12	12	SS-12	0 - 1	4/17/2001	BU105	SVOCs, Metals, WAD Cyanide
		S-1-2	0 - 4	4/18/2001	BU105	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
		S-1-2	0 - 4	Dup.	BU105	VPH/EPH
SB-13/ SB-13A/ SB-13B	8/ 8/ 10 @	SS-13	0 - 1	4/13/2001	BU105	SVOCs, Metals, WAD Cyanide
		S-3-4	4 - 8	4/13/2001	BU105; BU111	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-3-4	4 - 8	Dup.	BU105	Pesticides/PCBs, TOC
SB-14	10	SS-14	0 - 1	4/13/2001	BU105	SVOCs, Metals, WAD Cyanide
		S-3-4	4 - 8	4/13/2001	BU105	SVOCs, VOCs, Metals, WAD Cyanide
SB-15	19.8	SS-15	0 - 1	4/16/2001	BU105	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	4/16/2001	BU105	SVOCs, VOCs, Metals, WAD Cyanide
SB-16	10	SS-16	0 - 1	6/6/2001‡	BU110	SVOCs, Metals, WAD Cyanide
		S-3-4	4 - 8	6/6/2001‡	BU110	SVOCs, VOCs, Metals, WAD Cyanide

TABLE 2B
Summary of Soil Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Total Depth of Exploration (ft)	Sample(s) Analyzed			SDG Number	Analyses Performed
		Number	Depth Interval (ft)	Collection Date		
SB-17	12	SS-17	0 - 1	4/5/2001‡	BU104	SVOCs, Metals, WAD Cyanide
		S-4-5	6 - 10	4/5/2001	BU104; BU111	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
SB-18	12	SS-18	0 - 1	4/11/2001	BU105	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 5.4	4/11/2001	BU105	SVOCs, VOCs, Metals, WAD Cyanide
SB-19	18	SS-19	0 - 1	6/8/2001	BU110	SVOCs, Metals, WAD Cyanide
		S-1-2	0.4 - 4	6/8/2001	BU110	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-1-2	0.4 - 4	Dup.	BU110	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
SB-20	18.4	SS-20	0 - 1	6/12/2001	BU110	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	6/12/2001	BU110	SVOCs, VOCs, Metals, WAD Cyanide
SB-21	12.5	SS-21	0 - 1	4/2/2001	BU104	SVOCs, VOCs, Metals, WAD Cyanide,Pesticides/PCBs, TOC
		S-3-4	4 - 8	4/2/2001	BU104; BU111	SVOCs, VOCs, Metals, WAD Cyanide
SB-22	9.5	SS-22	0 - 1	6/13/2001	BU110; BU111	SVOCs, Metals, WAD Cyanide
		S-3	4 - 5.1	6/13/2001	BU110; BU111	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
SB-23	12	SS-23	0 - 1	4/11/2001‡	BU105	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	4/11/2001‡	BU105	SVOCs, VOCs, Metals, WAD Cyanide
SB-24	11.3	SS-24	0 - 1	4/12/2001	BU105	SVOCs, Metals, WAD Cyanide
		S-3-4	4 - 8	4/12/2001	BU105; BU111	SVOCs, VOCs, Metals, WAD Cyanide
SB-25	10.6	SS-25	0 - 1	3/29/2001	BU104	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		SS-25	0 - 1	Dup.	BU104	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-4-5	6 - 10	3/29/2001	BU104	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
		S-4-5	6 - 10	Dup.	BU104	VPH/EPH
SB-26	6.8	SS-26	0 - 1	3/30/2001	BU104	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-2-3	2 - 5.7	3/30/2001	BU104	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
SB-27	12	SS-27	0 - 1	6/15/2001‡	BU110	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	6/15/2001‡	BU110	SVOCs, VOCs, Metals, WAD Cyanide, TOC
SB-28	55	SS-28	0 - 1	7/23/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide, TOC
		S-3-4	4 - 8	7/23/2001	BU109	SVOCs, Metals, WAD Cyanide
		S-6	14 - 15.3	7/23/2001	BU607	Grain Size
		S-11	43.5 - 45.5	7/23/2001	BU607	Grain Size
SB-29	10	SS-29	0 - 1	3/28/2001	BU103	SVOCs, Metals, WAD Cyanide
SB-30	14	SS-30	0 - 1	3/28/2001	BU104	SVOCs, Metals, WAD Cyanide
		S-4-5	6 - 10	3/28/2001	BU104	SVOCs, Metals, WAD Cyanide
SB-31	31	SS-31	0 - 1	2/26/2001	BU102	SVOCs, VOCs, Metals, WAD Cyanide, TOC
		SS-31	0 - 1	Dup.	BU102	SVOCs, VOCs, Metals, WAD Cyanide, TOC
		S-3-4	4 - 8	2/26/2001	BU102	SVOCs, Metals, WAD Cyanide
SB-32	2	SS-32	0 - 1	2/22/2001‡	BU102	SVOCs, Metals, WAD Cyanide
SB-33	4	SS-33	0 - 1	2/23/2001‡	BU102	SVOCs, Metals, WAD Cyanide
SB-34	2	SS-34	0 - 1	5/2/2001‡	BU107	SVOCs, Metals, WAD Cyanide
SB-35	3.5	SS-35	0 - 1	5/2/2001‡	BU107	SVOCs, Metals, WAD Cyanide
		S-1-2	0 - 3.5	5/2/2001‡	BU107	SVOCs, VOCs, Metals, WAD Cyanide, TOC
SB-36	8	SS-36	0 - 1	2/21/2001	BU102	SVOCs, Metals, WAD Cyanide
SB-37	6.2	SS-37	0 - 1	4/23/2001	BU106	SVOCs, Metals, WAD Cyanide
SB-38	4	SS-38	0 - 1	4/23/2001	BU106	SVOCs, VOCs, Metals, WAD Cyanide, TOC
		S-2-3	2 - 4	4/23/2001	BU106; BU111	SVOCs, Metals, WAD Cyanide
SB-39	10	SS-39	0 - 1	2/22/2001	BU102	SVOCs, Metals, WAD Cyanide
SB-40	12	SS-40	0 - 1	2/26/2001	BU102	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	2/26/2001	BU102	SVOCs, VOCs, Metals, WAD Cyanide, TOC
SB-41/ SB-41A	4.8/ 7 @	S-1-2	3 - 7	3/20/2001‡	BU103	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-1-2	3 - 7	Dup.	BU103	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
SB-41D	30	S-5-6	15 - 22	7/27/2001‡	BU109	SVOCs, VOCs, Metals, WAD Cyanide

TABLE 2B
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Total Depth of Exploration (ft)	Sample(s) Analyzed			SDG Number	Analyses Performed
		Number	Depth Interval (ft)	Collection Date		
SB-42	30	S-1-2	2.7 - 7	7/27/2001‡	BU109	SVOCs, VOCs, Metals, WAD Cyanide
		S-3-4	10 - 15.9	7/27/2001‡	BU109	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-3-4	10 - 15.9	Dup.	BU109	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-4	15 - 15.9	7/27/2001	BU607	Grain Size
SB-43	29	S-1-2	3 - 6	8/1/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
		S-3-4	6 - 9	8/1/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
SB-44	80	S-1-2	4 - 8	7/31/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
		S-3-4	8 - 12	7/31/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
		S-7	17.5 - 18	7/31/2001	BU109; BU111	SVOCs, Metals, WAD Cyanide
		S-8	20 - 22	7/31/2001	BU607	Grain Size
SB-45	95	S-1-2	3 - 7	7/19/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
		S-4-5	10 - 14	7/19/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
		S-7	17 - 18	7/19/2001	BU601	Grain Size
		S-23	80 - 81.5	7/30/2001	BU601	Grain Size
SB-46	46.5	S-1-2	3 - 5.5	7/18/2001‡	BU109	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-3-4	17 - 21	7/18/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
SB-46B	21	S-1-2	8 - 12	7/18/2001‡	BU109	SVOCs, VOCs, Metals, WAD Cyanide
SB-47	57	S-1-2	1 - 5	7/25/2001‡	BU109	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-3-4	5 - 9	7/25/2001‡	BU109	SVOCs, VOCs, Metals, WAD Cyanide
SB-48	4	S-1-2	0.5 - 4	12/14/2000	BU101	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
SB-48A	16	S-3-4	4 - 7.3	12/14/2000	BU101	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
SB-49	10	S-1-2	0 - 4	4/24/2001	BU106	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
		S-3-4	4 - 8	4/24/2001	BU106	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide, Pesticides/PCBs, TOC
SB-50	10	S-1-2	0 - 4	4/24/2001	BU106	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
		S-3-4	4 - 8	4/24/2001	BU106	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
SB-51	19	S-1-2	0.8 - 4	12/7/2000	BU101	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
		S-5-6	8 - 12	12/7/2000	BU101	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
SB-52	40	S-1-2	4 - 8	4/18/2001‡	BU105	SVOCs, VOCs, Metals, WAD Cyanide
		S-4-5	10 - 14	4/18/2001‡	BU105	SVOCs, VOCs, Metals, WAD Cyanide
SB-53	45.5	S-1-2	2.3 - 7	7/13/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide
		S-3-4	19 - 23	7/13/2001	BU109	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
SB-54	1.4	S-1	0.4 - 1.4	5/3/2001	BU107	SVOCs, VOCs, Metals, WAD Cyanide
SB-55	1.3	S-1	0.3 - 1.3	5/3/2001‡	BU107	SVOCs, VOCs, Metals, WAD Cyanide
SB-56	1.8	S-1	0.8 - 1.8	5/3/2001	BU107	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
		S-1	0.8 - 1.8	Dup.	BU107	SVOCs, VOCs, Metals, WAD Cyanide, Pesticides/PCBs, TOC
SB-57	1.5	S-1	0.5 - 1.5	5/3/2001‡	BU107	SVOCs, VOCs, Metals, WAD Cyanide
SB-58	16	SS-58	0 - 1	4/26/2001‡	BU106	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 5.5	4/26/2001‡	BU106	SVOCs, Metals, WAD Cyanide
SB-59	11.8	SS-59	0 - 1	4/26/2001	BU106	SVOCs, VOCs, Metals, WAD Cyanide
		S-4-5	6 - 10	4/26/2001	BU106; BU111	SVOCs, Metals, WAD Cyanide
SB-60	11	SS-59	0 - 1	4/25/2001	BU106	SVOCs, Metals, WAD Cyanide
		S-4-5	6 - 8.5	4/25/2001	BU106; BU111	SVOCs, Metals, WAD Cyanide
SB-61	10.3	SS-61	0 - 1	4/25/2001	BU106	SVOCs, Metals, WAD Cyanide
		S-1-2	0 - 4	4/25/2001	BU106	SVOCs, Metals, WAD Cyanide
SB-62	16	SS-62	0 - 1	4/17/2001	BU105	SVOCs, VOCs, Metals, WAD Cyanide
		SS-62	0 - 1	Dup.	BU105	SVOCs, VOCs, Metals, WAD Cyanide
		S-3-4	4 - 8	4/17/2001	BU105; BU111	SVOCs, VOCs, Metals, WAD Cyanide
SB-63	14.5	SS-63	0 - 1	4/2/2001	BU104	SVOCs, Metals, WAD Cyanide
		S-1-2	0 - 4	4/2/2001	BU104	SVOCs, Metals, WAD Cyanide
SB-64	17.5	SS-64	0 - 1	3/23/2001	BU103	SVOCs, Metals, WAD Cyanide
		S-3-4	4 - 8	3/23/2001	BU103	SVOCs, VOCs, Metals, WAD Cyanide

TABLE 2B
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Total Depth of Exploration (ft)	Sample(s) Analyzed			SDG Number	Analyses Performed
		Number	Depth Interval (ft)	Collection Date		
SB-65	29	SS-65	0 - 1	3/26/2001	BU103; BU111	SVOCs, Metals, WAD Cyanide
		S-4-5	6 - 11	3/26/2001	BU103	SVOCs, Metals, WAD Cyanide
SB-66	9	SS-66	0 - 1	7/9/2001	BU108	SVOCs, Metals, WAD Cyanide
		S-3-4	4 - 8	7/10/2001	BU108; BU111	SVOCs, Metals, WAD Cyanide
SB-67	6	SS-67	0 - 1	7/11/2001	BU108	SVOCs, VOCs, Metals, WAD Cyanide
SB-68	6	SS-68	0 - 1	7/11/2001	BU108	SVOCs, Metals, WAD Cyanide
		S-2-3	2 - 6	7/11/2001	BU108; BU111	SVOCs, VOCs, Metals, WAD Cyanide
SB-69	6	SS-69	0 - 1	7/10/2001	BU108	SVOCs, Metals, WAD Cyanide
SB-70	6	SS-70	0 - 1	7/10/2001	BU108	SVOCs, VOCs, Metals, WAD Cyanide
		SS-70	0 - 1	Dup.	BU108	SVOCs, VOCs, Metals, WAD Cyanide
SB-71	6	SS-71	0 - 1	7/10/2001‡	BU108	SVOCs, Metals, WAD Cyanide
SB-72	6	SS-72	0 - 1	7/10/2001‡	BU108	SVOCs, Metals, WAD Cyanide
		S-1-2	0 - 4	7/10/2001‡	BU108	SVOCs, Metals, WAD Cyanide
SB-73	6	SS-73	0 - 1	7/10/2001	BU108	SVOCs, Metals, WAD Cyanide
UST-1/	1.2/	S-1-2	0.2 - 5	4/4/2001	BU104	SVOCs, VOCs, VPH/EPH
UST-1A/	1.8/	S-3-4	5 - 9	4/4/2001	BU104	SVOCs, VOCs, VPH/EPH
UST-2	12	S-1-2	0.3 - 4	4/5/2001‡	BU104	SVOCs, VOCs, VPH/EPH
		S-3-4	4 - 8	4/5/2001‡	BU104	SVOCs, VOCs, VPH/EPH
UST-3	12	S-1-2	0.2 - 4	4/4/2001	BU104	SVOCs, VOCs, VPH/EPH
		S-3-4	4 - 8	4/4/2001	BU104	SVOCs, VOCs, VPH/EPH
UST-4	10.6	S-1-2	1 - 4	12/11/2000	BU101	SVOCs, VOCs, VPH/EPH
		S-3-4	4 - 7.3	12/11/2000	BU101	SVOCs, VOCs, VPH/EPH
		S-5	8 - 8.7	12/12/2000	BU601	Grain Size
UST-5	14	S-1-2	0.5 - 4	12/12/2000	BU101	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
		S-1-2	0.5 - 4	Dup.	BU101	SVOCs, VOCs, VPH/EPH, Metals, WAD Cyanide
		S-3-4	4 - 6.8	12/13/2000	BU101	SVOCs, VOCs, VPH/EPH
		S-7	12 - 14	12/13/2000	BU601	Grain Size
UST-6	8.5	S-1-2	0.4 - 4	12/13/2000	BU101	SVOCs, VOCs, VPH/EPH
		S-3-4	4 - 8	12/13/2000	BU101	SVOCs, VOCs, VPH/EPH
EUA-1	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
		NA	0 - 0.5	Dup.	BU112	Select SVOCs, Select Metals, TOC, Grain Size
EUA-2	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
EUA-3	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
FPW-1	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
FPW-2	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
FPW-3	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
OP-1	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
OP-2	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
OP-3	0.5	NA	0 - 0.5	8/8/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
OSA-1	0.5	NA	0 - 0.5	8/7/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
OSA-2	0.5	NA	0 - 0.5	8/12/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
OSA-3	0.5	NA	0 - 0.5	8/12/2003	BU112	Select SVOCs, Select Metals, TOC, Grain Size
OSR-1-S	0.5	NA	0 - 0.5	11/21/2003	BU113	Select SVOCs, Select Metals, TOC, Grain Size
		NA	0 - 0.5	Dup.	BU113	Select SVOCs, Select Metals, TOC, Grain Size
OSR-2-S	0.5	NA	0 - 0.5	11/4/2003	BU113	Select SVOCs, Select Metals, TOC, Grain Size
OSR-3-S	0.5	NA	0 - 0.5	10/31/2003	BU113	Select SVOCs, Select Metals, TOC, Grain Size

TABLE 2B
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Walpole, Massachusetts

Notes:

1. Depths indicated are approximate and represent depths in feet (ft) below the ground surface. Samples were collected by SHA on the dates indicated. Refer to the boring and monitoring well logs and field sampling summaries in Appendix B for further information.

2. "†" Sample SS-02 / 04-26-01, from location SB-02, was originally submitted with sample delivery group (SDG) BU106; however, due to the low percent solids present in this sample, it was moved to sediment SDG BU402 and freeze-dried prior to analysis. Refer to the data validation reports included in the Data Usability Report (SHA, 2002) for additional information.

3. "‡" A split sample was collected from this location by the United States Environmental Protection (USEPA) oversight contractor, Metcalf & Eddy (M&E).

4. Chemical analyses were generally performed by Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts; TOC and grain size analyses were performed by Applied Marine Sciences, Inc. (AMS) of League City, Texas.

5. "SVOCs" indicates analysis for semi-volatile organic compounds performed by USEPA Method 8270C-EI, and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Refer to Tables 11C and 12C for lists of individual analytes and validated analytical results.
"Select SVOCs*" indicates analysis for benzoic acid, butylbenzylphthalate, carbazole, dibenzofuran, 1,2-dichlorobenzene, 4-methylphenol, and PAHs performed by USEPA Method 8270C-SIM. Refer to Tables 11C and 12C for lists of individual analytes and validated analytical results.
"VOCs" indicates analysis for volatile organic compounds performed by USEPA Method 8260B. Refer to Tables 11D and 12D for lists of individual analytes and validated analytical results.
"VPH/EPH" indicates analysis for volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH) performed by Massachusetts Department of Environmental Protection (MADEP) methods MADEP-VPH-98-1 and MADEP-EPH-98-1, respectively. Refer to Table 12D for lists of individual analytes and validated analytical results.
"Metals" indicates analysis for the target analyte list (TAL) of metals, including aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc performed by USEPA Methods 6010B and 6020; and analysis for mercury performed by USEPA Method 7471A. Refer to Tables 11B and 12B for validated analytical results.
"Select Metals**" indicates analysis for aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, thallium, vanadium, and zinc performed by USEPA Methods 6010 and 6020B; and analysis for mercury performed by USEPA Method 7471A. Refer to Table 11B for validated analytical results.
"WAD Cyanide" indicates analysis for weak acid dissociable cyanide performed by USEPA Method 4500-CN I. Refer to Tables 11B and 12B for validated analytical results.
"Pesticides/PCBs" indicates analysis for pesticides performed by USEPA Method 8081A, and analysis for polychlorinated biphenyls (PCBs) performed by USEPA Method 8082. Refer to Tables 11E and 12E for individual analyte lists and validated analytical results.
"TOC" indicates analysis for total organic carbon by USEPA Method 9060 (modified). Refer to Table 7A for validated analytical results.
"Grain Size" indicates analysis for grain size in accordance with American Society of Testing and Materials (ASTM) Method D-422. Refer to Table 6A for validated analytical results.

6. Refer to Section 2 of the text for further explanation and discussion regarding analytical program. Location designations are:
"SH-" series locations are borings in which a monitoring well was installed.
"SB-" series locations are borings with no monitoring well installed.
"UST-" series locations are areas around former underground storage tank locations.
"EUA-" series locations are within the east upland area.
"FPW-" series locations are within the floodplain.
"OP-" series locations are within the Orlando property.
"OSA-" series locations are within the on-site area.
"OSR-" series locations are within the on-site reference area.

7. "Dup." indicates a blind field duplicate was collected at this location on the same date as the primary sample and submitted for the listed analyses.
"NA" indicates that the category is not applicable as only one sample was collected from each of these locations.

8. "@" indicates at some locations, insufficient sample volume was recovered from the required sample interval. This necessitated that additional boring(s) be advanced to the required sample interval. These additional boring(s) were completed adjacent to the original boring. Samples were designated by the first boring from which a portion of the sample was collected. See boring and monitoring well logs included in Appendix B for additional information.

9. A description of the analytical program completed on the co-located earthworm samples for the EUA-, FPW-, OP-, OSA- and OSR-series samples is presented on Table 2F.

TABLE 2C
Summary of Surface Water Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Analyses Performed
SW-102	4/5/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/1/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SW-103	4/4/2001‡	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/1/2001‡	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SW-105	4/4/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/1/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SW-106	4/4/2001‡	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	Dup.	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/1/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	Dup.	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SW-107	4/4/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/1/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SW-108	4/4/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/1/2001‡	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SWR-1	4/5/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/2/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SWR-2	4/5/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/2/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SWR-3	4/5/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/2/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SWR-4	4/5/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/2/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SWR-5	4/5/2001	BU301; BU501	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	8/1/2001	BU302; BU504	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos

Notes:

1. Samples were collected by SHA on the dates indicated. Refer to the field sampling summaries in Appendix B for further information.

2. "‡" A split sample was collected from this location by the United States Environmental Protection (USEPA) oversight contractor, Metcalf & Eddy (M&E).

4. Chemical analyses were generally performed by Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts. Asbestos analyses were performed by International Asbestos Testing Laboratory (IATL) of Mt. Laurel, New Jersey.

4. "SVOCs" indicates analysis for semi-volatile organic compounds by USEPA Method 8270C-EI, and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Refer to Table 14D for list of individual compounds and validated analytical data.

"VOCs" indicates analysis for volatile organic compounds by USEPA Method 8260B. Refer to Table 14E for list of individual compounds and validated analytical data.

"Metals" indicates analysis for the target analyte list (TAL) of metals, including dissolved and total aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc by USEPA Method 6020; and analysis for mercury by USEPA Method 7000 series with gold amalgamation preparation. Refer to Table 14C for validated analytical data.

"WAD Cyanide" indicates analysis for weak acid dissociable cyanide by USEPA Method 4500-CN I. Refer to Table 14C for validated analytical data.

"TOC" indicates analysis for total organic carbon. Samples collected in April 2001 were analyzed by USEPA Method 9060 (modified). Samples collected in August 2001 were analyzed by USEPA Method 415.1. Refer to Table 7C for validated analytical data.

"Asbestos" indicates analysis for asbestos by USEPA Methods 600/4-83-043 and 100.1. Refer to Table 14F for list of individual analytes and validated analytical data.

5. Refer to Section 2 of the text for further explanation of the analytical program. Location designations are:

"SW-" series locations are Site surface water sampling locations.

"SWR-" series locations are surface water reference sampling locations.

6. "Dup." indicates a blind field duplicate was collected at this location on the same date as the primary sample and submitted for the listed analyses.

TABLE 2D
Summary of Sediment Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	Sample Depth (ft)	SDG Number	Analyses Performed
Neponset River Sediments				
NR-1	7/26/2001‡	0 - 0.3	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	Dup.	0 - 0.3	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
NR-2	07/26/01	0 - 0.2	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
NR-3	7/26/2001‡	0 - 0.2	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
NR-4	7/26/2001‡	0 - 0.5	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
NR-5†	07/26/01	0 - 0.2	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	12/18/2002	0 - 0.5	BU409;BU801	Select SVOCs**, Metals, TOC, Bioaccumulation
NR-6	7/26/2001‡	0 - 0.3	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
NR-7	07/25/01	0 - 0.1	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	12/18/2002	0 - 0.5	BU409;BU801	Ammonia, Select SVOCs**, Select VOCs, Metals, TOC, Bioaccumulation, Toxicity
NR-8	7/25/2001‡	0 - 0.2	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	12/18/2002	0 - 0.5	BU409;BU801	Ammonia, Select SVOCs**, Select VOCs, Metals, TOC, Bioaccumulation, Toxicity
Neponset River (Upstream of the Site) Reference Sediments				
SedRN-1	7/26/2001‡	0 - 0.2	BU401; BU602	TOC, Grain Size
	5/24/2002	0 - 0.5	BU407; BU507	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	Dup.	0 - 0.5	BU407; BU507	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRN-2	7/26/2001	0 - 0.2	BU401; BU602	TOC, Grain Size
	5/24/2002	0 - 0.5	BU407; BU507	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Asbestos
SedRN-3	7/26/2001	0 - 0.2	BU401; BU602	TOC, Grain Size
	5/24/2002‡	0 - 0.5	BU407; BU507	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Asbestos
SedRN-4	7/26/2001	0 - 0.2	BU401; BU602	TOC, Grain Size
	5/24/2002‡	0 - 0.5	BU407; BU507	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Asbestos
	12/18/2002	0 - 0.5	BU409;BU801	Ammonia, Select SVOCs**, Select VOCs, Metals, TOC, Bioaccumulation, Toxicity
SedRN-5	7/26/2001	0 - 0.2	BU401; BU602	TOC, Grain Size
	5/24/2002‡	0 - 0.5	BU407; BU507	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Asbestos
Lewis Pond Sediments				
LP-01	7/31/2001‡	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	Dup.	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	12/18/2002	0 - 0.5	BU409;BU801	Ammonia, Select SVOCs**, Select VOCs, Metals, TOC, Bioaccumulation, Toxicity
LP-02	7/31/2001	0 - 0.3	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
LP-03	7/31/2001‡	0 - 0.4	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
LP-04	7/31/2001	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
LP-05	7/30/2001‡	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
LP-06	7/30/2001‡	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	12/18/2002	0 - 0.5	BU409;BU801	Select SVOCs**, Metals, TOC, Bioaccumulation
LP-07	7/30/2001	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
LP-08	7/30/2001	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
LP-09	7/30/2001‡	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	12/18/2002	0 - 0.5	BU409;BU801	Select SVOCs**, Metals, TOC, Bioaccumulation
LP-10	7/30/2001	0 - 0.5	BU402; BU503; BU603	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
Lower Pond (Norwood, Massachusetts) Reference Sediments				
SedRNwd-01	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002‡	0 - 0.5	BU408; BU508	Ammonia, SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
	Dup.	0 - 0.5	BU408; BU508	Ammonia, SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-02	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-03	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-04	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-05	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-06	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-07	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-08	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-09	11/15/2001	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos
SedRNwd-10	11/15/2001‡	0 - 0.5	BU405; BU606	TOC, Grain Size
	Dup.	0 - 0.5	BU405; BU606	TOC, Grain Size
	12/17/2002	0 - 0.5	BU408; BU508	SVOCs, VOCs, Metals, WAD Cyanide, TOC, Asbestos

TABLE 2D
Summary of Sediment Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	Sample Depth (ft)	SDG Number	Analyses Performed
Stoughton Pond (Stoughton, Massachusetts) Reference Sediments				
SedRS-01	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
	Dup.	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-02	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-03	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-04	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-05	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-06	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-07	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-08	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-09	11/15/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRS-10	11/15/2001‡	0 - 0.5	BU403; BU604	TOC, Grain Size
Memorial Pond (Walpole, Massachusetts) Reference Sediments				
SedRW-01	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-02	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-03	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-04	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-05	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-06	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-07	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-08	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-09	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
SedRW-10	11/16/2001	0 - 0.5	BU403; BU604	TOC, Grain Size
Floodplain Sediments				
FP-01	10/10/2001‡	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	Dup.	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FP-02	10/10/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FP-03	10/10/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FP-04	10/10/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FP-05	10/10/2001‡	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	8/05/2003‡	0 - 1	BU410; BU509	Select SVOCs*, Select Metals
	Dup.	0 - 1	BU410; BU509	Select SVOCs*, Select Metals
	8/5/2003	1 - 3	BU410; BU509	Select SVOCs*, Select Metals
FP-06	10/10/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	8/5/2003	0 - 1	BU410; BU509	Select SVOCs*, Select Metals
	8/5/2003	1 - 3	BU410; BU509	Select SVOCs*, Select Metals
FP-08	10/10/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FP-09	10/10/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	8/5/2003	0 - 1	BU410; BU509	Select SVOCs*, Select Metals
	8/5/2003	1 - 3	BU410; BU509	Select SVOCs*, Select Metals
FP-10	10/10/2001‡	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
Floodplain Reference Sediments				
FPR-01	10/9/2001‡	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-02	10/9/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-03	10/9/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-04	10/9/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-05	10/9/2001‡	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-06	10/9/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-07	10/9/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-08	10/9/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-09	10/9/2001	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
FPR-10	10/9/2001‡	0 - 1	BU404; BU505; BU605	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
Former Mill Tailrace Sediments				
TR-1	7/25/2001‡	0 - 0.5	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
TR-2	7/25/2001	0 - 0.4	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
TR-3	7/25/2001‡	0 - 0.4	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	12/16/2002‡	0 - 0.5	BU409;BU801	Ammonia, Select SVOCs**, Select VOCs, Metals, TOC, Bioaccumulation, Toxicity
	Dup.	0 - 0.5	BU409;BU801	Ammonia, Select SVOCs**, Select VOCs, Metals, TOC, Bioaccumulation, Toxicity
	8/6/2003	0 - 2.5	BU509	Asbestos
TR-4	8/7/2003	0 - 0.4	BU509	Asbestos
	7/25/2001	0 - 3	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
TR-5	7/25/2001‡	0 - 0.6	BU401; BU502; BU602	SVOCs, VOCs, Metals, WAD Cyanide, TOC, AVS/SEM, Grain Size, Asbestos
	8/6/2003‡	0 - 2.9	BU-509	Asbestos

TABLE 2D
Summary of Sediment Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by SHA on the dates indicated. Refer to the field sampling summaries in Appendix B for further information.

2. "†" The stake at the original NR-5 location was lost after the July 26, 2001 sample was collected. The location was re-established as NR-5A for the December 18, 2002 sample.

3. "‡" A split sample was collected from this location by the United States Environmental Protection (USEPA) oversight contractor, Metcalf & Eddy (M&E).

4. Chemical analyses were generally performed by Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts; grain size analyses were performed by Applied Marine Sciences, Inc. (AMS) of League City, Texas and WHGEL. Asbestos analyses were performed by International Asbestos Testing Laboratory (IATL) of Mt. Laurel, New Jersey. Toxicity and bioaccumulation analyses were performed by Aquatec Biological Sciences, Inc. (Aquatec) of South Bennington, Vermont.

5. "SVOCs" indicates analysis for semi-volatile organic compounds by USEPA Method 8270C-EI, and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Refer to Table 15C for list of individual compounds and validated analytical data.

"Select SVOCs*" indicates analysis for bis(2-ethylhexyl)phthalate and carbazole by USEPA Method 8270C-EI and PAHs by USEPA Method 8270C-SIM. Refer to Table 15C for list of individual compounds and validated analytical data.

"Select SVOCs**" indicates analysis for benzoic acid, benzyl alcohol, bis[2-ethylhexyl]phthalate, carbazole, 2,4-dimethylphenol, di-n-octylphthalate, 4-methylphenol, and 4-nitroaniline by USEPA Method 8270C-EI; and PAHs by USEPA Method 8270C-SIM. Refer to Table 15C for list of individual compounds and validated analytical data.

"VOCs" indicates analysis for volatile organic compounds by USEPA Method 8260B. Refer to Table 15D for list of individual compounds and validated analytical data.

"Select VOCs" indicates analysis for acetone, 2-butanone (methyl ethyl ketone [MEK]), carbon disulfide, and methyl-tert-butyl ether by USEPA Method 8260B. Refer to Table 15D for validated analytical data.

"Metals" indicates analysis for the target analyte list (TAL) of metals, including aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. Samples collected in 2001 were analyzed by USEPA Methods 6010B/6020 and 7471A (mercury only). Samples collected in 2002 and 2003 were analyzed by USEPA Methods 6010B/6020A and 7471A (mercury only). Refer to Table 15B for validated analytical data.

"Select Metals" indicates analysis for aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc by USEPA Methods 6010B/6020 and 7471A (mercury only). Refer to Table 15B for validated analytical data.

"WAD Cyanide" indicates analysis for weak acid dissociable cyanide by USEPA Method 4500-CN I. Refer to Table 15B for validated analytical data.

"Ammonia" indicates analysis for ammonia as nitrogen by USEPA Method 350.1. Refer to Table 15B for validated analytical data.

"TOC" indicates analysis for total organic carbon by USEPA Method 9060 (modified). Refer to Table 7B for validated analytical data.

"AVS/SEM" indicates analysis for acid volatile sulfides and simultaneously extracted metals (cadmium, copper, lead, nickel, and zinc) by USEPA AVSSEM SOP v2.0 9/4/92. Refer to Table 15B for validated analytical data.

"Asbestos" indicates analysis for asbestos. Samples collected in 2001 and 2002 were analyzed by USEPA Region I Method 1994 and TEM ELAP Method 198.4. Samples collected in 2003 were analyzed by USEPA Region I Method 1994 and USEPA Method 600/R-93-116 (July 1993). Refer to Table 15E for list of individual analytes and validated analytical data.

"Grain Size" indicates analysis for grain size in accordance with American Society of Testing and Materials (ASTM) Method D-422. Refer to Table 6B for validated analytical results.

"Bioaccumulation" indicates testing for bioaccumulation in invertebrates in accordance with Aquatec's Standard Operating Procedure (SOP) entitled "Oligochaete, *Lumbriculus variegates* , 28-day Bioaccumulation Test for Sediments". Refer to Table 2G for a description of the sampling and analysis program completed on *Lumbriculus variegates* , and Tables 17A and 17B for validated analytical results of chemical analyses performed on the *Lumbriculus variegates* .

"Toxicity" indicates testing for toxicity in accordance with Aquatec's SOP entitled "Amphipod, *Hyalella azteca* , 28-day Survival and Growth Toxicity Testing for Sediments".

6. Refer to Section 2 of this Report for further explanation and discussion regarding analytical program. Location designations are:
"NR-" series locations are along the bed of the Neponset River immediately downstream of the Site.
"SedRN-" series locations are reference locations along the bed of the Neponset River upstream of the Site.
"LP-" series locations are along three transects across Lewis Pond.
"SedRNwd-" series locations are Lewis Pond reference locations located in Lower Pond in Norwood, Massachusetts.
"SedRS-" series locations are Lewis Pond reference locations located in Stoughton Pond in Stoughton, Massachusetts.
"SedRW-" series locations are Lewis Pond reference locations located in Memorial Pond in Walpole, Massachusetts.
"FP-" series locations are in the floodplain downstream of the Site, between the Site and the dam at Lewis Pond.
"FPR-" series locations are reference floodplain samples located upstream of the Site.
"TR-" series locations are in the former mill tailrace.

7. "Dup." indicates a blind field duplicate was collected at this location on the same date as the primary sample and submitted for the listed analyses.

TABLE 2E
Summary of Fish Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Analyses Performed
Neponset River Fish Fillet and Carcass Samples			
NRF-1	8/18/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
NRF-2	8/18/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
NRF-3	8/18/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
NRF-4	8/18/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
NRF-5	8/18/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
NRC-5	8/18/2003	BU903	Select SVOCs, % Lipids, Select Metals
Neponset River Whole Body Fish Samples			
NRW-1	8/18/2003	BU903	Select SVOCs, % Lipids, Select Metals
NRW-3	8/18/2003	BU903	Select SVOCs, % Lipids, Select Metals
NRW-4	8/18/2003	BU903	Select SVOCs, % Lipids, Select Metals
NRW-5	8/18/2003	BU903	Select SVOCs, % Lipids, Select Metals
Lewis Pond Fish Fillet Samples			
LPF-1	8/19/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
LPF-2	8/19/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
LPF-3	8/19/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
LPF-4	8/19/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
LPF-5	8/19/2003	BU903;BU903A	Select SVOCs, % Lipids, Select Metals†
Lewis Pond Whole Body Fish Samples			
LPW-1	8/19/2003	BU903	Select SVOCs, % Lipids, Select Metals
LPW-2	8/19/2003	BU903	Select SVOCs, % Lipids, Select Metals
LPW-3	8/19/2003	BU903	Select SVOCs, % Lipids, Select Metals
LPW-4	8/19/2003	BU903	Select SVOCs, % Lipids, Select Metals
LPW-5	8/19/2003	BU903	Select SVOCs, % Lipids, Select Metals
Lower Pond (Norwood, Massachusetts) Fish Fillet and Carcass Samples			
NWD-1-F	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-1-C	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-2-F	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-2-C	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-3-F	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-3-C	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-4-F	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-5-F	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
Lower Pond (Norwood, Massachusetts) Whole Body Fish Samples			
NWD-6-W	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals
NWD-7-W	10/30/2003	BU905	Select SVOCs, % Lipids, Select Metals

TABLE 2E
Summary of Fish Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. The fish samples were collected by SHA and Aquatec Biological Sciences, Inc. (Aquatec) of South Bennington, Vermont on the dates indicated, and include fillet (F), carcass (C), and whole body (W) samples. Refer to the field sampling summaries in Appendix B for further information.

2. In areas where insufficient number of whole body samples were collected, carcass samples from filleted fish were analyzed and the results were combined mathematically with fillet sample results to calculate whole body concentrations.

3. Chemical analyses were performed by Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts.

4. "Select SVOCs" indicates analysis for the semi-volatile organic compounds benzoic acid, benzyl alcohol, bis[2-ethylhexyl]phthalate, carbazole, 2,4-dimethylphenol, di-n-octylphthalate, 4-methylphenol, and 4-nitroaniline by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Refer to Table 16B for list of individual compounds and validated analytical data.

"Select Metals" indicates analysis for aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc by USEPA Methods 6020 and 7471A (mercury only). Refer to Table 16A for validated analytical data.

"% Lipids" indicates analysis for percent lipids by WHGEL SOP# OP-015, Rev. 1, August 26, 2002. Refer to Table 16B for validated analytical data.

5. Refer to Section 2 of this Report for further explanation and discussion regarding analytical program. Location designations are:

"NRF-" series locations are fish fillet samples from the Neponset River.

"NRC-" series locations are fish carcass samples from the Neponset River.

"NRW-" series locations are whole body fish samples from the Neponset River.

"LPF-" series locations are fish fillet samples from Lewis Pond.

"LPW-" series locations are whole body fish samples from Lewis Pond.

"NWD-" series locations are Lewis Pond reference fish samples (F=fillet, C=carcass, W=whole body fish) collected from Lower Pond in Norwood, Massachusetts.

6. Sample NRW-2 was not analyzed.

7. "†" indicates analysis for arsenic was inadvertently not performed during the initial analyses of these samples. WHGEL analyzed and reported arsenic for these samples in a separate SDG.

TABLE 2F
Summary of Earthworm Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Analyses Performed
EUA-1	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
	Dup.	BU902	Select SVOCs, % Lipids, Select Metals
EUA-2	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
EUA-3	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
FPW-1	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
FPW-2	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
FPW-3	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
OP-1	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
OP-2	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
OP-3	8/8/2003	BU902	Select SVOCs, % Lipids, Select Metals
OSA-1	8/7/2003	BU902	Select SVOCs, % Lipids, Select Metals
OSA-2	8/12/2003	BU902	Select SVOCs, % Lipids, Select Metals
OSA-3	8/12/2003	BU902	Select SVOCs, % Lipids, Select Metals
OSR-1-W	11/21/2003	BU906;BU904	Select SVOCs, % Lipids, Select Metals
	Dup.	BU906;BU904	Select SVOCs, % Lipids, Select Metals
OSR-2-W	11/4/2003	BU904	Select SVOCs, % Lipids, Select Metals
OSR-3-W	10/31/2003	BU904	Select SVOCs, % Lipids, Select Metals

Notes:

1. Earthworms and co-located soil samples were collected by SHA and Menzie-Cura & Associates, Inc. (MCA) of Winchester, Massachusetts on the dates indicated. A description of the analytical program on the co-located soil samples is presented on Table 2B. Refer to the field sampling summaries in Appendix B for further information.

2. Chemical analyses were performed by Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts.

3. "Select SVOCs" indicates analysis for the semi-volatile organic compounds benzoic acid, butylbenzylphthalate, carbazole, dibenzofuran, 1,2-dichlorobenzene, and 4-methylphenol by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by United States Environmental Protection Agency (USEPA) Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Refer to Table 18B for list of individual compounds and validated analytical data.

"Select Metals" indicates analysis for aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc by USEPA Methods 6020 and 7471A (mercury only). Refer to Table 18A for validated analytical data.

"% Lipids" indicates analysis for percent lipids by WHGEL SOP# OP-015, Rev. 1, August 26, 2002. Refer to Table 18B for validated analytical data.

4. Refer to Section 2 of this Report for further explanation and discussion regarding analytical program. Location descriptions are:

"EUA-" series locations are within the east upland area.
"FPW-" series locations are within the floodplain.
"OP-" series locations are within the Orlando property.
"OSA-" series locations are within the on-site area.
"OSR-" series locations are within the on-site reference area.

5. "Dup." indicates a blind field duplicate was collected at this location on the same date as the primary sample and submitted for the listed analyses.

TABLE 2G
Summary of Bioaccumulated Invertebrate Sampling and Analysis Program
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sediment Collection Date	Invertebrate (*Lumbriculus Variegates*) Collection Date	SDG Number	Analyses Performed
NR-5	12/18/2002	1/28/2003	BU901	Select SVOCs, % Lipids, Select Metals
NR-7	12/18/2002	1/28/2003	BU901	Select SVOCs, % Lipids, Select Metals
NR-8	12/18/2002	1/28/2003	BU901	Select SVOCs, % Lipids, Select Metals
SedRN-4	12/18/2002	1/28/2003	BU901	Select SVOCs, % Lipids, Select Metals
LP-01	12/18/2002	1/27/2003	BU901	Select SVOCs, % Lipids, Select Metals
LP-06	12/18/2002	1/27/2003	BU901	Select SVOCs, % Lipids, Select Metals
LP-09	12/18/2002	1/27/2003	BU901	Select SVOCs, % Lipids, Select Metals
SedRNwd-01	12/17/2002	1/27/2003	BU901	Select SVOCs, % Lipids, Select Metals
	Dup.	1/27/2003	BU901	Select SVOCs, % Lipids, Select Metals
TR-3	12/16/2002	1/27/2003	BU901	Select SVOCs, % Lipids, Select Metals

Notes:

1. Sediment samples were collected by SHA on the dates indicated. Refer to the field sampling summaries in Appendix B for further information.

2. Sediment samples were submitted to Aquatec Biological Sciences, Inc. (Aquatec) of South Bennington, Vermont for a 28-day bioaccumulation test using *Lumbriculus variegates.* Following the 28-day test, Aquatec submitted the *Lumbriculus variegates* to Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts for chemical analysis. In addition, WHGEL performed chemical analysis on sediment from each location. A description of the analytical program completed on these sediment samples is presented on Table 2D.

3. "Select SVOCs" indicates analysis for the semi-volatile organic compounds benzoic acid, benzyl alcohol, bis[2-ethylhexyl]phthalate, carbazole, 2,4-dimethylphenol, di-n-octylphthalate, 4-methylphenol, and 4-nitroaniline by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Refer to Table 17B for list of individual compounds and validated analytical data.

"Select Metals" indicates analysis for aluminum, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc by USEPA Methods 6020 and 7471A (mercury only). Refer to Table 17A for validated analytical data.

"% Lipids" indicates analysis for percent lipids by WHGEL SOP# OP-015, Rev. 1, August 26, 2002. Refer to Table 17B for validated analytical data.

4. Refer to Section 2 of this Report for further explanation and discussion regarding analytical program. Location designations are:
"NR-" series locations are along the bed of the Neponset River immediately downstream of the Site.
"SedRN-" series locations are reference locations along the bed of the Neponset River upstream of the Site.
"LP-" series locations are along three transects across Lewis Pond.
"SedRNwd-" series locations are Lewis Pond reference locations located in Lower Pond in Norwood, Massachusetts.
"TR-" series locations are in the former mill tailrace.

5. "Dup." indicates a blind field duplicate was collected at this location on the same date as the primary sample and submitted for the listed analyses.

TABLE 3A
Summary of Groundwater Elevations
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Monitoring Well Location	Reference Elevation (ft)	Ground Surface Elevation (ft)	August 20, 2001		October 29, 2001		March 5, 2002		May 14, 2002		November 17&18, 2003		May 25, 2004		September 19, 2006	
			Depth to Water (ft)	Groundwater Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)
Shallow Monitoring Wells																
SH-01S	167.60	165.35	15.61	151.99	17.06	150.54	15.19	152.41	14.50	153.10	14.78	152.82	14.37	153.23	15.38	152.22
SH-02S	167.22	165.15	16.33	150.89	17.38	149.84	16.05	151.17	15.52	151.70	15.64	151.58	15.08	152.14	16.08	151.14
SH-03S	169.77	167.06	19.79	149.98	20.51	149.26	19.30	150.47	19.04	150.73	19.12	150.65	18.45	151.32	19.48	150.29
SH-04S	151.30	149.53	5.70	145.60	5.99	145.31	5.30	146.00	4.62	146.68	5.58	145.72	5.38	145.92	5.41	145.89
SH-05S	152.16	150.10	5.77	146.39	6.44	145.72	5.26	146.90	4.41	147.75	5.43	146.73	5.18	146.98	5.33	146.83
SH-06S	155.08	155.55	5.62	149.46	7.09	147.99	5.77	149.31	4.09	150.99	4.99	150.09	4.56	150.52	5.64	149.44
SH-07S	161.93	162.31	9.98	151.95	11.57	150.36	9.58	152.35	8.29	153.64	9.28	152.65	5.80	156.13	9.88	152.05
SH-08S	162.52	162.90	6.69	155.83	8.58	153.94	6.74	155.78	5.79	156.73	6.53	155.99	5.65	156.87	6.65	155.87
SH-09S	167.57	165.55	13.66	153.91	14.80	152.77	13.19	154.38	12.69	154.88	13.44	154.13	13.37	154.20	13.84	153.73
SH-10S	174.04	171.44	18.23	155.81	19.11	154.93	18.00	156.04	17.72	156.32	17.94	156.10	17.73	156.31	18.04	156.00
SH-11S	169.91	167.64	15.22	154.69	15.81	154.10	14.83	155.08	14.56	155.35	14.75	155.16	14.51	155.40	15.09	154.82
SH-12S	169.32	167.07	19.27	150.05	19.80	149.52	18.84	150.48	18.59	150.73	18.63	150.69	17.98	151.34	18.97	150.35
SH-13S	168.19	165.72	17.64	150.55	18.16	150.03	17.34	150.85	17.17	151.02	17.24	150.95	16.77	151.42	17.42	150.77
SH-14S	152.28	150.07	4.57	147.71	4.90	147.38	4.33	147.95	3.97	148.31	4.44	147.84	4.19	148.09	4.42	147.86
SH-15S	148.95	146.94	5.17	143.78	5.35	143.60	4.83	144.12	2.26	146.69	3.08	145.87	4.94	144.01	4.89	144.06
SH-16S	150.84	148.83	4.36	146.48	5.54	145.30	3.60	147.24	2.33	148.51	3.54	147.30	3.53	147.31	4.43	146.41
SH-17S	156.28	156.66	7.57	148.71	9.23	147.05	7.67	148.61	6.55	149.73	7.1	149.18	6.00	150.28	7.33	148.95
SH-18S	170.33	168.10	15.94	154.39	17.38	152.95	16.46	153.87	15.20	155.13	15.92	154.41	14.24	156.09	15.86	154.47
SH-19S	168.32	168.55	9.55	158.77	10.47	157.85	9.61	158.71	8.88	159.44	8.61	159.71	8.51	159.81	9.48	158.84
SH-20S	167.90	168.19	9.23	158.67	10.15	157.75	9.24	158.66	8.48	159.42	9.21	158.69	8.42	159.48	9.23	158.67
SH-21S	165.39	165.67	6.26	159.13	6.93	158.46	6.25	159.14	5.79	159.60	5.99	159.40	5.49	159.90	6.14	159.25
SH-22S	170.29	170.61	10.86	159.43	11.68	158.61	10.90	159.39	10.37	159.92	10.77	159.52	9.87	160.42	10.69	159.60
SH-23S	171.86	169.48	7.33	164.53	8.54	163.32	8.22	163.64	7.15	164.71	7.58	164.28	6.41	165.45	7.31	164.55
SH-24S	145.36	145.53	NI		NI		NI		NI		2.04	143.32	1.78	143.58	1.91	143.45
SH-25S	148.93	146.89	NI		NI		NI		NI		4.40	144.53	4.15	144.78	4.68	144.25
SH-26S	145.32	145.6	NI		NI		NI		NI		1.59	143.73	1.49	143.83	1.61	143.71
SH-27S	159.07	159.45	NI		NI		NI		NI		10.69	148.38	9.38	149.69	10.98	148.09
SH-28S	150.94	150.94	NI		NI		NI		NI		8.62	142.32	8.48	142.46	8.55	142.39
WP-01	161.4	157.23	NI		NI		NI		NI		5.63	155.77	5.36	156.04	5.13	156.27
WP-02	160.04	157.25	NI		NI		NI		NI		4.02	156.02	3.71	156.33	3.65	156.39
WP-03	149.99	147.7	NI		NI		NI		NI		2.49	147.50	5.12	144.87	5.12	144.87
WP-04	146.75	143.38	NI		NI		NI		NI		2.78	143.97	1.64	145.11	1.43	145.32
WP-05	145.52	142.61	NI		NI		NI		NI		1.52	144.00	1.34	144.18	1.06	144.46
WP-06	145.19	142.39	NI		NI		NI		NI		2.32	142.87	2.22	142.97	2.08	143.11
WP-07	145.54	142.86	NI		NI		NI		NI		2.08	143.46	2.19	143.35	2.21	143.33
Deep / Bedrock Monitoring Wells																
SH-01D	167.82	165.55	17.67	150.15	17.78	150.04	17.98	149.84	16.65	151.17	17.98	149.84	17.05	150.77	16.76	151.06
SH-01R	167.57	165.20	16.35	151.22	17.34	150.23	17.77	149.80	16.22	151.35	16.15	151.42	16.01	151.56	16.44	151.13
SH-02D	166.79	164.14	15.84	150.95	16.64	150.15	15.52	151.27	15.07	151.72	15.09	151.70	14.61	152.18	15.52	151.27
SH-02R	166.42	163.91	15.27	151.15	16.02	150.40	15.03	151.39	14.56	151.86	14.88	151.54	14.31	152.11	15.18	151.24
SH-03D	169.27	166.99	18.48	150.79	19.09	150.18	18.16	151.11	17.70	151.57	17.99	151.28	17.04	152.23	18.25	151.02
SH-04D	151.28	149.39	3.39	147.89	4.23	147.05	3.18	148.10	2.53	148.75	2.70	148.58	2.53	148.75	3.08	148.20
SH-05D	151.65	149.96	4.22	147.43	4.98	146.67	3.90	147.75	3.17	148.48	3.65	148.00	3.15	148.50	4.04	147.61
SH-06D	155.22	155.55	6.30	148.92	7.14	148.08	7.29	147.93	5.57	149.65	6.80	148.42	5.85	149.37	5.66	149.56
SH-07D	162.09	162.27	10.81	151.28	11.91	150.18	11.02	151.07	10.13	151.96	9.60	152.49	9.62	152.47	9.81	152.28
SH-08D	162.62	162.80	9.66	152.96	11.32	151.30	9.65	152.97	8.38	154.24	9.30	153.32	8.46	154.16	9.56	153.06
SH-09D	167.28	165.60	14.18	153.10	15.34	151.94	13.83	153.45	13.22	154.06	13.78	153.50	13.40	153.88	14.11	153.17
SH-12D	169.14	166.67	17.98	151.16	18.66	150.48	17.72	151.42	17.30	151.84	17.57	151.57	16.99	152.15	17.75	151.39
SH-14D	151.98	150.16	2.32	149.66	3.00	148.98	2.31	149.67	1.86	150.12	2.06	149.92	1.50	150.48	2.19	149.79
SH-15D	148.99	147.13	3.36	145.63	3.88	145.11	2.99	146.00	4.05	144.94	2.98	146.01	2.69	146.30	2.71	146.28
SH-18D	170.49	168.10	14.72	155.77	15.99	154.50	14.95	155.54	13.87	156.62	14.63	155.86	13.20	157.29	14.6	155.89
SH-19D	167.99	168.25	10.18	157.81	11.17	156.82	10.25	157.74	9.74	158.25	10.06	157.93	9.06	158.93	10	157.99
SH-19R	167.88	168.14	9.53	158.35	10.16	157.72	10.20	157.68	9.89	157.99	9.49	158.39	8.61	159.27	8.46	159.42
SH-05R-A	152.89	151.31	NI		NI		NI		NI		2.08	150.81	1.03	151.86	2.09	150.80
SH-05R-B	152.94	151.31	NI		NI		NI		NI		1.88	151.06	0.90	152.04	2.0	150.94
SH-06R-A	155.90	156.21	NI		NI		NI		NI		6.37	149.53	5.25	150.65	6.16	149.74
SH-06R-B	156.01	156.21	NI		NI		NI		NI		7.44	148.57	5.31	150.70	6.34	149.67
SH-17D	156.59	156.51	NI		NI		NI		NI		7.40	149.19	6.27	150.32	7.63	148.96
SH-17R	156.17	156.38	NI		NI		NI		NI		7.05	149.12	6.04	150.13	7.06	149.11
SH-24R	145.47	145.72	NI		NI		NI		NI		1.56	143.91	1.28	144.19	0.98	144.49
SH-25D	150.27	147.05	NI		NI		NI		NI		3.74	146.53	2.73	147.54	3.85	146.42
SH-27D	159.24	159.58	NI		NI		NI		NI		11.15	148.09	9.80	149.44	11.33	147.91
SH-27R	159.79	159.96	NI		NI		NI		NI		11.16	148.63	11.09	148.70	11.52	148.27
SH-28D	150.87	150.94	NI		NI		NI		NI		6.89	143.98	5.80	145.07	6.43	144.44
SH-28R	150.57	150.39	NI		NI		NI		NI		6.46	144.11	5.67	144.90	6.48	144.09

Notes:

1. Groundwater level measurements were obtained by Sanborn, Head & Associates, Inc. (SHA) during six "comprehensive" groundwater monitoring rounds completed on the dates indicated using a Slope Indicator Co. water level meter or oil/water interface probe.

2. Depth measurements and elevations are reported in feet (ft).

3. Reference point elevations and local benchmarks were surveyed by Bryant Associates, Inc. of Boston, Massachusetts in April, August, or December 2001, and November 2003. Elevations shown are feet relative to the National Geodetic Vertical Datum (NGVD) of 1929 (above mean sea level).

4. The top of the PVC well casing was used as the reference point for depth to water measurements.

5. The groundwater measurement at SH-21S was completed on November 24, 2003 because the well was obstructed by debris on November 17 and 18, 2003.

6. The groundwater measurement at SH-27D/R/S was completed on May 26, 2004 because the wells were obstructed on May 25, 2004.

7. "NI" indicates that the corresponding location was not installed at the time of the measurement.

8. "NM" indicates No Measurement taken.

9. The Depth to Water and Groundwater Elevation presented on September 19,2006 for monitoring well SH-21S, was measured by Sanborn, Head & Associates, Inc. (SHA) on September 26, 2006.

TABLE 3B
Summary of Surface Water Elevations
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Reference Elevation (ft)	August 20, 2001		October 29, 2001		March 5, 2002		May 14, 2002		November 17 & 18, 2003		May 25, 2004	
		Depth to Water (ft)	Surface Water Elevation (ft)	Depth to Water (ft)	Surface Water Elevation (ft)	Depth to Water (ft)	Surface Water Elevation (ft)	Depth to Water (ft)	Surface Water Elevation (ft)	Depth to Water (ft)	Surface Water Elevation (ft)	Depth to Water (ft)	Surface Water Elevation (ft)
SG-101	168.77	2.48	166.29	2.76	166.01	2.12	166.65	Stake Missing		Stake Missing		Stake Missing	
SG-101AE	168.78	NI		NI		NI		NI		3.05	165.73	Dry	
SG-102	173.08	14.47	158.61	Dry		13.98	159.10	13.60	159.48	14.37	158.71	14.09	158.99
SG-103	161.26	6.58	154.68	Dry		6.40	154.86	5.53	155.73	Dry		NM	
SG-104	156.71	8.85	147.86	NM	NM	8.34	148.37	NM		NM		8.64	148.07
SG-105	146.23	2.42	143.81	2.48	143.75	Stake Missing		Stake Missing		Stake Missing		Stake Missing	
SG-105A	145.91	NI		NI		1.81	144.10	1.20	144.71	2.01	143.90	1.85	144.06
SG-106	145.96	2.62	143.34	2.34	143.62	2.32	143.64	1.60	144.36	Stake Missing		Stake Missing	
SG-106A	146.03	NI		NI		NI		NI		2.56	143.47	2.63	143.40
SG-107	144.98	2.27	142.71	1.96	143.02	1.58	143.40	0.62	144.36	NM		0.79	144.19
SG-107A	147.95	NI		NI		NI		NI		4.74	143.21	NM	
SG-108	143.90	2.33	141.57	2.52	141.38	1.65	142.25	0.72	143.18	4.05	139.85	3.79	140.11
SG-109	147.07	5.66	141.41	5.83	141.24	5.21	141.86	4.06	143.01	NM		Stake Missing	
SG-109A	147.12	NI		NI		NI		NI		NI		5.34	141.78
SG-110A	150.16	NI		NI		NI		NI		NI		8.96	141.20
SG-111	141.60	2.26	139.34	2.50	139.10	1.87	139.73	1.09	140.51	NM		2.04	139.56
SG-112	143.98	4.76	139.22	4.94	139.04	4.30	139.68	3.78	140.20	NM		4.46	139.52
SG-113	149.11	NI		2.33	146.78	1.75	147.36	1.22	147.89	Stake Missing		Stake Missing	
SG-113E	148.00	NI		NI		NI		NI		NM		2.56	145.44
SG-113M	148.80	NI		NI		NI		NI		2.92	145.88	2.73	146.07

TABLE 3B
Summary of Surface Water Elevations
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Elevations and depths are reported in feet.

2. Surface water measurements were obtained by Sanborn, Head & Associates, Inc. (SHA) personnel on the dates indicated using a Slope Indicator Co. water level meter, a Solinst Model 101 water level meter or steel tape.

3. Reference point elevations and local benchmarks were surveyed by Bryant Associates, Inc. of Boston, Massachusetts in either April 2001, August 2001, December 2001 or November 2003. Elevations shown are feet relative to the National Geodetic Vertical Datum (NGVD) of 1929 (above mean sea level).

4. Staff gauge SG-113 was installed on October 29, 2001 as part of the surface water- groundwater interaction monitoring.

5. On March 5, 2002, the wooden grade stake marking staff gauge location SG-105 was missing. SHA installed a new staff gauge designated SG-105A in the approximate location of former SG-105.

6. Data are not presented for SG-110 because of concerns with the accuracy of the reference elevation. SG-110A was re-established in November 2003 at the approximate location of SG-110.

7. In November 2003 SHA installed new staff gauges designated SG-101AM, SG-106A, SG-107A, SG-109A, SG-110A, SG-113E, and SG-113M to replace missing staff gauges.

8. "NM" indicates that surface water level was not measured at this location/date.
"NI" indicates that the corresponding location was not installed at the time the surface water levels were measured.
"-" indicates the corresponding surface water elevation has not been calculated because the monitoring location is a replacement for a previously missing staff gauge.
"Stake Missing" indicates that the wooden stake used as the staff gauge was missing on the date indicated.
"Dry" indicates that no surface water was present at the staff gauge location on the date indicated.

TABLE 4
Summary of Site-Specific Temperature and Precipitation Data
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Month - Year	Minimum Temperature (ºF)	Maximum Temperature (ºF)	Average Temperature (ºF)	Temperature Source	Precipitation (in)	Precipitation Source
January-01	14	43	27	On-Site, NCDC	2.59	NCDC
February-01	5	41	28	On-Site, NCDC	2.17	NCDC
March-01	19	44	32	On-Site	10.62	NCDC
April-01	29	58	41	On-Site	1.48	NCDC
May-01	49	70	59	On-Site	2.56	NCDC
June-01	57	74	64	On-Site	7.51	NCDC
July-01	52	79	63	On-Site	5.46	NCDC
August-01	58	81	70	On-Site	3.79	NCDC
September-01	44	69	56	On-Site	1.77	NCDC
October-01	33	70	51	On-Site	0.59	NCDC
November-01	37	73	55	On-Site	1.06	NCDC
December-01	33	64	49	On-Site	3.30	NCDC
January-02	24	59	34	On-Site	2.85	NCDC
March-02	26	55	40	On-Site	4.02	NCDC
April-02	38	62	50	On-Site	2.50	NOAA
May-02	44	76	57	On-Site	5.65	NCDC
July-02	62	86	74	On-Site	2.18	NCDC
December-02	19	37	31	On-Site	6.21	NCDC
August-03	56	72	66	On-Site	5.59	NCDC
September-03	42	70	57	On-Site	3.56	NCDC
October-03	28	58	44	On-Site	6.08	NCDC
November-03	28	56	43	On-Site	2.69	NCDC
December-03	22	45	31	On-Site	6.86	NCDC

Notes:

1. Source:
"On-Site" - Data recorded by SHA personnel on-Site using a Davis Weather Monitor II station with external temperature sensor and tipping bucket rain collector.

"NCDC" - Data taken from National Climatic Data Center of Asheville, North Carolina for the Walpole 2 Station located approximately five miles south of the Site.

"NOAA" - Data taken from the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service (NWS) weather station located in Norwood, MA.

2. Measurements were typically recorded by Sanborn, Head & Associates, Inc (SHA) personnel each morning (usually between 7 A.M. and 9 A.M.) when on-Site.

3. When on-Site data was not available, data was taken from the NCDC. Data recorded in April 2002 was not available from the NCDC; therefore, data was taken from NOAA.

4. Temperature data from January 26, 2001 to February 19, 2001 was taken from the NCDC for the Walpole 2 Station. Average temperatures are based on daily temperatures recorded on-Site and from the NCDC data for the dates indicated.

TABLE 5
Summary of Public and Private Water Supply Wells within Approximately 1 Mile of the Site
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Well Identification	Approximate Distance from Site (feet)	Well Type	Total Well Depth (ft)	Depth to Bedrock (ft)	Bedrock Description	Well Yield	Princpal Water-Bearing Zones
PublicWells							
Mine Brook #1	4,500	24" x 48" gravel packed	37	37	NF	500 gpm	-
Mine Brook #5	5,100	24" x 48" gravel packed	63.5	63.5	NF	500 gpm	-
Washington #2	4,500	16" x 24" gravel packed	66	66	NF	500 gpm	-
Washington #3	5,200	16" x 24" gravel packed	57	57	NF	350 gpm	-
Washington #4	3,600	16" x 24" gravel packed	53.5	53.5	NF	400 gpm	-
Washington #5	4,500	24" x 48" gravel packed	60.5	60.5	NF	800 gpm	-
Washington #6	5,200	24" x 48" gravel packed	69	69	NF	800 gpm	-
Neponset Well #1	2,600	18" x 60" gravel packed	45	45	NF	400 gpm	-
Neponset Well #2	2,800	18" x 60" gravel packed	48	48	NF	160 gpm	-
Private Wells							
11 Audubon Drive	2,000	Domestic	360	45	Granite	-	350-355'
15 Audubon Drive	2,100	Irrigation	-	-	-	-	-
16 Audubon Drive	2,200	unknown	400	85	Granite	30 gpm	-
19 Audubon Drive	2,300	Irrigation	-	-	-	-	-
23 Audubon Drive	2,800	Unknown	-	-	-	-	-
252 Baker Street	4,800	Domestic	-	-	-	-	-
14 Brown Drive	2,100	Irrigation	-	-	-	-	-
505 Center Lane	1,200	Irrigation	-	-	-	-	-
Clear Pond Drive-A	2,900	Irrigation	605	85	Sandstone	25 gpm	425-445'
Clear Pond Drive-B	2,400	Irrigation	805	27	Sandstone / Shale	8 gpm	-
79 Common Street	800	Domestic/Irrigation	-	-	-	-	-
10 Diamond Street	3,200	Unknown	-	-	-	-	-
599 East Street	5,200	Domestic	245	110	-	245' / 4.1 hrs @ >100 gpm	145-150', 185-190', 225-230'
863 East Street	2,700	Domestic	285	50	-	255' / 1.5 hrs	105-115', 120-130', 265-275'
925 East Street	2,600	Domestic	-	-	-	-	-
7 Juniper Circle	5,100	Irrigation	540	83	Granite	-	-
91 Lake Avenue	1,500	Unknown	-	-	-	-	-
20 Lewis Avenue	900	Irrigation	-	-	-	-	-
825 Main Street	4,400	Domestic	-	-	-	-	-
1081 Main Street	1,000	Irrigation	-	-	-	-	-
1426 Main Street	5,200	Irrigation	-	-	-	-	-
45 Merchants Way	4,500	Irrigation	325	50	-	300' / 4 hrs @ 5 gpm	200-210', 300-310'
35 Norfolk Street	3,600	Irrigation	600	45	Granite	30 gpm	-
58 Peach Street	4,400	Irrigation	-	-	-	-	-
395 South Street	2,800	Domestic	-	-	-	-	-

TABLE 5
Summary of Public and Private Water Supply Wells within Approximately 1 Mile of the Site
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Well Identification	Approximate Distance from Site (feet)	Well Type	Total Well Depth (ft)	Depth to Bedrock (ft)	Bedrock Description	Well Yield	Princpal Water-Bearing Zones
599 South Street	4,900	Domestic	350	-	-	4.5 gpm	-
195 Spring Street	1,700	Domestic	-	-	-	-	-
225 Spring Street	1,800	Domestic	355	30	Shale	300' / 24 hrs @ 5 gpm	300-325'
233 Stone Street	2,600	Irrigation	-	-	-	-	-
Stone St. (Centre Height)	1,200	Irrigation	-	-	-	-	-
2 Taft Street	4,200	Domestic	525	40	-	340' / 12 hrs @ 3 gpm	265-266', 483-484'
15 Townside Lane	4,200	Domestic	240	-	-	-	-
1271 Washington Street	3,800	Irrigation	-	-	-	10 gpm	-
226 West Street	3,700	Irrigation	-	-	-	-	-
331 West Street	4,200	Irrigation	825	8	-	825' / 4 hrs @ 5gpm	180-190', 425-435'
965 West Street	4,400	Domestic	445	24	Granite	445' /4 hrs @ 8 gpm	100-110', 340-350'
1000 West Street	4,300	Domestic	-	-	-	-	-
1079 West Street	3,300	Domestic	665	-	-	1.5 gpm	-
1115 West Street	3,100	Domestic	625	-	-	6.5 gpm	-

Notes:

1. Information on public wells was obtained by Sanborn, Head & Associates, Inc (SHA) from the Town of Walpole (Town) web site, and a December 4, 1995, publication by William F. Abbott entitled "Town of Walpole, Walpole Water System, 100 years, 1895-1995" (Abbott, 1995).
   - Abbott, 1995 indicates well depth as "...generally the distance from the surface to bedrock." SHA has interperated this to mean that the total well depth and depth to bedrock are the same.
   - Well yields ("capacity") are presented in gallons per minute (gpm).
   - Abbott, 1995 indicates that for gravel packed wells, the first number listed for well sizes (e.g., 18" x 60") is the actual diameter of well, and the second number is the diameter of the boring into which the well was set.

2. Information on private wells was obtained by SHA from a list provided by the Town Board of Health to the Respondents dated April 28, 1999 on "known wells... on file within a half mile radius of the Shaffer Property"; a list of domestic wells provided to SHA by the Town Board of Health on December 29, 2000; a list of domestic and irrigation wells provided to SHA by the Town Department of Public Works on January 18, 2002; a list of Walpole Drinking Wells, as of June 21, 1996, and a list of private wells and ponds (circa 1985) both provided to SHA by the Town Board of Health on July 19, 2002; and a review of "well record applications" which included Well Completion Reports (prepared by the well driller) maintained by the Town's Board of Health on January 17, 2001, May 8, 2002, July 19, 2002, July 24, 2002, April 27, 2004, and May 19, 2005. Based on conversations with the Town Board of Health, irrigation wells are not required to be registered and well application records only date back to approximately 1985.

3. The locations of private wells were estimated by SHA using lists of properties that reportedly have wells, as indicated in Note 2. Addresses which appeared to be within one mile of the industrial portion of the Site, were then located approximately using an on-line mapping tool (e.g., Mapquest.com).

4. Information on "well yields" for private wells are based on well driller's Well Completion Reports and observed water level relative to ground surface for a period of time and a pumping rate.

5. Information on "principal water-bearing zones" for private wells are based on well drillers' Well Completion Reports.

6. Distances from the Site were estimated based on measurements from the site boundary to the well (see Figure F-1).

7. "NF" indicates the information suggests the well is screened in overburden material above the top of bedrock.
   "-" indicates no information was available from the records reviewed.

TABLE 6A
Grain Size Data - Soil
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Sample Number	Collection Date	Inferred Stratum	Grain Size Distribution				SHA Material Description
				Gravel (%)	Sand (%)	Fines (%)	Solids Total (%)	
EUA-1	NA	8/8/03	Topsoil	11.3	74.3	14.5	79.6	Very Dark Gray (2.5Y 3/1), fine to coarse SAND, little Gravel, little Silt, trace Organic matter (roots). Moist.
EUA-2	NA	8/8/03		3.2	72.4	24.3	57.4	Very Dark Brown (10YR 2/2), fine SAND, some Silt, trace Gravel, trace Orgainic matter (roots). Moist. Topsoil.
EUA-3	NA	8/8/03		0.8	51.1	48.2	65.6	Very Dark Brown (10YR 2/2), fine to medium SAND and Silt, trace Gravel, trace Orgainic matter (roots). Moist. Topsoil.
FPW-1	NA	8/8/03		2.7	59	38.3	59.0	Very Dark Grayish Brown (2.5Y 3/2), fine to medium SAND and Silt, trace Organic matter (roots). Moist. Topsoil.
FPW-2	NA	8/8/03		15.5	61.9	22.5	52.5	Black (2.5Y 2.5/1), fine to medium SAND, little Gravel, some Silt,, trace Organic matter (roots). Moist.
FPW-3	NA	8/8/03		2.1	78.3	19.5	54.4	Black (2.5 Y 2.5/1), fine SAND, little Silt, trace Gravel. Moist. Topsoil.
OP-1	NA	8/8/03		3.3	58.5	38.1	67.1	Very Dark Brown (10 YR 2/2), fine SAND and Silt, trace Gravel, trace Organic matter. Wet. Topsoil.
OP-2	NA	8/8/03		11.8	61	27.1	77.6	Dark Olive Brown (2.5 Y 3/3), fine to coarse SAND, some Silt, little Gravel, with pieces of glass. Wet. Possible Fill.
OP-3	NA	8/8/03		0.3	69.5	30.2	63.9	Very Dark Grayish Brown (2.5Y 3/2), fine to medium SAND, some Silt, trace Organic matter. Wet. Topsoil.
OSA-1	NA	8/7/03		8.9	74.7	16.3	80.9	Very Dark Gray (2.5 Y 3/1), fine to medium SAND, little Silt, trace Gravel, trace Organic matter. Moist.
OSA-2	NA	8/12/03		2.2	72	25.8	73.9	Very Dark Brown (10 YR 2/2), fine to medium SAND, some Silt, trace Gravel. Moist.
OSA-3	NA	8/12/03		0.6	81.9	17.5	72.6	Very Dark Grayish Brown (2.5 Y 3/2), fine SAND, little Silt. Moist.
OSR-1-S	NA	11/21/03		8.9	63.9	27.2	66.1	Fine SAND, some Clayey Silt, trace Gravel, trace Organic matter (roots). Moist.
OSR-2-S	NA	11/4/03		0.5	61.9	37.6	55.5	Black (10YR 2/1), fine to coarse SAND and Clayey Silt, trace Organic matter (roots, wood). Moist. Topsoil.
OSR-3-S	NA	10/31/03		4.6	63.1	32.3	63.4	Very Dark Brown (10YR 3/2), fine to medium SAND, some Silt, trace Gravel. Moist. Topsoil.
SB-10	S-3	6/7/2001	Soil Fill	45.8	44.0	10.3	100	Gray (2.5Y 5/1), fine to coarse SAND and Gravel, little Silt. Pale yellow (2.5Y 7/4) fibers (approximately 3/4" long) and ash. Changed at approximately 4.3' to light yellowish brown (2.5Y 6/3), GRAVEL and fine to coarse Sand, little Silt.
SH-11S/SB-42	S-4	7/27/2001		21.3	60.8	17.9	78	Black (2.5Y 2.5/1), fine to coarse SAND, some Gravel, little Silt. Pieces of brick, ash, mortar, glass, and fibers. Wet.
SH-03D/SB-45	S-7	7/19/2001		41.7	46.2	12.1	87	Dark grayish brown (2.5Y 4/2), fine to coarse SAND and Gravel, little Silt. Pieces of concrete and bricks.
SH-08S/SB-51	S-6	12/7/2000		66.8	29.0	4.2	91	Very dark gray (5Y 3/1), GRAVEL, some fine to coarse Sand, trace Silt. Pieces of plastic sheeeting. Petroleum staining.
SH-01R	S-5	6/25/2001		27.5	59.8	12.7	81	Black (2.5Y 2.5/1), fine to coarse SAND, some Gravel, little Silt. Pieces of black vesicular material, brick, metal, and gray fibrous material.
SB-03	S-2	5/9/2001	Alluvial	7.9	47.9	44.2	81	Grayish brown (2.5Y 5/2), fine to medium SAND and Clayey Silt, trace Gravel.
SH-12D/SB-44	S-8	7/31/2001		4.3	90.9	4.8	86	Pale olive (5Y 6/4), fine to medium SAND, trace Gravel, trace Clayey Silt.
UST-4	S-5	12/12/2000		2.9	42.7	54.4	84	Dark grayish brown (2.5Y 4/2), Clayey SILT and fine to coarse Sand, trace Gravel. Petroleum staining.
SB-06	S-13	3/16/2001	Ice Contact Sand/Sand & Gravel	64.1	32.4	3.5	96	Light olive brown (2.5Y 5/3), GRAVEL, some fine to coarse Sand, trace Silt.
SB-06	S-8	3/16/2001		22.1	67.9	10.0	91	Dark grayish brown (2.5Y 4/2), fine to coarse SAND, little Gravel, trace Silt.
SB-08A	S-5	3/15/2001		37.7	50.9	11.5	95	Light olive brown (2.5Y 5/3), fine to coarse SAND and Gravel, little Silt.
SH-18D/SB-28	S-6	7/23/2001		1.8	78.9	19.3	89	Light olive brown (2.5Y 5/6), fine to coarse SAND, little Silt, trace Gravel.
SH-04D	S-4	2/7/2001		64.2	31.3	4.5	97	Olive gray (5Y 4/2), GRAVEL, some fine to coarse Sand, trace Silt.
SH-05D	S-4	1/30/2001		42.2	51.1	6.8	89	Black (2.5Y 2.5/1), fine to coarse SAND and Gravel, trace Silt. Petroleum odor.
SH-15S	S-1	2/20/2001		20.0	53.0	27.0	91	Light olive brown (2.5Y 5/3), fine to coarse SAND, some Silt, little Gravel.
SH-17S	S-3	2/27/2001		3.5	92.7	3.8	87	Light olive brown (2.5Y 5/3), fine to coarse SAND, trace Gravel, trace Silt. Stratified.
SH-19R	S-4	6/27/2001		33.7	48.5	17.8	96	Light olive brown (2.5Y 5/4), fine to coarse SAND, some Gravel, little Silt.
SH-18D/SB-28	S-11	7/23/2001		60.3	26.6	13.1	94	Grayish green (10GY 5/2), GRAVEL, some fine to coarse SAND, little Silt. Possible weathered Sandstone boulder.

TABLE 6A
Grain Size Data - Soil
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Sample Number	Collection Date	Inferred Stratum	Grain Size Distribution				SHA Material Description
				Gravel (%)	Sand (%)	Fines (%)	Solids Total (%)	
SH-03D/SB-45	S-23	7/30/2001	Glacial Till	49.5	35.4	15.1	89	Light olive gray (5Y 5/2) pale yellowish brown (10YR 6/2), and dark gray (N3), GRAVEL (highly angular Sandstone and Conglomerate fragments) and fine to coarse Sand, little Silt.
SH-02R	S-13	6/26/2001		14.6	37.1	48.4	94	Light olive brown (2.5Y 5/3), Clayey SILT and fine to coarse Sand, little weathered Gravel.
SH-04D	S-15	2/9/2001		34.4	36.1	29.6	90	Light olive brown, (2.5Y 5/3), fine to coarse SAND, some Gravel, some Clayey Silt.
SH-07D	S-4	6/22/2001		22.4	49.2	28.4	93	Light olive brown (2.5Y 5/4), fine to coarse SAND, some Gravel, some Clayey Silt.
SH-15D	S-13	2/16/2001		18.0	36.9	45.1	86	Light yellowish brown (2.5Y 6/3), Clayey SILT and fine to coarse Sand, little Gravel. Possible highly weathered Conglomerate boulder.
SH-19R	S-7	6/27/2001		11.4	49.3	39.3	93	Light olive brown (2.5Y 5/4), fine to medium SAND and Clayey Silt, little Gravel.
SH-22S	S-6	6/28/2001		50.9	39.2	9.9	93	Yellowish brown (10YR 5/4), GRAVEL and fine to coarse Sand, trace Silt, trace Cobbles.
UST-5	S-7	12/13/2000		32.1	41.4	26.5	94	Light olive brown (2.5Y 5/3), fine to coarse SAND, some Gravel, some Clayey Silt. Slight oil staining.

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) personnel on the dates indicated.

2. Samples collected in 2000 and 2001 were submitted to Woods Hole Group Environmental Laboratories (WHGEL), Raynham, Massachusetts, and analyzed and reported by their subcontractor, Applied Marine Sciences, Inc. (AMS) of League, Texas, for grain size in accordance with American Society of Testing and Materials (ASTM) Method D-422. Samples collected in 2003 were analyzed by WHGEL for grain size using ASTM Method D-422.

3. Grain size and total solids results are provided in percent (%).

4. Classification of soil grain size was based on ASTM Method D2487-92, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). Grain size designations are as follows:

   Gravel = 75 mm (millimeters) to 4.76 mm
   Sand = 4.76 mm to 75 µm (micrometers)
   Fines = <75 µm

5. "Fines (%)" is the arithmetic sum of the reported values of Silt Fine and Clay Fine.

6. "NA" indicates there was only one sample collected from this location, so a sample number is not applicable.

TABLE 6B
Grain Size Data - Sediment
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Collection Date	Grain Size Distribution				SHA Material Description
		Gravel (%)	Sand (%)	Fines (%)	Solids Total (%)	
Neponset River Sediments						
NR-1	7/26/2001	8.2	91.8	0*	71	Dark olive gray (5Y 3/2), fine to coarse SAND, trace Gravel, trace Organic matter (roots, leaves).
NR-2	7/26/2001	3.3	96.7	0*	74	Dark olive brown (2.5Y 3/3), fine to coarse SAND, trace Gravel, trace Organic matter (roots, leaves).
NR-3	7/26/2001	27.1	72.9	0*	81	Dark olive brown (2.5Y 3/3), fine to coarse SAND, some Gravel, trace Silt.
NR-4	7/26/2001	63.1	37.0	0*	84	Olive brown (2.5Y 4/3), GRAVEL and fine to coarse Sand.
NR-5	7/26/2001	0.4	99.5	0*	81	Olive brown (2.5Y 4/3), fine to coarse SAND.
NR-6	7/26/2001	2.8	97.1	0*	78	Olive brown (2.5Y 4/3), fine to coarse SAND, trace Gravel.
NR-7	7/25/2001	40.9	59.0	0*	80	Dark olive brown (2.5Y 3/3), fine to coarse SAND and Gravel.
NR-8	7/25/2001	37.9	62.1	0*	84	Dark olive brown (2.5Y 3/3), fine to coarse SAND and Gravel.
Neponset River Reference Sediments						
SedRN-1	7/26/2001	76.2	23.8	0*	87	Light olive brown (2.5Y 5/4), GRAVEL, some fine to coarse Sand.
SedRN-2	7/26/2001	65.6	34.4	0*	85	Light olive brown (2.5Y 5/4), GRAVEL, some fine to coarse Sand.
SedRN-3	7/26/2001	44.1	56.0	0*	76	Light olive brown (2.5Y 5/4), fine to coarse SAND and Gravel.
SedRN-4	7/26/2001	54.9	45.1	0*	82	Light olive brown (2.5Y 5/4), GRAVEL and fine to coarse Sand.
SedRN-5	7/26/2001	71.7	28.2	0*	80	Light olive brown (2.5Y 5/4), GRAVEL, some fine to coarse Sand.
Lewis Pond Sediments						
LP-01	7/31/2001	0.0	71.6	28.4	42	Black (2.5Y 2.5/1), fine SAND, some Clayey Silt, trace Organic matter (roots, leaves).
LP-02	7/31/2001	0.0	2.2	97.8	29	Olive brown (2.5Y 4/4), Clayey SILT, trace fine Sand, trace Organic matter (roots, leaves).
LP-03	7/31/2001	0.0	3.9	96.2	30	Dark grayish brown (2.5Y 4/2), Clayey SILT, trace fine Sand, trace Organic matter (roots, leaves).
LP-04	7/31/2001	0.0	28.5	71.5	30	Black (2.5Y 2.5/1), Clayey SILT, some fine Sand, trace Organic matter (roots, leaves).
LP-05	7/30/2001	0.0	1.6	98.4	25	Olive brown (2.5Y 4/3), Clayey SILT, little Organic matter (roots, leaves), trace fine Sand.
LP-06	7/30/2001	0.0	1.4	98.6	28	Very dark grayish brown (2.5Y 3/2), Clayey SILT, little Organic matter (roots, leaves), trace fine Sand.
LP-07	7/30/2001	0.0	54.0	46.0	36	Dark olive brown (2.5Y 2.5/1), fine SAND and Clayey SILT, trace Organic matter (roots, leaves).
LP-08	7/30/2001	0.0	15.8	84.2	36	Black (2.5Y 2.5/1), Clayey SILT, little fine Sand, trace Organic matter (roots, leaves).
LP-09	7/30/2001	3.5	59.1	37.4	39	Black (2.5Y 2.5/1), fine SAND and Clayey SILT, trace Gravel, trace Organic matter (roots, leaves).
LP-10	7/30/2001	0.0	14.7	85.4	34	Black (2.5Y 2.5/1), Clayey SILT, little fine Sand, trace Organic matter (roots, leaves).
Lower Pond (Norwood, Massachusetts) Reference Sediments						
SedRNwd-01	11/15/2001	36.3	51.6	12.1	50	Black (2.5Y 2.5/1), fine to medium SAND and Gravel, little Silt, trace Organic matter (plant material).
SedRNwd-02	11/15/2001	0.0	31.2	68.8	26	Black (2.5Y 2.5/1), SILT, some fine to medium Sand, some Peat and Organic matter (plant material).
SedRNwd-03	11/15/2001	3.8	70.5	25.7	41	Black (2.5Y 2.5/1), fine to coarse SAND, little Silt, trace Gravel, trace Organic matter (roots).
SedRNwd-04	11/15/2001	0.0	13.6	86.4	22	Black (2.5Y 2.5/1), SILT, little fine Sand, trace Organic matter (roots).
SedRNwd-05	11/15/2001	2.6	86.0	11.4	65	Black (2.5Y 2.5/1), fine to coarse SAND, little Silt, trace Gravel, trace Organic matter (roots).
SedRNwd-06	11/15/2001	0.0	12.0	88.0	31	Black (2.5Y 2.5/1), SILT, little fine Sand, trace Organic matter (roots).
SedRNwd-07	11/15/2001	0.0	1.4	98.6	18	Black (2.5Y 2.5/1), SILT, trace fine Sand, trace Organic matter (leaves).
SedRNwd-08	11/15/2001	2.0	26.3	71.7	35	Black (2.5Y 2.5/1), Clayey SILT, some fine Sand, trace Gravel, trace Organic matter and Shells.
SedRNwd-09	11/15/2001	0.0	20.0	80.0	27	Black (2.5Y 2.5/1), SILT, little fine Sand, little Organic matter.
SedRNwd-10	11/15/2001	0.0	10.2	89.8	24	Black (2.5Y 2.5/1), SILT, trace fine Sand, trace Organic matter.
Stoughton Pond (Stoughton, Massachusetts) Reference Sediments						
SedRS-01	11/15/2001	0.0	4.4	95.6	21	Black (2.5Y 2.5/1), SILT, trace fine to medium Sand, trace Organic matter (roots).
SedRS-02	11/15/2001	0.0	5.8	94.2	15	Black (2.5Y 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRS-03	11/15/2001	0.0	2.0	98.0	13	Black (2.5Y 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRS-04	11/15/2001	0.0	1.0	99.0	17	Black (2.5Y 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRS-05	11/15/2001	0.0	0.6	99.4	21	Black (2.5Y 2.5/1), SILT, trace Organic matter (roots).
SedRS-06	11/15/2001	0.0	0.5	99.6	19	Black (2.5Y 2.5/1), SILT, trace Organic matter (roots).
SedRS-07	11/15/2001	8.6	41.9	49.5	29	Black (2.5Y 2.5/1), SILT and fine to coarse Sand, trace Gravel, trace Organic matter (roots).
SedRS-08	11/15/2001	0.0	15.5	84.5	16	Black (2.5Y 2.5/1), SILT, little fine to coarse Sand, trace Organic matter (roots).
SedRS-09	11/15/2001	0.0	1.5	98.5	18	Black (2.5Y 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRS-10	11/15/2001	0.0	5.8	94.3	10	Black (2.5Y 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
Memorial Pond (Walpole, Massachusetts) Reference Sediments						
SedRW-01	11/16/2001	0.0	4.1	95.9	13	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRW-02	11/16/2001	0.0	1.4	98.7	16	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRW-03	11/16/2001	0.0	0.9	99.1	13	Black (2.5Y 2.5/1), SILT, trace Organic matter.
SedRW-04	11/16/2001	0.0	2.3	97.7	8	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRW-05	11/16/2001	0.0	1.0	99.0	14	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRW-06	11/16/2001	0.0	1.1	98.9	11	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRW-07	11/16/2001	0.0	6.2	93.8	10	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRW-08	11/16/2001	0.0	16.6	83.4	17	Greenish black (5GY 2.5/1), SILT, little fine Sand, trace Organic matter (roots).
SedRW-09	11/16/2001	0.0	2.5	97.5	14	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).
SedRW-10	11/16/2001	0.0	4.6	95.4	19	Greenish black (5GY 2.5/1), SILT, trace fine Sand, trace Organic matter (roots).

TABLE 6B
Grain Size Data - Sediment
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Collection Date	Grain Size Distribution				SHA Material Description
		Gravel (%)	Sand (%)	Fines (%)	Solids Total (%)	
Floodplain Sediments						
FP-01	10/10/2001	52.8	40.2	7.0	92.0	Dark grayish brown (2.5Y 4/2), GRAVEL and fine Sand, trace Silt, trace Organic matter (leaves, roots).
FP-02	10/10/2001	0.5	58.5	41.0	91.0	Dark gray (2.5Y 4/1), fine SAND and Clayey Silt, trace Organic matter (leaves, roots).
FP-03	10/10/2001	1.7	57.0	41.3	85.0	Dark olive brown (2.5Y 3/3), fine SAND and Silt, trace Gravel, trace Organic matter (leaves, roots).
FP-04	10/10/2001	0.8	36.5	62.7	64.0	Very dark grayish brown (2.5YR 3/2), Clayey SILT and fine Sand, trace Organic matter (leaves, roots).
FP-05	10/10/2001	0.0	48.4	51.6	57.0	Very dark grayish brown (2.5Y 3/2), Clayey SILT and fine SAND, trace Organic matter (leaves, roots).
FP-05 (0-1')	8/5/2003	0.0	52.0	47.9	87.8	Dark Reddish Brown (5YR 2.5/2), fine SAND and Silt. Wet.
FP-5 (1-3')	8/5/2003	1.0	62.4	36.6	94.4	Very dark brown (10YR 2/2), fine SAND and Silt, Trace Gravel, trace Organic matter. Wet.
FP-06	10/10/2001	13.4	53.1	33.6	79.0	Very dark gray (2.5Y 3/1), fine SAND, some Clayey Silt, lillte Gravel, trace Organic matter (leaves, roots)
FP-06 (0-1')	8/5/2003	3.1	57.3	39.6	99.1	Dark Reddish Brown (5 YR 2.5/2), fine Sand and Clayey Silt, trace Gravel. Egg shells at approximately 0.5'. Dry.
FP-06 (1-3')	8/5/2003	17.5	57.5	24.9	99.7	Olive Brown (2.5 Y 4/4), fine to medium SAND, some Silt, little Gravel, little. Dry.
FP-08	10/10/2001	5.6	34.0	60.4	49.0	Very dark gray (10YR 3/1), Clayey SILT, some fine SAND, trace Gravel, trace Organic matter (leaves, roots).
FP-09	10/10/2001	0.0	28.2	71.8	36.0	Very dark gray (10YR 3/1), Clayey SILT, some fine SAND, trace Organic matter (leaves, roots).
FP-09 (0-1')	8/5/2003	0.5	61.2	38.3	90.8	Black (5 YR 2.5/1), fine SAND and Clayey Silt. Moist.
FP-09 (1-3')	8/5/2003	0.0	39.6	60.4	90.4	Dark Reddish Brown (5YR 2.5/2), Clayey SILT and fine Sand. Changes at approx. 2 ft to Dark Gray (2.5Y 4/1) Silt and trace fine Sand. Wet.
FP-10	10/10/2001	0.5	29.3	70.2	73.0	Very dark grayish brown (10YR 3/2), Clayey SILT, some fine Sand, trace Organic matter (leaves, roots).
Floodplain Reference Sediments						
FPR-01	10/9/2001	0.0	5.7	94.3	23	Black (2.5Y 2.5/1), Clayey SILT, trace fine to medium Sand, trace Organic matter (leaves, roots).
FPR-02	10/9/2001	18.2	52.2	29.5	65	Very dark brown (10YR 2/2), fine to medium SAND, some Clayey Silt, little Gravel, trace Organic matter (roots, leaves).
FPR-03	10/9/2001	0.3	61.0	38.8	65	Black (10YR 2/1), fine to medium SAND and Clayey Silt, little Organic matter (roots, leaves).
FPR-04	10/9/2001	0.0	45.3	54.7	58	Dark olive brown (2.5Y 3/3), Clayey SILT and fine to medium Sand, little Organic matter (roots, leaves).
FPR-05	10/9/2001	5.9	53.2	41.0	83	Olive brown (2.5Y 4/3), fine to medium SAND and Clayey Silt, little Organic matter (roots, leaves), trace Gravel.
FPR-06	10/9/2001	7.6	42.1	50.3	46	Black (10YR 2/1), Clayey SILT and fine to medium Sand, little Organic matter (roots, leaves), trace Gravel.
FPR-07	10/9/2001	3.6	46.4	50.0	58	Black (10YR 2/1), Clayey SILT and fine Sand, little Organic matter (roots, leaves), trace Gravel.
FPR-08	10/9/2001	0.8	75.9	23.3	77	Very dark grayish brown (2.5Y 3/2), fine to coarse SAND, some SILT, trace Organic matter (roots, leaves).
FPR-09	10/9/2001	0.2	42.3	57.4	60	Black (10YR 2/1), Clayey SILT and fine Sand, trace Organic matter (roots, leaves).
FPR-10	10/9/2001	6.6	53.1	40.3	51	Black (10YR 2/1), fine to medium SAND and Clayey Silt, trace Gravel, trace Organic matter (roots).
Former Mill Tailrace Sediments						
TR-1	7/25/2001	10.8	72.8	16.5	83	Olive (5Y 4/3), fine to coarse SAND, little Silt, trace Gravel.
TR-2	7/25/2001	0.0	78.3	21.7	53	Black (5Y 2.5/1), fine SAND, some Organic Silt.
TR-3	7/25/2001	4.0	68.7	27.4	56	Black (5Y 2.5/1), trace fine SAND, some Clayey Silt, trace Gravel.
TR-4	7/25/2001	0.0	15.3	84.7	30	Black (5Y 2.5/1), Clayey SILT, little fine Sand.
TR-5	7/25/2001	0.3	5.8	93.9	19	Very dark gray (5Y 3/1), Clayey SILT, trace fine Sand.

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) personnel on the dates indicated.
2. Samples collected in July and October 2001 were submitted to Woods Hole Group Environmental Laboratories (WHGEL), Raynham, Massachusetts, and analyzed and reported by their subcontractor, Applied Marine Sciences, Inc. (AMS) of League, Texas, for grain size analysis using American Society of Testing Materials (ASTM) Method D-422.
3. Samples collected on August 5, 2003 were submitted to and analyzed by WHGEL for grain size analysis using ASTM Method D-422.
4. Grain size and total solids results are provided in percent (%).
5. Classification of sediment grain size was based on ASTM Method D2487-92, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). Grain size designations are as follows:
   Gravel = 75 mm (millimeters) to 4.76 mm
   Sand = 4.76 mm to 75 µm (micrometers)
   Fines = <75 µm
6. "Fines (%)" is the arithmetic sum of the reported values of Silt Fine and Clay Fine.
7. "*" indicates that the silt/clay factors of these samples are reported as one value (0%) on the analytical reports.

TABLE 7A
Summary of Total Organic Carbon Data - Soil
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusettes

Location	Sample Number	Sample Depth (ft)	Sample Date	SDG Number	Inferred Stratum	TOC (mg/kg)	Qualifier	Bias
SB-04	SS-4	0-1	3/21/2001	BU103	Fill	130,000		
SB-06	S-4-5	6-10	3/16/2001	BU103	Sand	2,100		
SB-07	SS-7	0-1	3/15/2001	BU103	Fill	14,000		
SB-09	SS-9	0.3-1.3	4/23/2001	BU106	Fill	15,000		
SB-13A	S-3-4	4-8	4/13/2001	BU105	Sand	1,200		
SB-19	S-1-2	0.4-4	6/8/2001	BU110	Fill/Sand	2,000		
SB-21	SS-21	0-1	4/2/2001	BU104	Fill	16,000		
SB-22	S-3	4-5.1	6/13/2001	BU110	Sand & Gravel	410		
SB-25	SS-25	0-1	3/29/2001	BU104	Fill	100,000	J	L
SB-26	S-2-3	2-5.7	3/30/2001	BU104	Fill	12,000		
SB-26	SS-26	0-1	3/30/2001	BU104	Fill	38,000		
SB-27	S-2-3	2-6	6/15/2001	BU110	Fill	5,200		
SB-31	SS-31	0-1	2/26/2001	BU102	Topsoil	34,000		
SB-35	S-1-2	0-3.5	5/2/2001	BU107	Sand	27,000		
SB-38	SS-38	0-1	4/23/2001	BU106	Sand	18,000		
SB-40	S-2-3	2-6	2/26/2001	BU102	Sand	2,200		
SB-41	S-1-2	3-7	3/20/2001	BU103	Fill	52,000		
SB-49	S-3-4	4-8	4/24/2001	BU106	Fill	91,000		
SB-56	S-1	0.8-1.8	5/3/2001	BU107	Fill	610		
SH-01D/SB-53	S-3-4	19-23	7/13/2001	BU109	Fill	78,000		
SH-02D/SB-46	S-1-2	3-5.5	7/18/2001	BU109	Fill	20,000		
SH-06D/SB-47	S-1-2	1-5	7/25/2001	BU109	Fill	18,000		
SH-11S/SB-42	S-3-4	10-15.9	7/27/2001	BU109	Fill	208,000		
SH-18D/SB-28	SS-28	0-1	7/23/2001	BU109	Topsoil	31,000		
EUA-1	NA	0-0.5	8/8/2003	BU112	Topsoil	67,000		
EUA-2	NA	0-0.5	8/8/2003	BU112	Topsoil	100,000	J	I
EUA-3	NA	0-0.5	8/8/2003	BU112	Topsoil	58,000		
FPW-1	NA	0-0.5	8/8/2003	BU112	Topsoil	85,000		
FPW-2	NA	0-0.5	8/8/2003	BU112	Topsoil	78,000	J	I
FPW-3	NA	0-0.5	8/8/2003	BU112	Topsoil	85,000		
OP-1	NA	0-0.5	8/8/2003	BU112	Topsoil	46,000		
OP-2	NA	0-0.5	8/8/2003	BU112	Topsoil	12,000		
OP-3	NA	0-0.5	8/8/2003	BU112	Topsoil	29,000		
OSA-1	NA	0-0.5	8/7/2003	BU112	Topsoil	31,000		
OSA-2	NA	0-0.5	8/12/2003	BU112	Topsoil	28,000		
OSA-3	NA	0-0.5	8/12/2003	BU112	Topsoil	37,000		
OSR-1-S	NA	0-0.5	11/21/2003	BU113	Topsoil	98,000	J	I
OSR-2-S	NA	0-0.5	11/21/2003	BU113	Topsoil	160,000	J	I
OSR-3-S	NA	0-0.5	10/31/2003	BU113	Topsoil	93,000	J	I

TABLE 7A
Summary of Total Organic Carbon Data - Soil
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusettes

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated.

2. Samples were submitted to Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts and analyzed for total organic carbon (TOC) by their subcontractor Applied Marine Sciences, Inc. (AMS) of League City, Texas by United States Environmental Protection Agency (USEPA) Method 9060 (modified).

3. Refer to the appendices of this Report for Soil Boring/Groundwater Monitoring Well logs.

4. The following qualifiers and bias were assigned during data validation by New Environmental Horizons, Inc. (NEH). Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

Bias:

"L" Low

"I" Indeterminate

5. All concentrations are presented in milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm).

TABLE 7B
Summary of Total Organic Carbon Data - Sediment
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Depth (ft)	Sample Date	SDG Number	TOC (mg/kg)	Qualifier	Bias
Neponset River Sampling Locations						
NR-1	0-0.3	7/26/2001	BU401	1,600	J	I
NR-2	0-0.2	7/26/2001	BU401	2,800		
NR-3	0-0.2	7/26/2001	BU401	4,200		
NR-4	0-0.5	7/26/2001	BU401	6,900		
NR-5	0-0.2	7/26/2001	BU401	112,000		
NR-5A	0-0.5	12/18/2002	BU409	11,000	J	I
NR-6	0-0.3	7/26/2001	BU401	136,000		
NR-7	0-0.1	7/25/2001	BU401	3,600		
	0-0.5	12/18/2002	BU409	3,500	J	I
NR-8	0-0.2	7/25/2001	BU401	2,300		
	0-0.5	12/18/2002	BU409	5,700	J	I
Neponset River Reference Area Locations						
SedRN-1	0-0.2	7/26/2001	BU401	3,800		
	0-0.5	5/24/2002	BU407	3,300		
SedRN-2	0-0.2	7/26/2001	BU401	1,700		
	0-0.5	5/24/2002	BU407	1,400		
SedRN-3	0-0.2	7/26/2001	BU401	3,200		
	0-0.5	5/24/2002	BU407	2,100		
SedRN-4	0-0.2	7/26/2001	BU401	1,600		
	0-0.5	5/24/2002	BU407	2,800		
	0-0.5	12/18/2002	BU409	2,200	J	I
SedRN-5	0-0.2	7/26/2001	BU401	3,200		
	0-0.5	5/24/2002	BU407	2,900		
Lewis Pond Sampling Locations						
LP-01	0-0.5	7/31/2001	BU402	62,000		
	0-0.5	12/18/2002	BU409	58,000	J	I
LP-02	0-0.3	7/31/2001	BU402	125,000		
LP-03	0-0.4	7/31/2001	BU402	127,000		
LP-04	0-0.5	7/31/2001	BU402	83,000		
LP-05	0-0.5	7/30/2001	BU402	150,000		
LP-06	0-0.5	7/30/2001	BU402	118,000		
	0-0.5	12/18/2002	BU409	95,000	J	I
LP-07	0-0.5	7/30/2001	BU402	65,000		
LP-08	0-0.5	7/30/2001	BU402	78,000		
LP-09	0-0.5	7/30/2001	BU402	48,000		
	0-0.5	12/18/2002	BU409	69,000	J	I
LP-10	0-0.5	7/30/2001	BU402	91,000		
Norwood Pond Reference Area Sediments						
SedRNwd-01	0-0.5	11/15/2001	BU405	61,000		
	0-0.5	12/17/2002	BU408	39,000	J	H
SedRNwd-02	0-0.5	11/15/2001	BU405	109,000		
	0-0.5	12/17/2002	BU408	9,900	J	H
SedRNwd-03	0-0.5	11/15/2001	BU405	122,000		
	0-0.5	12/17/2002	BU408	48,000	J	H
SedRNwd-04	0-0.5	11/15/2001	BU405	122,000		
	0-0.5	12/17/2002	BU408	76,000	J	I
SedRNwd-05	0-0.5	11/15/2001	BU405	33,000		
	0-0.5	12/17/2002	BU408	27,000	J	H

TABLE 7B
Summary of Total Organic Carbon Data - Sediment
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Depth (ft)	Sample Date	SDG Number	TOC (mg/kg)	Qualifier	Bias
SedRNwd-06	0-0.5	11/15/2001	BU405	96,000		
	0-0.5	12/17/2002	BU408	60,000	J	H
SedRNwd-07	0-0.5	11/15/2001	BU405	149,000		
	0-0.5	12/17/2002	BU408	64,000	J	I
SedRNwd-08	0-0.5	11/15/2001	BU405	86,000		
	0-0.5	12/17/2002	BU408	130,000	J	I
SedRNwd-09	0-0.5	11/15/2001	BU405	112,000		
	0-0.5	12/17/2002	BU408	130,000	J	I
SedRNwd-10	0-0.5	11/15/2001	BU405	150,000		
	0-0.5	12/17/2002	BU408	57,000	J	I
Stoughton Reference Area Sediments						
SedRS-01	0-0.5	11/15/2001	BU403	295,000		
SedRS-02	0-0.5	11/15/2001	BU403	314,000		
SedRS-03	0-0.5	11/15/2001	BU403	399,000		
SedRS-04	0-0.5	11/15/2001	BU403	301,000		
SedRS-05	0-0.5	11/15/2001	BU403	234,000		
SedRS-06	0-0.5	11/15/2001	BU403	305,000		
SedRS-07	0-0.5	11/15/2001	BU403	216,000		
SedRS-08	0-0.5	11/15/2001	BU403	255,000		
SedRS-09	0-0.5	11/15/2001	BU403	469,000		
SedRS-10	0-0.5	11/15/2001	BU403	252,000		
Walpole Reference Area Sediments						
SedRW-01	0-0.5	11/16/2001	BU403	172,000		
SedRW-02	0-0.5	11/16/2001	BU403	132,000		
SedRW-03	0-0.5	11/16/2001	BU403	126,000		
SedRW-04	0-0.5	11/16/2001	BU403	195,000		
SedRW-05	0-0.5	11/16/2001	BU403	143,000		
SedRW-06	0-0.5	11/16/2001	BU403	139,000		
SedRW-07	0-0.5	11/16/2001	BU403	190,000		
SedRW-08	0-0.5	11/16/2001	BU403	124,000		
SedRW-09	0-0.5	11/16/2001	BU403	131,000		
SedRW-10	0-0.5	11/16/2001	BU403	136,000		
Floodplain Sampling Locations						
FP-01	0-1	10/10/2001	BU404	25,000		
FP-02	0-1	10/10/2001	BU404	42,000		
FP-03	0-1	10/10/2001	BU404	39,000		
FP-04	0-1	10/10/2001	BU404	37,000		
FP-05	0-1	10/10/2001	BU404	56,000		
	0-1	8/5/2003	BU410	61,000	J	H
	1-3	8/5/2003	BU410	21,000	J	H
FP-06	0-1	10/10/2001	BU404	21,000		
	0-1	8/5/2003	BU410	32,000	J	H
	1-3	8/5/2003	BU410	6,200	J	H
FP-08	0-1	10/10/2001	BU404	80,000		
FP-09	0-1	10/10/2001	BU404	133,000		
	0-1	8/5/2003	BU410	150,000	J	I
	1-3	8/5/2003	BU410	24,000	J	H
FP-10	0-1	10/10/2001	BU404	90,000		

TABLE 7B
Summary of Total Organic Carbon Data - Sediment
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Depth (ft)	Sample Date	SDG Number	TOC (mg/kg)	Qualifier	Bias
Floodplain Reference Area Sampling Locations						
FPR-01	0-1	10/9/2001	BU404	272,000		
FPR-02	0-1	10/9/2001	BU404	38,000		
FPR-03	0-1	10/9/2001	BU404	26,000		
FPR-04	0-1	10/9/2001	BU404	56,000		
FPR-05	0-1	10/9/2001	BU404	35,000		
FPR-06	0-1	10/9/2001	BU404	175,000		
FPR-07	0-1	10/9/2001	BU404	93,000		
FPR-08	0-1	10/9/2001	BU404	18,000		
FPR-09	0-1	10/9/2001	BU404	64,000		
FPR-10	0-1	10/9/2001	BU404	77,000		
Former Mill Tailrace Sampling Locations						
TR-1	0-0.5	7/25/2001	BU401	130,000		
TR-2	0-0.4	7/25/2001	BU401	21,000		
TR-3	0-0.4	7/25/2001	BU401	17,000		
	0-0.5	12/16/2002	BU409	10,000	J	I
TR-4	0-0.4	7/25/2001	BU401	70,000		
TR-5	0-0.6	7/25/2001	BU401	71,000		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated.

2. Samples were submitted to Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts and analyzed for total organic carbon (TOC) by their subcontractor Applied Marine Sciences, Inc. (AMS) of League City, Texas in accordance with United States Environmental Protection Agency (USEPA) Method 9060.

3. Refer to the appendices of this Report for Field Sampling Summary Forms.

4. The following qualifiers and bias were assigned during data validation by New Environmental Horizons, Inc. (NEH). Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

Bias:

"H" High

"I" Indeterminate

5. All concentrations are presented in milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm).

6. The sample depth is reflective of the depth of the sample relative to the surface water / sediment interface or, in the event that there was no surface water present, relative to the ground surface.

TABLE 7C
Summary of Total Organic Carbon Data - Surface Water
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Result (mg/l)	Qualifier	Bias
SW-102	4/5/2001	BU301	3.9		
	8/1/2001	BU302	5.7	J	I
SW-103	4/4/2001	BU301	4.4		
	8/1/2001	BU302	5.2	J	I
SW-105	4/4/2001	BU301	4.5		
	8/1/2001	BU302	5.3	J	I
SW-106	4/4/2001	BU301	50		
	8/1/2001	BU302	2.0	J	I
SW-107	4/4/2001	BU301	7.3		
	8/1/2001	BU302	28	J	I
SW-108	4/4/2001	BU301	4.2		
	8/1/2001	BU302	5.3	J	I
SWR-1	4/5/2001	BU301	4.4		
	8/2/2001	BU302	6.1	J	I
SWR-2	4/5/2001	BU301	4.2		
	8/2/2001	BU302	6.0	J	I
SWR-3	4/5/2001	BU301	4.3		
	8/2/2001	BU302	5.9	J	I
SWR-4	4/5/2001	BU301	4.3		
	8/2/2001	BU302	5.3	J	I
SWR-5	4/5/2001	BU301	4.5		
	8/1/2001	BU302	5.4	J	I

Notes:

1. Samples were collected by SHA on April 4 and 5, 2001, and August 1 and 2, 2001.

2. Samples were collected by SHA on the dates indicated. Samples were analyzed for total organic carbon (TOC) by Applied Marine Sciences, Inc. Samples collected in April 2001 were analyzed by United States Enviromental Protection Agency (USEPA) Method 9060 (modified). Samples collected in August 2001 were analyzed by USEPA Method 415.1.

3. Refer to Appendix B of this Report for Field Sampling Forms.

4. The following qualifiers and bias were assigned during data validation by New Environmental Horizons, Inc. (NEH). Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

Bias:

"I" Indeterminate

4. All concentrations are presented in milligrams per liter (mg/l), which are equivalent to parts per million (ppm).

TABLE 7D
Summary of Total Organic Carbon Data - Groundwater
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Result (mg/l)	Qualifier	Bias
SH-01D	10/29/2003	BU211	86		
SH-01R	10/30/2003	BU211	78		
SH-01S	10/28/2003	BU211	9.3		
SH-02D	10/30/2003	BU211	65		
SH-02R	11/4/2003	BU210	4.6		
SH-02S	10/29/2003	BU210	13		
SH-03D	11/3/2003	BU210	1.0	U	
SH-03S	11/3/2003	BU210	12		
SH-04D	11/5/2003	BU210	1	U	
SH-04S	10/28/2003	BU211	15		
SH-05D	11/4/2003	BU210	1.2		
SH-05R-A	11/10/2003	BU209	1.0	U	
SH-05R-B	11/11/2003	BU209	1.0	U	
SH-05S	10/29/2003	BU211	9.9		
SH-06D	10/29/2003	BU211	74		
SH-06R-A	11/5/2003	BU209	3		
SH-06R-B	11/6/2003	BU209	4.9		
SH-06S	10/29/2003	BU211	34		
SH-07D	10/30/2003	BU211	75		
SH-07S	10/29/2003	BU211	18		
SH-08D	10/29/2003	BU211	13		
SH-08S	10/28/2003	BU211	3.3		
SH-09D	10/28/2003	BU211	18		
SH-09S	10/31/2003	BU210	8.4		
SH-10S	10/31/2003	BU210	1.5		
SH-11S	11/3/2003	BU210	4		
SH-12D	11/3/2003	BU210	1.0	U	
SH-12S	11/3/2003	BU210	5.8		
SH-13S	11/3/2003	BU210	5.5		
SH-14D	11/4/2003	BU210	1.0	U	
SH-14S	11/4/2003	BU210	4.0		
SH-15D	11/4/2003	BU210	1.0	U	
SH-15S	10/28/2003	BU211	14		
SH-16S	11/19/2003	BU210	6.8		
SH-17D	11/20/2003	BU211	12		
SH-17R	11/20/2003	BU211	13		
SH-17S	11/19/2003	BU210	1.5		
SH-23S	11/4/2003	BU210	1.0	U	
SH-24R	11/6/2003	BU209	1.0	U	
SH-24S	11/6/2003	BU209	1.0	U	
SH-25D	11/5/2003	BU209	1.0	U	
SH-25S	11/5/2003	BU209	8.4		
SH-26S	10/28/2003	BU211	16		
SH-27D	11/19/2003	BU209	1.5		
SH-27R	11/20/2003	BU209	1.4		
SH-27S	11/21/2003	BU209	1.2		
SH-28D	11/6/2003	BU209	1.0	U	

TABLE 7D
Summary of Total Organic Carbon Data - Groundwater
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	SDG Number	Result (mg/l)	Qualifier	Bias
SH-28R	11/7/2003	BU209	1.0	U	
SH-28S	11/6/2003	BU209	1.9		
WP-01	11/4/2003	BU209	1.6		
WP-02	11/4/2003	BU209	2.2		
WP-03	11/5/2003	BU209	2.4		
WP-04	11/7/2003	BU209	5.8		
WP-05	11/7/2003	BU209	1.0	U	
WP-06	10/28/2003	BU211	1.8		
WP-07	10/27/2003	BU211	19		

Notes:

1. Samples were collected by SHA between October 27 and November 21, 2003.

2. Samples were collected by SHA on the dates indicated. Samples were analyzed for total organic carbon (TOC) by Katahdin Analytical Services, Inc. of Westbrook, Maine, by United States Environmental Protection Agency (USEPA) Method 415.1.

3. Refer to the Appendix B of this Report for Field Sampling Forms.

4. The following qualifiers and bias were assigned during data validation by New Environmental Horizons, Inc. (NEH). Refer to NEH's Data Usability Report (included in Appendix B.7 of the Phase 1B Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

4. All concentrations are presented in milligrams per liter (mg/l), which are equivalent to parts per million (ppm).

TABLE 8
Summary of Estimates of Hydraulic Conductivities by Formation Type
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Depth Interval Tested (ft)	Sample Number(s)	Inferred Stratum	Method of Estimation	Hydraulic Conductivity (ft/day)	Geometric Mean K per Stratigraphic Unit of Slug Tests (ft/day)*
SH-01R	8'-10'	S-5	Soil Fill	Hazen	0.51	17
SH-11S	15'-15.9'	S-4		Hazen	0.66	
SH-03D/SB-45	17'-18'	S-7		Hazen	2.0	
SH-08S	4'-19'	S-6		Hazen	230	
SH-01R	8'-10'	S-5		Kozeny-Carmen	0.19	
SH-11S	15'-15.9'	S-4		Kozeny-Carmen	0.25	
SH-03D/SB-45	17'-18'	S-7		Kozeny-Carmen	0.49	
SH-08S	4'-19'	S-6		Kozeny-Carmen	57	
SH-02S	13'-21'	S-7 to S-9		Slug (Rising)	3.3	
SH-09S	3'-18'	S-1 to S-7		Slug (Rising)	5.0	
SH-05S	3'-18'	S-2 to S-6		Slug (Rising)	9.5	
SH-03S	10'-25'	S-4 to S-7		Slug (Rising)	9.7	
SH-14S	3'-18'	S-3 to S-8		Slug (Rising)	14	
SH-11S	6'-21'	S-3 to S-5		Slug (Rising)	15	
SH-15S	3'-18'	S-1		Slug (Rising)	33	
SH-01S	7'-22'	S-4 to S-9		Slug (Rising)	38	
SH-21S	4'-19'	S-3 to S-8		Slug (Rising)	51	
SH-12S	11.3'-26.3	S-4 to S-9		Slug (Rising)	142	
SH-15S	14'-16'	S-1	Ice Contact Sand / Sand & Gravel	Borehole	9.5	5.2
SH-19R	15'-17'	S-4		Hazen	0.16	
SH-15S	14'-16'	S-1		Hazen	0.44	
SH-12D	20'-22'	S-8		Hazen	57	
SH-05D	6'-8'	S-4		Hazen	77	
SH-17S	11'-13'	S-3		Hazen	77	
SH-04D	6'-8'	S-4		Hazen	150	
SH-19R	15'-17'	S-4		Kozeny-Carmen	0.059	
SH-15S	14'-16'	S-1		Kozeny-Carmen	0.17	
SH-12D	20'-22	S-8		Kozeny-Carmen	14	
SH-05D	6'-8'	S-4		Kozeny-Carmen	19	
SH-17S	11'-13'	S-3		Kozeny-Carmen	19	
SH-04D	6'-8'	S-4		Kozeny-Carmen	37	
SH-06S	5'-20'	S-4 to S-6		Slug (Rising)	0.37	
SH-26S	3' to 18'	S-2 to S-7		Slug (Rising)	0.44	
SH-25S	2'-17'	S-2 to S-5		Slug (Rising)	0.57	
SH-24S	2'-14'	S-2 to S-4		Slug (Rising)	0.71	
SH-18S	5'-20'	S-3 to S-6		Slug (Rising)	1.6	
SH-04S	3'-18'	S-2 to S-7		Slug (Rising)	6.0	
SH-10S	11'-26	S-5 to S-7		Slug (Rising)	6.2	
SH-23S	3'-18'	S-2 to S-6		Slug (Rising)	6.9	
SH-19S	5'-20'	S-2 to S-4		Slug (Rising)	8.3	
SH-13S	10'-25'	S-4 to S-8		Slug (Rising)	10	
SH-27S	3'-18'	S-2 to S-6		Slug (Rising)	11.5	
SH-28S	2.4'-17.4'	S-2 to S-6		Slug (Rising)	55.3	
SH-17S	3'-13'	S-2 to S-3		Slug (Rising)	61	
SH-22S	5'-20'	S-3 to S-6		Slug (Rising)	63	

TABLE 8
Summary of Estimates of Hydraulic Conductivities by Formation Type
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Depth Interval Tested (ft)	Sample Number(s)	Inferred Stratum	Method of Estimation	Hydraulic Conductivity (ft/day)	Geometric Mean K per Stratigraphic Unit of Slug Tests (ft/day)*
SH-02R	40'-42'	S-13	Glacial Till	Hazen	0.0091	0.39
SH-07D	15'-17'	S-4		Hazen	0.010	
SH-07D	15'-17'	S-4		Hazen	0.010	
SH-19R	35'-37'	S-7		Hazen	0.012	
SH-15D	48'-48.5'	S-13		Hazen	0.033	
SH-04D	58'-58.5'	S-15		Hazen	0.061	
SH-18D	43.5'-45.5	S-11		Hazen	0.28	
SH-03D	80'-81.5'	S-23		Hazen	1.4	
SH-22S	16'-17'	S-6		Hazen	27	
SH-07D	15'-17'	S-4		Kozeny-Carmen	0.0019	
SH-02R	40'-42'	S-13		Kozeny-Carmen	0.0020	
SH-07D	15'-17'	S-4		Kozeny-Carmen	0.0037	
SH-19R	35'-37'	S-7		Kozeny-Carmen	0.0045	
SH-15D	48'-48.5'	S-13		Kozeny-Carmen	0.0062	
SH-04D	58'-58.5'	S-15		Kozeny-Carmen	0.012	
SH-18D	43.5'-45.5'	S-11		Kozeny-Carmen	0.030	
SH-03D	80'-81.5'	S-23		Kozeny-Carmen	0.17	
SH-22S	16'-17'	S-6		Kozeny-Carmen	2.7	
SH-06D	37'-47'	S-11 to S-13		Slug (Falling & Rising)	0.012	
SH-25D	44'-54'	S-11 to S-12		Slug (Falling & Rising)	0.017	
SH-05D	43.1'-53.1'	S-12 to S-13		Slug (Falling & Rising)	0.024	
SH-28D	44'-54'	S-12 to S-13		Slug (Falling & Rising)	0.025	
SH-03D	80'-90'	S-23 to S-27		Slug (Falling & Rising)	0.048	
SH-07D**	41'-51'	S-8 to S-10		Slug (Falling & Rising)	0.097	
SH-02D	35'-45'	S-12 to S-13		Slug (Falling & Rising)	0.40	
SH-15D	45'-55'	S-13		Slug (Falling & Rising)	0.82	
SH-19D	27'-37'	S-6 to S-7		Slug (Falling & Rising)	1.0	
SH-27D	35'-45'	S-5 to S-6		Slug (Falling & Rising)	1.3	
SH-14D	39'-49'	S-11 to S-12		Slug (Falling & Rising)	2.2	
SH-18D	37.5'-47.5'	S-10 to S-12		Slug (Falling & Rising)	6.8	
SH-17D	22.2'-32.2'	S-6 to S-8		Slug (Falling & Rising)	9.3	
SH-07S	4'-16'	S-3 to S-9		Slug (Rising)	4.5	
SH-16S	2'-12'	S-2 to S-5		Slug (Rising)	5.6	
SH-6R-A	63'-73'	AC-2 to AC-4	Bedrock	Slug (Falling & Rising)	0.04	0.13
SH-6R-B	109'-119'	AC-11 to AC-13		Slug (Falling & Rising)	0.061	
SH-02R	62'-72'	RC-4 to RC-5B		Slug (Falling & Rising)	0.075	
SH-27R	58'-68'	RC-3 to RC-4		Slug (Falling & Rising)	0.096	
SH-28R	72'-82'	RC-2 to RC-4		Slug (Falling & Rising)	0.10	
SH-24R	28.5'-38.5'	RC-2 to RC-4		Slug (Falling & Rising)	0.12	
SH-5R-B	156'-166'	AC-14 to AC-15		Slug (Falling & Rising)	0.13	
SH-5R-A	105.1'-115.1'	AC-3 to AC-5		Slug (Falling & Rising)	0.16	
SH-17R	42.4'-52.4'	RC-2 to RC-5		Slug (Falling & Rising)	4.9	
SH-19R	49.5'-59.5'	RC-2 to RC-6		Slug (Falling)	0.051	

TABLE 8
Summary of Estimates of Hydraulic Conductivities by Formation Type
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Estimated hydraulic conductivities are presented in feet per day (ft/day).

2. "Hazen" indicates hydraulic conductivity is estimated from grain size distribution using Hazen's equation (Freeze & Cherry, 1979):

$$K = C (D_{10})^2$$

where: K is hydraulic conductivity (in centimeters per second [cm/s])
D_{10} is the grain size in cm for which 10% of a given soil is finer; and
C is a coefficient - based on Fetter (1994)

C values used are based on material description (provided on the soil boring/monitoring well logs, included in Appendix B):

40-80	fine sand with appreciable fines
80-120	medium sand, well sorted & coarse sand, poorly sorted
120-150	coarse sand, well sorted, clean

3. "Kozeny-Carmen" indicates hydraulic conductivity is estimated from grain size distribution using the method developed by Kozeny-Carmen (Freeze & Cherry, 1979):

$$K = (pg/u)[n^3/(1-n)^2](d_m^2/180)$$

where: K is hydraulic conductivity (in centimeters per second [cm/s])
p is fluid density (in grams per cubic centimeter [g/cm^3])
g is acceleration due to gravity (in centimeters per square second [cm/s^2])
u is fluid viscosity (in grams per centimeter seconds [g/s·cm])
n is porosity (unitless)
d_m is some representative grain size, interpreted as D_{10} for these analyses (in centimeters [cm])

4. "Borehole" indicates that the hydraulic conductivity is estimated from field falling head test performed as a wick test in a cased-hole boring using the equations of Hvorslev (1951).

5. "Slug" indicates that the hydraulic conductivity is estimated from a field falling and/or rising head test performed in completed monitoring wells by lowering and raising a slug in and out of the groundwater within the well. The data are evaluated using the equations of Bower & Rice (1976).

6. Sample number and interval refer to samples collected from approximate depth interval within tested boring or in associated deep borings (D) located within approximately 10 to 15 feet horizontal distance.

7. "*" Denotes that the geometric mean shown is based only on the results from the slug test analyses and the borehole permeability tests. The results from the Hazen method and Kozeny-Carmen analyses are not included in this calculation for reasons outlined in Appendix HD.

8. "**" Dense aqueous phase liquid (DAPL) conditions (with a pH greater than 12.5 standard units) were observed in wells SH-01D/R, SH-02D,SH-06D, and SH-07D. Groundwater density and viscosity are likely different than that of water; however, for simplicity, the density and viscosity of water were used for the calculation of hydraulic conductivity as described in Section 5.2.1.1 of this Report.

TABLE 9
Summary of Transmissivities by Location
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

General Location at the Site	Boring Location	Inferred Stratum	Saturated Thickness (ft)	Hydraulic Conductivity (ft/day)	Transmissivity (ft^2/day)	Total Transmissivity (ft^2/day)	Geometric Mean for Area (ft^2/day)	Geometric Mean for All Areas (ft^2/day)
Industrial Area East of South	SH-19R	Fill	16.2	17	283	291	291	97
		Till	20.0	0.39	7.8			
Industrial Area West of South St.	SH-01R	Fill	11.4	17	199	206	91	
		Till	20.0	0.39	7.8			
	SH-02R	Fill	4.5	17	79	90		
		Till	28.7	0.39	11.2			
	SH-05R-B	Fill	5.0	17	87.5	170		
		Sand & Gravel	11.0	5.2	57.2			
		Till	64.0	0.39	25.0			
	SH-06R-B	Fill	1.8	17	31.3	79		
		Sand	7.0	5.2	36.4			
		Till	30.0	0.39	11.7			
	SH-17R	Sand & Gravel	10.8	5.2	55.9	61.8		
		Till	15.0	0.39	5.9			
	SH-03D	Fill	3.23	17	56.5	126		
		Sand & Gravel	9.0	5.2	46.8			
		Till	58.5	0.39	22.8			
	SH-06D	Fill	1.8	17	31.0	79		
		Sand & Gravel	7.0	5.2	36.4			
		Till	30.0	0.39	11.7			
	SH-07D	Till	40.2	0.39	15.7	16		
	SH-08D	Fill	4.4	17	76.4	173		
		Sand & Gravel	17.0	5.2	88.4			
		Till	20.5	0.39	8.0			
	SH-09D	Fill	4.3	17	74.9	99		
		Sand & Gravel	4.0	5.2	20.8			
		Till	9.5	0.39	3.7			
	SH-18D	Sand & Gravel	15.2	5.2	79.0	87		
		Till	21.5	0.39	8.4			
Wetland / Former Mill Tailrace West of the AOC	SH-26S	Sand & Gravel	16.2	5.2	84.4	84.4	128	
	SH-04D	Fill	3.4	17	58.6	200		
		Sand & Gravel	24.0	5.2	124.8			
		Till	43.0	0.39	16.8			
	SH-05D	Fill	3.5	17	61.2	135		
		Sand & Gravel	11.0	5.2	57.2			
		Till	42.2	0.39	16.5			
	SH-14D	Fill	3.0	17	52.5	153		
		Sand & Gravel	17.0	5.2	88.4			
		Till	30.0	0.39	11.7			
	SH-15D	Fill	3.2	17	56.0	143		
		Sand & Gravel	14.0	5.2	72.8			
		Till	37.0	0.39	14.4			
	SH-25D	Sand & Gravel	14.0	5.2	72.8	88.4		
		Till	40.0	0.39	15.6			

TABLE 9
Summary of Transmissivities by Location
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

General Location at the Site	Boring Location	Inferred Stratum	Saturated Thickness (ft)	Hydraulic Conductivity (ft/day)	Transmissivity (ft^2/day)	Total Transmissivity (ft^2/day)	Geometric Mean for Area (ft^2/day)	Geometric Mean for All Areas (ft^2/day)
Down Gradient / Side Gradient Residential Properties	SH-24R	Sand & Gravel	1.5	5.2	7.6	12.1	48	97
		Till	11.3	0.39	4.4			
	SH-27R	Sand & Gravel	10.9	5.2	56.7	65.7		
		Till	23.0	0.39	9.0			
	SH-28R	Fill	2.8	17	49.1	144		
		Sand & Gravel	15.7	5.2	81.6			
		Till	33.0	0.39	12.9			

Notes:

1. Saturated thicknesses are based on the depth to water measurements from the May 25, 2004 comprehensive water level round. This measurment was corrected such that it is relative to ground surface and then subtracted from the bottom depth of the stratum of interest to give the saturated thickness of the stratum at each location.

2. The hydraulic conductivities used in the transmissivity calculations represent the hydraulic conductivity calculated from slug test results (and in one instance, a borehole permeability test) at each boring location. Additional information on hydraulic conductivities is provided in Table 8.

3. Transmissivities (T) were calculated as $T = Kb$
where:
K is the hydraulic conductivity (ft/day),
b is the saturated thickness of the unit (ft).

4. Total transmissivity is the sum of the transmissivities of individual strata at a given location.

5. The geometric mean of total transmissivity represents an area-wide or Site-wide average transmissivity.

6. "AOC" is the deed restricted, capped Area of Containment.

TABLE 10
Summary of Groundwater Vertical Gradients
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Well Couplet	August 20, 2001			October 29, 2001			March 5, 2002			May 14, 2002			November 17-18, 2003			May 25, 2004		
	Equivalent Potentiometric Elevation (ft)	Saturated Thickness (ft)	Vertical Gradient (ft/ft)	Equivalent Potentiometric Elevation (ft)	Saturated Thickness (ft)	Vertical Gradient (ft/ft)	Equivalent Potentiometric Elevation (ft)	Saturated Thickness (ft)	Vertical Gradient (ft/ft)	Equivalent Potentiometric Elevation (ft)	Saturated Thickness (ft)	Vertical Gradient (ft/ft)	Equivalent Potentiometric Elevation (ft)	Saturated Thickness (ft)	Vertical Gradient (ft/ft)	Equivalent Potentiometric Elevation (ft)	Saturated Thickness (ft)	Vertical Gradient (ft/ft)
Shallow and Deep Monitoring Wells																		
SH-01S	151.99	26.9	-6.8E-02	150.54	25.5	-2.0E-02	152.41	27.4	-9.4E-02	153.10	28.1	-6.9E-02	152.82	27.8	-1.1E-01	153.23	28.2	-8.7E-02
SH-01D	150.15			150.04			149.84			151.17			149.84			150.77		
SH-02S	150.89	26.8	2.2E-03	149.84	25.7	1.2E-02	151.17	27.0	3.7E-03	151.70	27.6	7.3E-04	151.58	27.4	4.4E-03	152.14	28.0	1.4E-03
SH-02D	150.95			150.15			151.27			151.72			151.70			152.18		
SH-03S	149.98	68.0	1.2E-02	149.26	67.3	1.4E-02	150.47	68.5	9.3E-03	150.73	68.7	1.2E-02	150.65	68.7	9.2E-03	151.32	69.3	1.3E-02
SH-03D	150.79			150.18			151.11			151.57			151.28			152.23		
SH-04S	145.60	62.2	3.7E-02	145.31	61.9	2.8E-02	146.00	62.6	3.4E-02	146.68	63.3	3.3E-02	145.72	62.3	4.6E-02	145.92	62.5	4.5E-02
SH-04D	147.89			147.05			148.10			148.75			148.58			148.75		
SH-05S	146.39	44.5	2.3E-02	145.72	43.9	2.2E-02	146.90	45.0	1.9E-02	147.75	45.9	1.6E-02	146.73	44.9	2.8E-02	146.98	45.1	3.4E-02
SH-05D	147.43			146.67			147.75			148.48			148.00			148.50		
SH-06S	149.46	35.9	-1.5E-02	147.99	34.4	2.6E-03	149.31	35.8	-3.9E-02	150.99	37.4	-3.6E-02	150.09	36.5	-4.5E-02	150.52	37.0	-3.1E-02
SH-06D	148.92			148.08			147.93			149.65			148.44			149.37		
SH-07S	151.95	35.7	-1.9E-02	150.36	34.1	-5.3E-03	152.35	36.1	-3.5E-02	153.64	37.4	-4.5E-02	152.65	36.4	-4.4E-03	156.13	39.9	-9.2E-02
SH-07D	151.28			150.18			151.07			151.96			152.49			152.47		
SH-08S	155.84	20.5	-1.4E-01	153.95	18.7	-1.4E-01	155.79	20.5	-1.4E-01	156.74	21.4	-1.2E-01	156.00	20.7	-1.3E-01	156.87	21.6	-1.3E-01
SH-08D	152.97			151.31			152.98			154.25			153.33			154.16		
SH-09S	153.91	14.8	-5.5E-02	152.77	13.7	-6.1E-02	154.38	15.3	-6.1E-02	154.88	15.8	-5.2E-02	154.13	15.0	-4.2E-02	154.20	15.1	-2.1E-02
SH-09D	153.10			151.94			153.45			154.06			153.50			153.88		
SH-12S	150.05	54.6	2.0E-02	149.52	54.1	1.8E-02	150.48	55.0	1.7E-02	150.73	55.3	2.0E-02	150.69	55.2	1.6E-02	151.34	55.9	1.4E-02
SH-12D	151.16			150.48			151.42			151.84			151.57			152.15		
SH-14S	147.71	41.6	4.7E-02	147.38	41.2	3.9E-02	147.95	41.8	4.1E-02	148.31	42.2	4.3E-02	147.84	41.7	5.0E-02	148.09	41.9	5.7E-02
SH-14D	149.66			148.98			149.67			150.12			149.92			150.48		
SH-15S	143.78	46.7	4.0E-02	143.60	46.5	3.2E-02	144.12	47.0	4.0E-02	146.69	49.6	-3.5E-02	145.87	48.7	2.9E-03	144.01	46.9	4.9E-02
SH-15D	145.63			145.11			146.00			144.94			146.01			146.30		
SH-18S	154.39	28.8	4.8E-02	152.95	27.4	5.7E-02	153.87	28.3	5.9E-02	155.13	29.5	5.0E-02	154.41	28.8	5.0E-02	156.09	30.5	3.9E-02
SH-18D	155.77			154.50			155.54			156.62			155.86			157.29		
SH-19S	158.77	22.5	-4.3E-02	157.85	21.6	-4.8E-02	158.71	22.5	-4.3E-02	159.44	23.2	-5.1E-02	159.71	23.5	-7.6E-02	159.81	23.6	-3.7E-02
SH-19D	157.81			156.82			157.74			158.25			157.93			158.93		
SH-17S	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	149.18	19.9	5.0E-04	150.28	21.0	1.9E-03
SH-17D	NI			NI			NI			NI			149.19			150.32		
SH-25S	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	144.53	46.5	4.3E-02	144.78	46.7	5.9E-02
SH-25D	NI			NI			NI			NI			146.53			147.54		
SH-27S	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	148.38	28.8	-1.0E-02	149.69	30.1	-8.3E-03
SH-27D	NI			NI			NI			NI			148.09			149.44		
SH-28S	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	142.32	40.4	4.1E-02	142.46	40.5	6.4E-02
SH-28D	NI			NI			NI			NI			143.98			145.07		
Bedrock and Deep Overburden Wells																		
SH-01D	150.15	20.9	5.1E-02	150.04	20.9	9.1E-03	149.84	20.9	-1.9E-03	151.17	20.9	8.6E-03	149.84	20.9	7.6E-02	150.77	20.9	3.8E-02
SH-01R	151.22			150.23			149.80			151.35			151.42			151.56		
SH-02D	150.95	27.2	7.3E-03	150.15	27.2	9.2E-03	151.27	27.2	4.4E-03	151.72	27.2	5.1E-03	151.35	27.2	7.0E-03	152.18	27.2	-2.6E-03
SH-02R	151.15			150.40			151.39			151.86			151.54			152.11		
SH-19D	157.81	22.6	2.4E-02	156.82	22.6	4.0E-02	157.74	22.6	-2.7E-03	158.25	22.6	-1.1E-02	157.93	22.6	2.0E-02	158.93	22.6	1.5E-02
SH-19R	158.35			157.72			157.68			157.99			158.39			159.27		
SH-17D	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	149.19	20.3	-3.4E-03	150.32	20.3	-9.3E-03
SH-17R	NI			NI			NI			NI			149.12			150.13		
SH-27D	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	148.09	22.6	2.4E-02	149.44	22.6	-3.3E-02
SH-27R	NI			NI			NI			NI			148.63			148.70		
SH-28D	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	143.98	28.6	4.6E-03	145.07	28.6	-6.0E-03
SH-28R	NI			NI			NI			NI			144.11			144.90		

Notes:

1. Vertical gradients are based on water level measurements recorded by SHA on the dates indicated. Additional water level information is provided in Table 3a.

2. Vertical gradients (in ft/ft) were calculated using:

i_v = (A-B) / (Saturated Thickness)

where:

"A" and "B" are the equivalent potentiometric elevations in the deeper and shallower well, respectively; and

"Saturated Thickness" for shallow to deep calculations is the distance between the midpoint of the screened interval of the deep well and the water level elevation of the shallow well. The saturated thicknesses used in the bedrock and deep overburden well calculation is the distance between the midpoints of the screened intervals of the deep and bedrock wells.

3. A negative number denotes a downward hydraulic gradient. A positive number denotes a upward hydraulic gradient.

TABLE 11A
Summary of Upper Soil Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SB-31	Peripheral On-Facility Area West of South Street	S-1A	0 - 1	2/26/2001	6.5		
SB-32	Peripheral On-Facility Area West of South Street	S-1A	0 - 1	2/22/2001	5.6		
SB-33	Peripheral On-Facility Area West of South Street	S-1A	0 - 0.8	2/23/2001	7.5		
SB-34	Peripheral Off-Facility Area West of South Street	S-1A	0 - 1	5/2/2001	5.4		
SB-35	Peripheral Off-Facility Area West of South Street	S-1A	0 - 1	5/2/2001	5.3		
SB-36	Peripheral Off-Facility Area West of South Street	S-1A	0 - 1	2/21/2001	6.5		
SB-37	Peripheral On-Facility Area West of South Street	S-1A	0 - 1	4/23/2001	4.8		
SB-38	Peripheral On-Facility Area West of South Street	S-1A	0 - 1	4/23/2001	4.5		
SB-39	Peripheral On-Facility Area West of South Street	S-1A	0 - 1	2/22/2001	6.3		
SB-40	Peripheral On-Facility Area West of South Street	S-1A	0 - 1	2/26/2001	6.9		
SH-09D / SB-52	Industrial Area West of South Street	S-00A	0 - 1	4/18/2001	7.4		
SH-17S	Peripheral On-Facility Area West of South Street	S-1A	0 - 1	2/27/2001	6.4		
EUA-1	Peripheral Off-Facility Area East of South Street	N/A	0 - 0.5	8/8/2003	6.8		
EUA-2	Peripheral Off-Facility Area East of South Street	N/A	0 - 0.5	8/8/2003	5.7		
EUA-3	Peripheral Off-Facility Area East of South Street	N/A	0 - 0.5	8/8/2003	6.4		
FPW-1	Residential Area West of South Street	N/A	0 - 0.5	8/8/2003	5.7		
FPW-2	Residential Area West of South Street	N/A	0 - 0.5	8/8/2003	5.2		
FPW-3	Residential Area West of South Street	N/A	0 - 0.5	8/8/2003	5.8		
OP-1	Residential Area West of South Street	N/A	0 - 0.5	8/8/2003	5.4		
OP-2	Residential Area West of South Street	N/A	0 - 0.5	8/8/2003	6.9		
OP-3	Residential Area West of South Street	N/A	0 - 0.5	8/8/2003	5.5		
OSA-1	Peripheral On-Facility Area West of South Street	N/A	0 - 0.5	8/7/2003	7.0		
OSA-2	Peripheral On-Facility Area West of South Street	N/A	0 - 0.5	8/7/2003	6.1		

TABLE 11A
Summary of Upper Soil Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
OSA-2	Peripheral On-Facility Area West of South Street	N/A	0 - 0.5	8/12/2003	6.0		
OSA-3	Peripheral On-Facility Area West of South Street	N/A	0 - 0.5	8/12/2003	5.6		
OSA-3	Peripheral On-Facility Area West of South Street	N/A	0 - 0.5	8/12/2003	5.8		
OSR-1-S	Peripheral Off-Facility Area East of South Street	N/A	0 - 0.5	10/31/2003	5.0		
OSR-2-S	Peripheral Off-Facility Area East of South Street	N/A	0 - 0.5	10/31/2003	5.5		
OSR-3-S	Peripheral Off-Facility Area East of South Street	N/A	0 - 0.5	10/31/2003	5.4		

Notes:

1. Soil samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated.

2. Values reported above have been rounded from values measured in the field.

3. Refer to Appendix B for field forms/logs for further information.

4. pH measurements were made using a Beckman 240 pH meter. pH is reported in standard units (s.u.).

5. In general, field measurements of pH were made in accordance with Standard Operating Procedure (SOP) F-1669B (B.7.3), using USEPA "Method 9045C Soil and Waste pH," in Test Methods for Evaluating Soil and Waste and, SW846, Third Edition, January 1995 (Revision 3) method as promulgated in the final update, December 1996. Data verification procedures included in United States Environmental Protection Agency (USEPA)- New England (NE) Quality Assurance Project Plan (QAPP) Worksheet #9c and #23a were also followed.

6. Data validation and data usability assessments were performed by SHA. None of the above pH data were qualified. Refer to the Phase 1A RI Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004) for additional detail regarding qualifiers and bias.

TABLE 11B
Summary of Upper Soil Data -
Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg																										
	Human Health		Ecological								SS-01 / 05-09-01			SS-02 / 04-26-01			SS-03 / 05-09-01			SS-04 / 03-21-01			SS-05 / 03-19-01			SS-06 / 03-15-01			SS-07 / 03-15-01			SS-08 / 03-14-01			SS-09 / 04-23-01			SS-10 / 06-07-01			SS-11 / 06-07-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Former Lower Mill Pond East of South St.			Former Lower Mill Pond East of South St.			Former Lower Mill Pond East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																										
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**5,490**	J	H	**10,400**			5,480	J	H	3,710			6,020			6,710			7,150			3,130			5,340	J	H	5,470			4,630		
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.86	UJ	L	**1.4**	J	L	0.91	UJ	L	**4.4**	J	H	**1.1**	J	H	**1.6**	J	H	0.31	U		0.28	U		0.81	UJ	L	0.75	UJ	L	0.86	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**1.5**			**9.5**			**0.83**			**106**			**52.1**			**33.7**			**15.9**			**2.7**			**2.5**			**1.3**			**2.7**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**18.7**			**73.1**			**21.9**			**37.3**			**36.3**			**35.6**			**36.2**			7.7			**34.6**			**48.0**			**52.3**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.32	U		0.62			0.38	U		0.30	U		0.34	U		0.33			0.32			0.25	U		0.30	U		0.33	U		0.36		
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.14			**2.4**			0.094	U		0.096	J	H	0.15	J	H	0.15	J	H	0.13	J	H	0.062	U		**0.47**			0.083	U		0.088	U	
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	501	B		3,340	J	I	466	B		2,050			18,200			15,200			13,600			592			5,990			7,920			3,190		
Chromium†	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**8.6**			**45.0**			**9.2**			**6.8**			**6.8**			**9.7**			**8.8**			**4.1**			**11.9**			**8.9**	J	H	**9.1**	J	H
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	2.1			10.1			2.2			3.8	J	H	5.2	J	H	5.8	J	H	5.0	J	H	2.8	J	H	5.5	J	L	4.5			9.2		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	13.1			**56.5**			8.1			**53.3**			**51.3**			**51.8**			35.7			28.5			**218**	J	I	27.8			11.2		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				6,170		L	14,600			5,080	J	L	23,200	J	I	23,300	J	I	18,100	J	I	13,200	J	I	7,240	J	I	10,100			8,810			7,230		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**49.8**			**130**			**22.7**			**79.7**			**38.2**			**52.8**			**20.2**			**7.6**			**287**			**49.3**	J	H	**37.5**	J	H
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,270			1,920			1,040			1,120			2,930			3,410			3,390			1,350			2,590	J	H	3,650	J	L	1,750	J	L
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	61.6			238			98.0			165	J	L	**373**	J	L	**379**	J	L	**343**	J	L	135	J	L	227			156			97.1		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	**0.20**	J	I	**1.0**	J	H	0.054	J	I	0.072			0.075			0.044			0.034			0.030	U		**0.11**			0.047			0.039		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	4.3	U		19.1			4.5	U		7.5			8.3			8.1			7.4			4.1			15.7			8.7			8.5		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	122			262			113			349			763			829			757			271			284			440			370		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.10	UJ	I	**1.7**	J	L	0.16	J	I	**0.47**	J	L	0.33	J	L	0.26	J	L	0.11	J	L	0.18	J	L	0.23			0.15	J	I	0.14	J	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.52	U		0.72	U		0.54	U		0.40	U		0.42	U		0.36	U		0.37	U		0.34	U		0.68	UJ	L	0.45	U		0.51	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	43.0	U		317			45.4	U		65.8	JB	I	61.7	JB	I	65.3	JB	I	74.6	JB	I	28.3	JB	I	52.7			159			258		
Thallium‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.048	UJ	I	**0.19**			0.057	UJ	I	**0.24**	B	H	**0.15**	B	H	**0.15**	B	H	**0.053**	JB	I	0.037	UJ	I	0.046	UJ	I	0.050	UJ	I	**0.060**	J	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**24.5**			**44.3**	J	H	**15.6**			**17.8**			**16.7**			**16.1**			**18.9**			**7.1**			**22.1**			**17.3**			**13.5**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**22.0**			**252**	J	H	**17.4**			**23.2**	J	I	**42.1**	J	I	**50.8**	J	I	**61.9**	J	I	**18.4**	J	I	**287**			**72.4**			**50.9**		
Cyanide (weak acid dissociable)$&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.14	U		0.84	UJ	L	0.14			0.67	U		0.39	U		0.34	U		0.51	U		0.36	U		0.53	UJ	L	0.47	U		0.52	U	

Analytes	COPC Screening Levels										Concentrations in mg/kg																															
	Human Health		Ecological								SS-12 / 04-17-01			SS-13 / 04-13-01			SS-14 / 04-13-01			SS-15 / 04-16-01			SS-16 / 06-06-01			SS-17 / 04-05-01			SS-18 / 04-11-01			SS-19 / 06-08-01			SS-20 / 06-12-01			SS-21 / 04-02-01			SS-22 / 06-13-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																										
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**11,900**	J	H	**9,700**	J	H	**5,710**	J	H	**5,140**	J	H	**4,000**			**4,400**			**5,020**	J	H	**7,190**			**6,450**			**4,110**			**5,410**	J	L
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.60	UJ	L	0.63	UJ	L	0.52	UJ	L	0.52	UJ	L	0.81	UJ	L	0.34	UJ	L	**1.3**	J	L	0.85	UJ	L	0.90	UJ	L	0.28	UJ	L	0.92	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**3.8**	J	H	**3.2**	J	H	**2.5**	J	H	**2.2**	J	H	**1.2**			**4.5**			**4.0**	J	H	**2.2**			**5.1**			**7.5**			**0.85**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**60.0**			**70.4**			**26.9**			**25.0**			15.0			**94.2**			**253**			**22.6**			**223**			**23.4**			**17.4**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.40			0.35			0.26			0.26	U		0.34	U		0.39			0.34			0.36	U		0.38	U		0.24	U		0.33	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.19			0.22			0.10			0.18			0.084	U		0.33			**1.1**			0.091	U		**0.72**			0.18			0.084	U	
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,390			2,240			1,940			2,760			6,000			1,880	J	L	5,590			1,260			1,530			1,800	J	L	1,970	J	L
Chromium†	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**24.4**			**11.1**			**7.9**			**7.4**			**10.1**	J	H	**10.7**			**10.6**			**10.1**	J	H	**22.5**	J	H	**6.3**			**14.6**	J	L
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	4.6			4.1			4.8			5.0			**14.4**			4.9			5.0			8.5			4.6			2.9			**16.0**	J	L
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	24.0			27.5			36.4			**55.1**			**49.8**			**116**			**77.1**			11.8			**110**			15.6			10.6		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				17,600			12,800			11,300			9,610			7,450			9,910			135,000			9,710			113,000			8,360			10,400		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**108**			**128**			**40.4**			**52.8**			**7.3**	J	H	**203**			**1,540**			**25.1**	J	H	**372**	J	H	**111**			**5.2**	J	I
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,920	J	I	2,310	J	I	2,470	J	I	2,060	J	I	2,580	J	L	3,050			2,550	J	I	2,080	J	L	2,670	J	L	1,920			2,600	J	L
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	155	J	L	200	J	L	227	J	L	139	J	L	163			161			**723**	J	L	175			**426**			130			189		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.080			**1.4**			0.070			**0.21**			0.030			**0.33**			**0.25**			0.053			**0.21**			0.033			0.024	UJ	L
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	8.1			9.4			7.9			7.5			6.3			21.1			18.1			8.2			22.7			5.2			6.7		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	271			299			591			321			455			303			288			358			280			272			445		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.19			0.25			0.079	UJ	I	0.20			0.11	UJ	I	**0.58**	J	H	0.30			0.14	J	I	**0.43**			0.20	J	H	0.11	UJ	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.45	U		0.39	U		0.38	U		0.42	U		0.49	U		0.34	U		0.38	U		0.51	U		0.85			0.33	U		0.55	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	58.6			103			59.4			58.0			304			95.7			128			117			59.2			57.7			148		
Thallium‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	**0.082**			**0.066**	J	I	**0.039**	J	I	0.039	UJ	I	0.051	U	I	**0.097**			**0.051**	J	I	0.054	U	I	**0.067**	J	I	**0.037**	J	I	0.050	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**26.4**			**24.0**			**15.1**			**19.5**			**12.6**			**19.5**			**33.3**			**18.8**			**35.1**			**19.0**			**20.3**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**154**			**261**			**59.6**			**54.0**			**29.2**			**210**			**4,370**			**37.0**			**1,060**			**41.3**			**86.3**		
Cyanide (weak acid dissociable)$&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS		R		0.40	U		0.28	U			R		0.47	U		0.44	U		0.36	U		0.46	U		0.57	UJ	L	0.47	U		0.50	UJ	L

TABLE 11B
Summary of Upper Soil Data -
Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg																										
	Human Health		Ecological								SS-23 / 04-11-01			SS-24 / 04-12-01			SS-25 / 03-29-01			SS-26 / 03-30-01			SS-27 / 06-15-01			SS-28 / 07-23-01			SS-29 / 03-28-01			SS-30 / 03-28-01			SS-31 / 02-26-01			SS-32 / 02-22-01			SS-33 / 02-23-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																												
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**5,760**	J	H	**8,240**	J	H	**3,560**			**5,050**			**4,680**			**7,460**	J	H	**6,820**			**5,860**			**5,160**	J	H	**5,900**	J	H	**6,160**	J	H
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	**15.0**	J	L	0.59	UJ	L	0.33	UJ	L	0.31	UJ	L	0.84	UJ	L	0.81	UJ	L	0.30	U		0.29	UJ	L	0.44	UJ	L	**0.72**	J	L	0.50	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**15.5**	J	H	**3.2**	J	H	**3.5**			**11.8**			**1.3**			**2.5**			**1.5**			**2.4**			**4.6**	J	L	**35.7**	J	L	**2.9**	J	L
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**489**			**52.2**			**85.2**			**46.3**			**19.8**			**48.6**			**26.3**			**43.9**			**35.9**			**46.0**			**51.4**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.41			0.32			0.40			0.45			0.31	U		0.33	U		0.29			0.26			0.32	U		0.33	U		0.37	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	**3.2**			0.21			**0.89**	J	I	0.31			0.077	U		0.14			0.082	J	H	0.28			0.28			0.29			0.16		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	17,600			26,200			1,700	J	L	1,670	J	L	1,680			1,210	J	I	1,660			1,190	J	L	2,130	JB	I	2,480	JB	I	1,710	JB	I
Chromium†	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**14.8**			**12.6**			**11.4**			**15.2**			**7.6**	J	H	**8.1**			**10.1**			**9.3**			**8.3**			**11.9**			**9.5**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	**501**			**53.9**			4.7			5.2			7.7			4.0	J	I	5.0	J	H	2.8			4.1			4.7			2.1		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	**157**			**105**			**259**			**52.0**			10.8			20.3	J	I	13.6			17.4			13.3			21.2			17.5		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				21,700			14,400			7,010			10,000			8,700			19,400			11,800	J	I	9,940			9,990			10,300			6,680		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**5,620**			**283**			**166**			**134**			**18.5**	J	H	**43.6**	J	I	**15.4**			**112**			**72.4**			**123**			**47.5**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,230	J	I	5,120	J	I	1,450			2,460			2,740	J	L	1,750	J	I	2,500			1,910			2,930	J	H	2,170	J	H	951	JB	H
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	110	J	L	239	J	L	118			174			182			190			228	J	L	151			199			197			142		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	**7.8**			**0.77**			**0.40**	J	I	**0.53**			0.024	U		0.033			0.032	U		0.035			0.036			0.072			0.074		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	16.1			8.2			13.3			11.5			7.6			9.3			7.9			8.6			9.5			9.1			5.4		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	712			532			222			317			255			269			309			214			350	B	H	348	B	H	290	B	H
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	**0.68**			0.16	J	I	0.32	J	H	**0.78**	J	H	0.10	UJ	I	0.18	J	I	0.17	J	L	0.27	J	H	0.14	J	I	**0.34**			**0.47**		
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	**15.0**			**7.2**			0.53			0.38	U		0.50	U		0.49	U		0.35	U		0.34	U		0.52	U		0.51	U		0.60	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	295			157			104			107			82.9			63.4			47.1	JB	I	38.1			59.7	B	H	45.6	B	H	574	B	H
Thallium‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	**0.10**			**0.045**	J	I	**0.046**	J	I	**0.14**			0.046	UJ	I	**0.050**	J	I	0.035	UJ	I	**0.052**	J	I	0.048	UJ	I	**0.072**	JB	I	**0.098**	JB	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**18.5**			**21.6**			**14.6**			**16.6**			**16.9**			**22.5**			**22.7**			**25.9**			**23.3**			**23.4**			**21.5**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**2,680**			**451**			**439**			**81.4**			**27.9**			**54.3**	J	H	**34.2**	J	I	**66.4**			**58.2**			**80.7**			**46.5**		
Cyanide (weak acid dissociable)$&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.36	U		0.51	U		0.38	J		0.34	U		0.46	UJ	L	0.48	U		0.53			0.31	U		0.12	JB	I	0.11	JB	I	0.042	JB	I

Analytes	COPC Screening Levels										Concentrations in mg/kg																															
	Human Health		Ecological								SS-34 / 05-02-01			SS-35 / 05-02-01			SS-36 / 02-21-01			SS-37 / 04-23-01			SS-38 / 04-23-01			SS-39 / 02-22-01			SS-40 / 2-26-01			SS-58 / 04-26-01			SS-59 / 04-26-01			SS-60 / 04-25-01			SS-61 / 04-25-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Peripheral Off-Facility Area West of South St.			Peripheral Off-Facility Area West of South St.			Peripheral Off-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																												
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**4,900**	J	H	**8,850**	J	H	**9,580**	J	H	**7,760**	J	H	**5,150**	J	H	**6,860**	J	H	**5,870**	J	H	**7,510**			**6,650**	J	H	**7,660**	J	H	**11,500**	J	H
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	1.0	UJ	L	1.0	UJ	L	0.41	UJ	L	0.98	UJ	L	0.96	UJ	L	0.38	UJ	L	0.42	UJ	L	0.83	UJ	L	0.77	UJ	L	0.93	UJ	L	0.87	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**3.4**			**2.3**			**3.4**	J	L	**2.0**			**1.4**			**3.1**	J	L	**2.6**	J	L	**2.0**			**1.7**			**3.6**			**3.3**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**24.3**			**67.9**			**24.1**			11.0			11.2			12.9			12.6			**37.0**			**21.2**			**57.6**			**72.3**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.39	U		0.40	U		0.32	U		0.31	U		0.34	U		0.29	U		0.35	U		0.40			0.28	U		0.32			0.39		
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.18			0.19			0.12			0.082			0.093			0.073	U		0.087	U		0.15			0.13			0.38			**0.43**		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	834	B		1,910			1,100	JB	I	658			750			724	JB	I	958	JB	I	2,400			1,500			988			2,240		
Chromium†	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**9.9**			**11.3**			**11.8**			**8.9**			**7.1**			**7.5**			**6.6**			**13.6**			**6.9**			**14.5**			**14.5**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	2.8			5.5			3.4			3.6	J	L	3.4	J	L	2.1			2.0			7.3			4.4	J	L	4.1	J	L	4.0	J	L
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	11.3			13.0			11.8			8.8	J	I	12.5	J	I	4.1			4.2			19.1			14.4	J	I	25.1	J	I	31.9	J	I
Iron	NS	2,300	NS	NS	NS	NS	Note 7				7,980	J	L	9,650	J	L	23,600			10,200			8,430			9,330			8,870			12,600			10,800			10,700			12,800		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**71.9**			**57.0**			**73.7**			**15.2**			**22.4**			**13.3**			**9.6**			**17.0**			**16.4**			**232**			**128**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,170			1,340			4,870	J	H	1,940	J	H	2,030	J	H	813	J	H	861	JB	H	3,200			2,480	J	H	2,120	J	H	1,930		
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	154			286			284			156			108			79.6			89.0			252			251			162			167		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.096	J	I	**0.17**	J	I	0.068			0.033			0.039			0.030	U		0.035	U		0.028	U		0.026	U		**0.23**			0.097		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	5.2			7.5			12.9			5.8			6.2			3.8	U		4.2	U		11.7			8.2			9.5			15.3		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	163			123			176	B	H	229			206			291	B	H	260	B	H	526			412			238			206		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.32			0.30			**0.42**			0.31			0.24			0.27			0.21	J	I	0.13	J	I	0.14	J	I	0.29			0.28		
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.61	U		0.61	U		0.49	U		0.50	UJ	L	0.48	UJ	L	0.46	U		0.51	U		0.48	U		0.42	UJ	L	0.45	UJ	L	0.51	UJ	L
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	54.2	B		50.9	U		40.9	B	H	42.9			39.8	U		38.0	B	H	42.5	B	H	70.2			82.6			127			58.4		
Thallium‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.059	UJ	I	**0.086**	J	I	**0.067**	JB	I	0.047	UJ	I	0.052	UJ	I	**0.054**	JB	I	0.052	UJ	I	**0.048**	J	I	0.043	UJ	I	**0.070**	J	I	**0.072**	J	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**19.0**			**21.5**			**37.8**			**21.3**			**20.9**			**13.9**			**12.9**			**26.9**			**16.5**			**23.2**			**32.0**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**26.6**			**46.8**			**45.6**			**26.9**			**22.9**			**14.9**			**16.1**			**45.6**			**57.5**			**97.9**			**116**		
Cyanide (weak acid dissociable)$&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.15	UJ	L	3.2	J	L	0.10	JB	I	0.51	UJ	L	0.53	UJ	L	0.054	JB	I	0.14	JB	I	0.54	UJ	L	0.51	UJ	L	0.54	UJ	L	0.53	UJ	L

TABLE 11B
Summary of Upper Soil Data -
Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg																										
	Human Health		Ecological								SS-62 / 04-17-01			SS-63 / 04-02-01			SS-64 / 03-23-01			SS-65 / 03-26-01			SS-66 / 07-09-01			SS-67 / 07-11-01			SS-68 / 07-11-01			SS-69 / 07-10-01			SS-70 / 07-10-01			SS-71 / 07-10-01			SS-72 / 07-10-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																										
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**9,420**	J	H	**12,200**			**9,950**			**10,800**			**5,110**			**7,900**			**8,960**			**5,130**			**7,920**			**6,200**			**9,450**		
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.60	UJ	L	0.33	UJ	L	0.33	U		0.31	U		0.81	UJ	L	0.91	UJ	L	0.97	UJ	L	0.89	UJ	L	0.90	UJ	L	0.93	UJ	L	0.86	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**4.5**	J	H	**14.3**			**4.2**			**19.3**			**1.6**			**2.2**			**2.9**			**2.3**			**2.0**			**2.6**			**2.3**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**35.7**			**67.3**			**61.1**			**74.3**			16.4			**31.4**			**28.3**			**32.8**			**29.7**			**44.0**			**21.5**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.36			0.40			0.38			0.40			0.35	U		0.35	U		0.48			0.33	U		0.35	U		0.38	U		0.35	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.18			**0.66**			0.18	J	H	0.35	J	H	0.11			0.16			0.10			0.23			0.13			0.15			0.088	U	
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,100			1,760	J	L	2,290			1,180			1,450	B		1,990	B		985	B		768	B		17,400	J		2,890	B		580	B	
Chromium†	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**14.0**			**15.0**			**11.1**			**13.6**			**5.7**			**9.3**			**17.2**			**9.3**			**7.0**			**10.3**			**9.4**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	5.2			4.0			3.8	J	H	3.7	J	H	2.9			3.7			9.6			4.6			4.1			4.5			4.2		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	17.4			32.6			21.5			30.7			7.9			12.6			7.2			10.5			13.0			14.4			7.7		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				15,700			15,400			11,900	J	I	11,800	J	I	7,290			10,300			27,800			10,500			12,500			12,400			9,940		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**118**			**205**			**236**			**278**			**29.1**			**71.0**			**23.2**			**41.3**			**16.0**			**33.5**			**15.7**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,040	J	I	2,480			1,830			1,540			2,120			1,740			3,480			985			2,870			1,460			1,470		
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	193	J	L	203			183	J	L	232	J	L	173			263			**435**			**615**			**355**	J		**526**			154		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.061			**0.20**			0.10			**0.31**			0.031			0.055			0.033	U		0.085			0.029	U		0.050			0.034		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	9.7			11.3			8.2			8.9			4.5	U		6.4			7.1			4.8			6.4			6.6			6.0		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	184			254			252			206			184	B		221	B		225	B		211	B		556	J		232	B		187	B	
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.29			**0.46**	J	H	**0.54**	J	L	**1.0**	J	L	0.16	J		0.29			0.30			**0.38**			0.18	J		0.21	J		0.27		
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.45	U		0.39	U		0.43	U		0.43	U		0.55	U		0.52	U		0.55	U		0.49	U		0.52	U		0.57	U		0.52	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	60.0			53.4			52.4	JB	I	43.4	JB	I	55.6	B		75.2	B		74.7	B		48.7	B		43.7	U		64.3	B		43.6	U	
Thallium‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	**0.068**	J	I	**0.093**			**0.073**	JB	I	**0.11**	B	H	0.053	UJ		0.052	UJ		0.055	UJ		**0.060**	J		0.052	UJ		0.057	UJ		0.053	UJ	
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**31.2**			**36.7**			**26.9**			**29.0**			**13.5**			**24.3**			**56.7**			**29.0**			**17.4**			**28.2**			**21.3**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**42.6**			**192**			**93.2**	J	I	**109**	J	I	**28.3**			**46.1**			**39.7**			**39.8**			**38.9**			**51.3**			**21.7**	B	
Cyanide (weak acid dissociable)$&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS		R		0.35	U		0.48			0.52	U			U		0.45	U		0.63	U		0.59	U		0.44	U		0.52	U		0.48	U	

Analytes	COPC Screening Levels										Concentrations in mg/kg																															
	Human Health		Ecological								SS-73 / 07-10-01			EUA-1 / 08-08-03			EUA-2 / 08-08-03			EUA-3 / 08-08-03			FPW-1 / 08-08-03			FPW-2 / 08-08-03			FPW-3 / 08-08-03			OP-1 / 08-08-03			OP-2 / 08-08-03			OP-3 / 08-08-03			OSA-1 / 08-07-03		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Residential Area West of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Peripheral On-Facility Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																										
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**8,470**			**6,500**			**6,300**			**11,000**			**7,700**			**5,500**			**5,600**			**6,600**			**11,000**			**6,700**			**7,000**		
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.89	UJ	L	**1.1**	J	L	**1.3**	J	L	0.68	UJ	L	0.56	UJ	L	**0.89**	J	L	**1.7**	J	L	0.50	UJ	L	0.51	UJ	L	0.54	UJ	L	0.39	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**2.2**			**57.0**			**9.6**			**11.0**			**5.3**			**6.2**			**4.8**			**4.4**			**1.9**			**2.8**			**1.6**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**26.0**			**39.0**			**64.0**			**170**			**68.0**			**89.0**			**96.0**			**50.0**			**23.0**			**66.0**			**74.0**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.32	U																																
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.092			0.20			**3.5**			**0.72**			**0.65**			**0.68**			**0.71**			0.36			0.12	U		**0.45**			0.28		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,830	B																																
Chromium†	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**8.3**			**7.3**			**23.0**			**19.0**			**12.0**			**17.0**			**24.0**			**15.0**			**8.1**			**11.0**			**9.6**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	3.5			5.1			3.7			4.4			4.1			4.8			3.7			4.4			3.8			5.2			5.2		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	8.3			**59.0**			**67.0**			**57.0**			25.0			**47.0**			**90.0**			24.0			9.2			22.0			21.0		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				11,600			17,000	J	H	17,000	J	H	14,000	J	H	13,000	J	H	16,000	J	H	15,000	J	H	12,000	J	H	15,000	J	H	10,000	J	H	15,000	J	H
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**19.9**			**42.0**			**190**			**420**			**130**			**300**			**430**			**100**			**19.0**			**100**			**48.0**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,600																																
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	216			270			200			250			**340**			**470**			190			290			190			**390**			**330**		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.028	U		0.056			**0.39**			**1.0**			**0.41**			**0.22**			**0.23**			**0.13**			0.033			0.078			0.10		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	5.4			8.5	B	H	10.0	B	H	14.0	B	H	7.9	B	H	11.0	B	H	12.0	B	H	9.3	B	H	6.4	B	H	7.7	B	H	9.6	B	H
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	312	B																																
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.19	J		0.29			**0.81**			**0.76**			**1.6**			**0.59**			**0.62**			**0.55**			0.29			**0.40**			0.15		
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.47	U																																
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	39.2	U																																
Thallium‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.048	UJ		**0.18**			**0.094**			**0.16**			**0.11**			**0.10**			**0.090**			**0.19**			**0.048**	B	H	**0.092**			**0.038**	B	H
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**18.8**			**14.0**			**35.0**			**30.0**			**20.0**			**32.0**			**26.0**			**27.0**			**15.0**			**19.0**			**15.0**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**28.7**			**66.0**			**390**			**310**			**120**			**130**			**170**			**75.0**			**32.0**	B	H	**84.0**			**140**		
Cyanide (weak acid dissociable)$&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.43	U																																

TABLE 11B
Summary of Upper Soil Data -
Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg													
	Human Health		Ecological								OSA-2 / 08-12-03			OSA-3 / 08-12-03			OSR-1-S / 11-21-03			OSR-2-S / 11-04-03			OSR-3-S / 10-31-03		
			ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																									
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**7,300**			**6,800**			**6,600**			**8,600**			**14,000**		
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.60	UJ	L	0.45	UJ	L	**0.29**	J	L	**0.98**	J	L	**0.66**	J	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**3.1**			**3.6**			**3.1**			**35.0**			**34.0**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**38.0**			**66.0**			**23.0**			**75.0**			**87.0**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS															
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.18			0.24			0.14			0.30			0.23		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS															
Chromium†	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**9.3**			**11.0**			**9.3**			**12.0**			**12.0**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	3.2			3.4			3.0	J	I	3.2			3.7		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	16.0			35.0			14.0			31.0			20.0		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				11,000	J	H	11,000	J	H	7,600	J	I	12,000	J	H	13,000	J	H
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**51.0**			**220**			**58.0**			**110**			**69.0**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS															
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	170			250			180	J	I	300			310		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.065			**0.13**			**0.13**			**0.21**			**0.33**		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	8.3	B	H	8.8	B	H	8.4	J	I	8.8			8.6		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS															
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	**0.38**			**0.42**			**0.63**	B	H	**1.1**			**0.67**		
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS															
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS															
Thallium‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	**0.077**			**0.063**			**0.074**			**0.15**			**0.13**		
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**19.0**			**22.0**			**31.0**			**40.0**			**30.0**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**60.0**			**95.0**			**28.0**	J	I	**56.0**			**51.0**		
Cyanide (weak acid dissociable)$&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS															

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories of Raynham, Massachusetts, perfomed: metals (except mercury) analyses by United States Environmental Protection Agency (USEPA) Method 6010B and Method 6020; mercury analyses by USEPA Method 7471A; and weak acid dissociable cyanide (WAD cyanide) analyses by USEPA Method 4500-CN I.

3. Data validation and data usability assessments were performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).

4. Concentrations are presented in milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.
"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.
"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.
"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL Based benchmarks for food ingestions for the American Robin.
"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian (birds) are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. Reference for ESSL for aluminum (OSWER Directive 9285.7-60, as found on the USEPA website www.epa.gov/ecotox/ecossl/) indicates aluminum is a COPC at pHs <5.5. Review of Figure 2.1 of this reference indicates that at the higher pHs observed in some site soils (e.g., pH >8), aluminum solubility increases to levels similar to that at pHs of <5.5.

7. In well aerated soil with pH of 5 to 8, iron is not toxic to plants.

8. "†" indicates that Region IX PRG and ORNL small mammal benchmarks presented are for chromium VI. The MCP 2/S-1 and ORNL avian benchmarks presented are for chromium III. The ORNL earthworm and phytotoxicity benchmarks do not indicate a chromium isomer.
"‡" indicates the Region IX PRG presented is for thallium chloride.
"$" indicates the MCP Method 2 S-1 standard presented is for free, or physiologically available cyanide.
"&" indicates the Region IX PRG presented is for hydrogen cyanide because cyanide in this form easily dissociates and becomes available for uptake as free cyanide.

9. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002], and Appendix B.7 of the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:
- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
- "R" Indicates data rejected during validation.
- "B" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with sediment metals analyses). The result is usable with possible uncertainty due to the potential for contamination.
- "JB" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with sediment metals analyses). The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision, and with possible uncertainty due to the potential for contamination.

Bias:
- "L" Low
- "I" Indeterminate
- "H" High

TABLE 11C
Summary of Upper Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels										SS-01 / 05-09-01			SS-02 / 04-26-01			SS-03 / 05-09-01			SS-04 / 03-21-01			SS-05 / 03-19-01			SS-06 / 03-15-01			SS-07 / 03-15-01			SS-08 / 03-14-01			SS-09 / 04-23-01			SS-10 / 06-07-01			SS-11 / 06-07-01			SS-12 / 04-17-01		
	Human Health		Ecological								Former Lower Mill Pond East of South St.			Former Lower Mill Pond East of South St.			Former Lower Mill Pond East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels																																									
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs											Concentrations in µg/kg																																								
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	17			320			5.7	U		460			4,000			45			19			5.4	U		1,400	J	I	10	U		5.5	U		43	J	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	17			230			5.7	U		2,900			12,000			410			20			5.4	U		220	J		10	U		9.2			79	J	
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	36			310			5.7	U		3,200			14,000			320			46			6.2			4,000			35			62			160	J	
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	120			810			14			11,000			22,000			1,000			140			19			8,600			24			180			470		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	130			750			16			**11,000**			**18,000**			1,000			130			16			**9,300**			10	U		190			570	J	L
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	120			980			20			19,000			30,000			2,000			140			18			11,000			10	U		230			660	J	L
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	69			320			11			3,300			11,000			830			84			10			3,300	J	L	10	U		100			150	J	L
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	110			770			14			8,000			14,000			870			100			13			5,400			10	U		89			480	J	L
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	150			1,300			21			13,000			24,000			1,500			170			20			8,700			66			220			500		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	11			96			5.7	U		1,200			3,400			250			20			5.4	U		960	J		10	U		26			49	J	L
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	310			1,800			35			23,000			56,000			2,100			340			44			22,000			110			360			980		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	19			190			5.7	U		350			4,300			28			14			5.4	U		1,400			10	U		5.5	U		230	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	80			390			13			4,300			13,000			930			80			9.8			3,900	J	L	10	U		110			160	J	L
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	6.2			160			5.7	U		1,300			2,300			400			13			5.4	U		340	J		140			74			230	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	9.3			300			5.7	U		1,300			2,200			450			21			5.4	U		680	J		210			82			51	J	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	240			1,300			24			6,400			22,000			760			230			27			16,000	J	I	87			280			550		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	290			2,400			34			17,000			45,000			1,700			310			37			18,000	J	I	130			260			950		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,734.5			12,426			202			126,710			297,200			14,593			1,877			220			115,200			802			2,272.2			5,852		
Other SVOCs																																															
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	190	J	L	1,200	J	L	160	J	L	2,700	J	L	730	J	L	240	UJ	L	48	J	L	220	UJ	L	1,100	UJ	L		R			R		230	UJ	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		48	J		230	U		270	U		280	U		240	U		230	U		220	U		1,100	UJ	L	410	U		220	U		230	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		46	UJ		40	UJ		120	UJ	L	130	UJ		110	UJ		100	UJ		98	UJ		200	UJ		72	UJ		39	UJ		41	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	UJ	L	240	UJ	L	230	UJ	L	220	UJ	L	1,100	U		410	U		220	U		230	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	220	U		100	JEB		230	U		110	J	L	280	U		240	U		230	U		54	J		230	JEB		150	J		47	J		50	JEB	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		250			230	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		110	J		230	U		770	J	L	2,000			140	J		230	U		220	U		2,300			410	U		220	U		62	J	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		150	J		230	U		810	J	L	2,800			290			230	U		220	U		970	J		410	U		49	J		230	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		54	J		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		69	J		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	UJ	L	230	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		83	J		370			240	U		230	U		220	U		1,100	U		410	U		220	U		230	UJ	L
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	38	UJ		46	UJ		40	UJ		78	UJ	L	82	UJ		70	UJ		68	UJ		63	UJ		200	UJ		72	UJ		39	UJ		41	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	540	U		260	U		570	U		670	U		690	U		600	U		580	U		540	U		2,800	UJ	L	1,000	U		550	U		580	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	1,100	U		650	UJ	L	1,100	U		670	UJ	L	690	U		600	U		580	U		540	U		5,600	UJ	L	2,000	UJ	L	1,100	UJ	L	1,200	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	UJ	L	230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	UJ	L
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		37	UJ		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	540	U		260	UJ	L	570	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	UJ	L	410	U		220	U		230	UJ	L
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	220	U		260	U		230	U		270	U		160	J		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		120	J		230	U		130	J		500			240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		46	UJ		40	UJ		100	UJ	L	100	UJ		90	UJ		86	UJ		81	UJ		200	UJ		72	UJ		39	UJ		41	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		68	J		280	U		240	U		230	U		220	U		1,100	U		1,000	U		550	U		230	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	220	U		67	J		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	UJ	L	280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		230	U		270	U		280	U		240	U		230	U		220	U		1,100	U		410	U		220	U		230	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	190			1,918			160			4,671			6,560			430			48			54			3,500			150			346			112		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,924.5			14,344			362			131,381			303,760			15,023			1,925			274			118,700			952			2,618.2			5,964		

TABLE 11C
Summary of Upper Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels										SS-13 / 04-13-01			SS-14 / 04-13-01			SS-15 / 04-16-01			SS-16 / 06-06-01			SS-17 / 04-05-01			SS-18 / 04-11-01			SS-19 / 06-08-01			SS-20 / 06-12-01			SS-21 / 04-02-01			SS-22 / 06-13-01			SS-23 / 04-11-01			SS-24 / 04-12-01		
	Concentrations in µg/kg																																														
	Human Health		Ecological								Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian																																						
PAHs																																															
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	69	J		210	U		310	J		5.2	U		400	J		3,600	J		5.5	UJ	L	5,000			2,100	U		5.1	U		13	U		6.0	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	290			180	J		1,100			5.2	U		8,500			4,100	U		5.5	UJ	L	4,700	U		4,100			5.1	U		15			6.0	U	
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	300			150	J		1,100			9.6			5,300			7,200			6.1	J	L	13,000			2,600			5.1	U		45			8.1		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	900			580			3,400			11			23,000			19,000			18	J	L	20,000			9,400			5.1	U		89			17		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	1,000			540			**4,200**			8.3			**33,000**			**19,000**	J	L	15	J	L	**15,000**			**10,000**			5.1	U		69			16		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	1,300			720			4,900			9.0			34,000			21,000	J	L	18	J	L	17,000			11,000			5.1	U		80			23		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	310			120	J		1,500			5.2			6,500	J	L	9,000	J	L	8.8	J	L	9,500			2,600			5.1	U		58			24		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	770			510			2,600			5.3			22,000			13,000	J	L	8.3	J	L	8,600			8,900			5.1	U		96			14		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	960			500			3,700			12			25,000			20,000			16	J	L	19,000			14,000			5.1	U		170			28		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	100	J		50	J		480			5.2	U		2,100	J	L	2,200	J	L	5.5	UJ	L	1,900	J		990	J		5.1	U		14			6.0	U	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	1,700			1,200			7,000			18			30,000			47,000			39	J	L	47,000			20,000			5.1	U		140			50		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	80	J		210	U		340	J		5.2	U		1,200			2,800	J		5.5	UJ	L	4,600	J		1,200	J		5.1	U		13	U		6.0	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	380			160	J		1,800			5.2			8,100	J	L	10,000	J	L	7.7	J	L	9,900			3,600			5.1	U		42			18		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	190	J		210	U		310	J		5.2	U		3,500			820	J		5.5	UJ	L	1,700	J		550	J		5.1	U		28			14		
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	270			62	J		630			5.3			6,400			1,400	J		5.5	UJ	L	4,000	J		610	J		5.1	U		63			18		
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,100			520			4,200			22			11,000			37,000			28	J	L	48,000			16,000			5.1	U		200			70		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	1,600			1,100			6,500			19			32,000			38,000			31	J	L	40,000			24,000			5.1	U		140			42		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	11,319			6,392			44,070			129.9			252,000			251,020			195.9			264,200			129,550			-			1,249			342.1		
Other SVOCs																																															
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	160	J	L	65	J	L	460	UJ	L		R		740	J	L	4,100	UJ	L		R			R		2,100	U			R		340	J	L	59	J	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	UJ	L	4,100	U		220	UJ	L	4,700	U			R		200	U		510	U		240	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	39	UJ		37	UJ		81	UJ		36	UJ		76	UJ		720	UJ		38	UJ	L	830	UJ		370	UJ		35	UJ		90	UJ		42	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	220	U		140	JEB		150	JEB		210	U		390	J		4,100	U		220	UJ	L	4,700	U		2,100	U		45	J		170	JEB		53	JEB	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		58	J		460	U		310			440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		520			4,200			300		
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	130	J		210	U		580			210	U		870			4,300			220	UJ	L	6,700			960	J		200	U		510	U		240	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U			R		200	U		510	U		240	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		240	J		210	U		1,200			2,300	J		220	UJ	L	4,000	J		2,100	U		200	U		510	U		240	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	UJ	L	440	U		4,100	U		220	UJ	L	4,700	U			R		200	UJ	L	510	U		240	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	UJ	L	210	U		100	J		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	39	UJ		37	UJ		81	UJ		36	UJ		76	UJ		720	UJ		38	UJ	L	830	UJ		370	UJ		35	UJ		90	UJ		42	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	560	U		520	U		1,200	U		520	U		1,100	U		10,000	U		540	UJ	L	12,000	U			R		510	U		1,300	U		600	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	1,100	UJ	L	1,000	UJ	L	2,300	UJ	L	1,000	UJ	L	2,200	U		20,000	U		1,100	UJ	L	24,000	UJ	L		R		1,000	UJ	L	2,600	UJ	L	1,200	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	UJ	L	4,100	UJ	L	220	UJ	L	4,700	U		2,100	U		200	U		510	UJ	L	240	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	210	UJ	L	460	UJ	L	210	U		440	U		4,100	UJ	L	220	UJ	L	4,700	U			R		200	U		510	UJ	L	240	UJ	L
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	220	U		210	U		460	U		210	U		98	J		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		280	J		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U			R		200	U		510	U		240	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	39	UJ		37	UJ		81	UJ		36	UJ		76	UJ		720	UJ		38	UJ	L	830	UJ		370	UJ		35	UJ		90	UJ		42	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		520	U		440	UJ	L	4,100	U		540	UJ	L	12,000	U		2,100	U		510	U		510	U		240	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		180	J	H	4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		460	U		210	U		440	U		4,100	U		220	UJ	L	4,700	U		2,100	U		200	U		510	U		240	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	290			263			970			310			3,858			6,600			-			10,700			960			565			4,710			412		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	11,609			6,655			45,040			439.9			255,858			257,620			195.9			274,900			130,510			565			5,959			754.1		

TABLE 11C
Summary of Upper Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels										SS-25 / 03-29-01 Industrial Area East of South St.			SS-26 / 03-30-01 Industrial Area East of South St.			SS-27 / 06-15-01 Peripheral On-Facility Area West of South St.			SS-28 / 07-23-01 Peripheral On-Facility Area West of South St.			SS-29 / 03-28-01 Peripheral On-Facility Area West of South St.			SS-30 / 03-28-01 Peripheral On-Facility Area West of South St.			SS-31 / 02-26-01 Peripheral On-Facility Area West of South St.			SS-32 / 02-22-01 Peripheral On-Facility Area West of South St.			SS-33 / 02-23-01 Peripheral On-Facility Area West of South St.			SS-34 / 05-02-01 Peripheral Off-Facility Area West of South St.			SS-35 / 05-02-01 Peripheral Off-Facility Area West of South St.			SS-36 / 02-21-01 Peripheral Off-Facility Area West of South St.		
	Concentrations in µg/kg																																																
	Human Health		Ecological																																														
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels																																												
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mamma l	Plant	Inverte-brate	Mamma l	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																																
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	140	J		5,300			5.1	U		90	J		65			750	J		11			15			7.4	U		6.0	U		6.3	U		6.2	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	370	J		2,100	U		5.1	U		220	U		160			2,100			64			180			7.6			15			7.4			6.3		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	540			15,000			5.1	U		140	J		200			2,200			52			91			7.4	U		13			6.3	U		7.1		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	1,800			20,000			9.3			380			380			6,400			310			560			29			58			33			33		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	**2,000**			**18,000**			9.8			330			400			**7,300**			270			540			27			64			38			29		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	2,300			18,000			13			380			360			6,700			390			960			36			88			52			33		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	690			5,300			6.6			180	J		98			3,200			120	J	L	330	J	L	17	J	L	44			29			18	J	L
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	1,700			15,000			5.2			220			210			3,900			240			500			27			64			42			24		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2,300			19,000			15			450			350			7,600			390	J	L	740	J	L	43	J	L	90			53			41	J	L
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	210	J		1,800	J		5.1	U		47	J		32			880			30			70			7.4	U		8.4			6.3			6.2	U	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	3,600			54,000			23			810			710			13,000			760			1,400			85			130			74			67		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	150	J		7,300			5.1	U		73	J		110			1,900			11	J	L	35	J	L	7.4	UJ	L	6.0	U		6.3	U		6.2	UJ	L
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	800			6,400			6.2			180	J		110			3,300			170			460			23			52			34			21		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	190	J		1,900	J		5.1	U		220	U		170			1,900			12	J	I	29			15			6.0	U		6.3	U		6.2	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	220	J		1,900	J		5.1	U		58	J		200			2,500			19	J	I	52	J	L	97	J	L	14			58			9.4	J	L
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,600			56,000			18			790			960			19,000			400	J	L	630	J	L	54	J	L	85			43			48	J	L
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	4,000			38,000			18			770			870			18,000			670			1,100			76			130			67			71		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	23,610			282,900			124.1			4,898			5,385			100,630			3,919			7,692			536.6			855.4			536.7			407.8		
Other SVOCs																																															
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	420	J		2,100	U			R		93	J	L	56	J	L	4,600			130	J	L	320	J	L	160	J	L	340	J	L	820	J	L	290	J	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	UJ	L	220	U		860	U			R			R			R		240	U		250	U			R	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	77	UJ		370	UJ		36	UJ		38	UJ		100	UJ		150	UJ		120	UJ	L	110	UJ	L	130	UJ	L	42	UJ		44	UJ		110	UJ	L
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	180	J		2,100	U		200	U		220	U		49	J		170	J		93	JEB	H	64	JEB	H	300	U		44	J		250	U		45	JEB	H
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		66	J		250	U		300	U		240	U		250	U		250	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	190	J		7,300			200	U		100	J		39	J		760	J		260	U		84	J		300	U		240	U		250	U		250	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	100	J		4,200			200	U		52	J		44	J		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	UJ	L	220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	77	UJ		370	UJ		36	UJ		38	UJ		66	UJ		150	UJ		76	UJ		74	UJ		87	UJ		42	UJ		44	UJ		73	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		5,300	U		510	U		220	UJ	L	560	U		2,100	U		650	UJ	L	630	UJ	L	740	UJ	L	600	U		630	U		620	UJ	L
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	2,200	U		11,000	U		1,000	UJ	L	540	UJ	L	560	UJ	L	4,300	U		650	UJ	L	630	UJ	L	740	UJ	L	1,200	U		1,300	U		620	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	UJ	L	220	U		860	U		650	UJ	L	630	UJ	L	740	UJ	L	600	U		630	U		620	UJ	L
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	77	UJ		370	UJ		36	UJ		38	UJ		84	UJ		150	UJ		98	UJ		95	UJ		110	UJ		42	UJ		44	UJ		94	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	440	U		2,100	U		510	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	U		250	U		300	U		240	U		250	U		250	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	440	U		2,100	U		200	U		220	U		220	U		860	U		260	UJ	L	250	UJ	L	300	UJ	L	240	U		250	U		250	UJ	L
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	890			11,500			-			245			188			5,530			289			468			160			384			820			335		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	24,500			294,400			124.1			5,143			5,573			106,160			4,208			8,160			696.6			1,239.4			1,356.7			742.8		

TABLE 11C
Summary of Upper Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels										SS-37 / 04-23-01			SS-38 / 04-23-01			SS-39 / 02-22-01			SS-40 / 2-26-01			SS-58 / 04-26-01			SS-59 / 04-26-01			SS-60 / 04-25-01			SS-61 / 04-25-01			SS-62 / 04-17-01			SS-63 / 04-02-01			SS-64 / 03-23-01			SS-65 / 03-26-01		
	Human Health		Ecological								Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian																																						
PAHs																																															
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	5.7	U		5.8	U		5.7	U		6.5	U		5.6	U		100	J		71	J		13			230	U		11			34			19		
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.7	U		6.5			5.7	U		6.5	U		5.6	U		590			93	J		32			46	J		46			53			100		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	5.7	U		5.8	U		5.7	U		6.5	U		5.6	U		500			200	J		40			58	J		64			190			86		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	7.3			18			5.7	U		6.5	U		15			1,200			600			160			260			260			320			270		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	7.5			18			5.7	U		6.5	U		16			1,400			640			160			370			240			260			290		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	11			22			5.7	U		6.5	U		16			1,700			870			170			560			250			310			370		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	7.2			14			5.7	UJ	L	6.5	UJ	L	12			350	J		230			94			230	J		130			61			86		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	9.3			18			5.7	U		6.5	U		13			940			400			140			300			200			170			260		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	13			28			5.7	UJ	L	6.5	UJ	L	21			1,400			740			200			420			330			290			360		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	5.7	U		5.8	U		5.7	U		6.5	U		5.6	U		120	J		75	J		17			55	J		27			21			27		
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	19			44			6.1			11			34			2,300			1,500			370			750			610			840			720		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	5.7	U		5.8	U		5.7	UJ	L	6.5	UJ	L	5.6	U		120	J		77	J		17			230	U		15			63			28		
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	8.1			14			5.7	U		6.5	U		10			410	J		290			100			260			140			78			100		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.7	U		5.8	U		5.7	U		6.5	U		5.6	U		420	U		220	U		9.4			230	U		14			9.0			19		
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	13			17			20	J	L	6.5	UJ	L	5.6	U		420	U		71	J		21			230	U		22			17			35		
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	12			30			5.7	UJ	L	7.5	J	L	31			1,300			1,000			250			350			440			680			470		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	16			41			6.6			11			40			2,600			1,300			330			590			570			630			620		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	123.4			270.5			32.7			29.5			208			15,030			8,157			2,123.4			4,249			3,369			4,026			3,860		
Other SVOCs																																															
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	270	J	L	270	J	L	140	J	L	200	J	L	150	J	L	420	UJ	L	250	J	L	290	J	L	560	J	L	130	J		770	J	L	300	J	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	230	UJ	L	230	UJ	L		R			R		220	UJ	L	420	UJ	L	220	UJ	L	240	UJ	L	230	U		240	U		260	U		240	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	40	UJ		41	UJ		100	UJ	L	120	UJ	L	39	UJ		73	UJ		39	UJ		42	UJ		41	UJ		42	UJ		120	UJ		110	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		460	EB		120	JEB		40	JEB		71	J		260	U		240	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		96	J		140	J		240	U		62	J		53	J		67	J		240	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	UJ	L	420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	UJ	L	420	U		220	U		240	U		230	UJ	L	240	U		260	U		240	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	40	UJ		41	UJ		67	UJ		77	UJ		39	UJ		73	UJ		39	UJ		42	UJ		41	UJ		42	UJ		76	UJ		71	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	570	U		580	U		570	UJ	L	660	UJ	L	560	UJ	L	1,000	U		550	U		590	U		580	U		600	U		650	U		600	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	1,100	U		1,200	U		570	UJ	L	660	UJ	L	1,100	UJ	L	2,100	U		1,100	U		1,200	U		1,200	UJ	L	1,200	U		650	UJ	L	600	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		570	UJ	L	660	UJ	L	220	UJ	L	420	U		220	U		240	U		230	UJ	L	240	U		260	U		240	U	
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	40	UJ		41	UJ		86	UJ		98	UJ		39	UJ		73	UJ		39	UJ		42	UJ		41	UJ		42	UJ		98	UJ		91	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	U		260	U		220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	230	U		230	U		230	UJ	L	260	UJ	L	220	U		420	U		220	U		240	U		230	U		240	U		260	U		240	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	270			270			140			200			150			96			850			410			662			254			837			300		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	393.4			540.5			172.7			229.5			358			15,126			9,007			2,533.4			4,911			3,623			4,863			4,160		

TABLE 11C
Summary of Upper Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels										SS-66 / 07-09-01			SS-67 / 07-11-01			SS-68 / 07-11-01			SS-69 / 07-10-01			SS-70 / 07-10-01			SS-71 / 07-10-01			SS-72 / 07-10-01			SS-73 / 07-10-01			EUA-1 / 08-08-03			EUA-2 / 08-08-03			EUA-3 / 08-08-03			FPW-1 / 08-08-03		
	Human Health		Ecological								Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Residential Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Concentrations in µg/kg																																				
PAHs																																														
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	5.9			6.3			18			6.4	U		5.9	U		6.4	U		6.1	U		5.8	U		110			42			29	U		32	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	45			33			28			6.4	U		5.9	U		7.4			6.1	U		7.0			1,200			150			120			100		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	20			28			20			6.4	U		5.9	U		6.5			6.1	U		5.8	U		1,200			210			120			110		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	93			150			52			26			24			34			9.9			31			1,200			690			520			520		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	95			110			45			24			21			31			9.1			31			1,200			770			610			560		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	97			140			59			34			25			41			14			39			1,200			860			680			720		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	64			47			29			13			10			19			6.1	U		16			1,200			400			360			310		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	55			63			31			24			18			23			7.8			27			1,200			670			570			590		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	100			130			44			41			30			42			14			42			1,200			960			760			740		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	19			17			19			6.4	U		5.9	U		6.4			6.1	U		5.8	U		1,200			110			88			85		
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	130			240			65			56			50			64			21			59			1,200			1,400			1,200			1,300		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	12			12			18			6.4	U		5.9	U		6.4	U		6.1	U		5.8	U		1,200			49			32			32	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	69			64			33			18			14			24			7.4			22			1,200			540			470			430		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	10			8.1			15			6.4			5.9	U		6.4	U		6.1	U		5.8	U		1,200			86			34			32	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	14			12			15			6.7			5.9	U		6.4	U		6.1	U		5.8	U		1,200			220			46			54		
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	89			140			34			34			24			38			11			28			1,200			910			730			650		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	160			230			60			45			43			56			16			51			1,200			1,200			1,100			1,100		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,077.9			1,430.4			585			328.1			259			392.3			110.2			353.0			19,310			9,267			7,440			7,269		
Other SVOCs																																														
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	96	J	I	140	J	I	160	J	I	140	J	I	51	J	I	75	J	I	56	J	I	100	J	I	390	UJ	I	1,300	JEB	I	570	UJ	I	3,300	JEB	I
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	230	UJ	L	250	UJ	L	270	UJ	L	260	UJ	L	240	UJ	L	250	UJ	L	240	UJ	L	230	UJ	L											
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	41	UJ		44	UJ		47	UJ		45	UJ		41	UJ		44	UJ		43	UJ		41	UJ													
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		91	J		240	U		230	U													
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U		120	U		79	J	I	150	U		84	J	I
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U		230			79	J	I	150	U		160	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	UJ	L	270	U		260	U		240	U		250	U		240	U		230	U													
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U		200			160	U		150	U		160	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U		120	U		160	U		150	U		160	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	230	U			R		270	U		260	U		240	U		250	U		240	U		230	U													
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	UJ	L	270	U		260	U		240	U		250	U		240	U		230	U													
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	41	UJ		44	UJ		47	UJ		45	UJ		41	UJ		44	UJ		43	UJ		41	UJ													
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	590	U		630	U		670	U		640	U		590	U		640	U		610	U		580	U													
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	590	UJ	I	630	UJ	I	670	UJ	I	640	UJ	I	590	UJ	I	640	UJ	I	610	UJ	I	580	UJ	I													
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	230	U		250	UJ	L	270	U		260	U		240	U		250	U		240	U		230	U													
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U		120	U		160	U		150	U		160	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	41	UJ		44	UJ		47	UJ		45	UJ		41	UJ		44	UJ		43	UJ		41	UJ													
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	590	U		630	U		670	U		640	U		590	U		640	U		610	U		580	U													
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	230	U		250	U		270	U		260	U		240	U		250	U		240	U		230	U													
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	96			140			160			140			51			166			56			100			430			1,458			-			3,384		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,173.9			1,570.4			745			468.1			310			558.3			166.2			453			19,740			10,725			7,440			10,653		

TABLE 11C
Summary of Upper Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels										Concentrations in µg/kg																									
	Human Health		Ecological								FPW-2 / 08-08-03 Residential Area West of South St.			FPW-3 / 08-08-03 Residential Area West of South St.			OP-1 / 08-08-03 Residential Area West of South St.			OP-2 / 08-08-03 Residential Area West of South St.			OP-3 / 08-08-03 Residential Area West of South St.			OSA-1 / 08-07-03 Peripheral On-Facility Area West of South St.			OSA-2 / 08-12-03 Peripheral On-Facility Area West of South St.			OSA-3 / 08-12-03 Peripheral On-Facility Area West of South St.			OSR-1-S / 11-21-03 Peripheral Off-Facility Area East of Soiuth St.			OSR-2-S / 11-04-03 Peripheral Off-Facility Area East of Soiuth St.			OSR-3-S / 10-31-03 Peripheral Off-Facility Area East of Soiuth St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
			Phyto-toxicity	Earth-worm	Avian	Mamma l	Plant	Inverte-brate	Mamma l	Avian																																		
PAHs																																												
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	58			35	U		28	U		24	U		1,800			320			26	U		27	U		5.6	U		6.4	U		6.0	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	100			72			28	U		24	U		270			2,400			37			97			5.6	UJ	I	120			81		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	170			71			34			24	U		3,300			2,300			26	U		80			5.6	UJ	I	140			84		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	490			300			120			24	U		5,000			6,100			81			340			75			570			380		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	520			280			110			29			**3,800**			**8,200**			120			350			87			680			480		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	500			380			120			29			3,500			5,400			130			300			100			670			480		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	260			170			70			26			1,300			3,100			74			180			71			440			310		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	460			300			100			26			3,100			5,200			95			270			83			500			380		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	630			450			160			32			4,600			7,800			140			400			130			820			560		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	71			52			28	U		24	U		610			850	J	L	26	U		45			5.6	UJ	I	150			110		
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100			700			250			38			8,300			10,000			190			580			210			1,100			700		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	63			35	U		28	U		24	U		1,800			900			26	U		27	U		5.6	U		6.4	U		6.0	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	340			240			82			27			2,100			4,200			84			200			62			400			300		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	35	U		80			28	U		24	U		780			1,000			26	U		27	U		5.6	U		150			110		
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	50			77			28	U		24	U		1,000			1,600			26	U		33			5.6	U		150			110		
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	860			400			150			24	U		9,200			11,000			130			390			130			550			340		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100			610			220			35			7,100			18,000			220			680			170			890			580		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	6,772			4,182			1,416			242			57,560			88,370			1,301			3,945			1,118			7,330			5,005		
Other SVOCs																																												
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	1,000	JEB	I	1,100	JEB	I	620	JEB	I	240	UJ	I	400	UJ	I	460	UJ	I	340	UJ	I	460	UJ	I	660	JEB	I	8,900	J	L	1,300	J	I
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																																		
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS																																		
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS																																		
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS																																		
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																																		
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	180	U		180	U		140	U		120	U		140	U		230	U		130	U		130	U		140	U		220			180		
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	180	U		180	U		140	U		120	U		1,200			360			130	U		130	U		140	U		130	J	I	79	J	I
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																																		
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS																																		
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																																		
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	180	U		180	U		140	U		120	U		880			210	J	I	130	U		130	U		140	U		100	J	I	79	J	I
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	180	U		180	U		140	U		120	U		140	U		230	U		130	U		130	U		140	U		160	U		150	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS																																		
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS																																		
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS																																		
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS																																		
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS																																		
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS																																		
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS																																		
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS																																		
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS																																		
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS																																		
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS																																		
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS																																		
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS																																		
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	180	U		180	U		140	U		120	U		56	J	I	230	U		130	U		130	U		140	U		160	U		150	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS																																		
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS																																		
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS																																		
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																																		
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS																																		
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS																																		
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS																																		
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS																																		
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS																																		
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS																																		
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS																																		
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS																																		
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,000			1,100			620			-			2,136			570			-			-			660			9,350			1,638		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	7,772			5,282			2,036			242			59,696			88,940			1,301			3,945			1,778			16,680			6,643		

TABLE 11C
Summary of Upper Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels).

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.
"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.
"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.
"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the American Robin.
"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian (birds) are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002], and Appendix B.7 of the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

"R" Indicates data rejected during validation.

"EB" The compound was detected in an associated equipment blank. The result is usable with possible uncertainty due to the potential for contamination.

"JEB" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The compound was detected in an associated equipment blank. The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision, and with possible uncertainty due to the potential for contamination.

Bias:

"L" Low

"I" Indeterminate

"H" High

7. Total concentrations listed (e.g. Total PAHs) are the sum of detected concentrations of the relevant suite of compounds. "PAHs" are polycyclic aromatic hydrocarbons. "Other SVOCs" are non-PAH semi-volatile organic compounds.

TABLE 11D
Summary of Upper Soil Data - Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Cocnentrations in µg/kg																														
	COPC Screening Levels										SS-04 / 03-21-01			SS-07 / 03-15-01			SS-09 / 04-23-01			SS-21 / 04-02-01			SS-25 / 03-29-01			SS-26 / 03-30-01			SS-28 / 07-23-01		
	Human Health		Ecological								Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Peripheral On-Facility Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian																					
AVOCs																															
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	3.0	J	L	1.9	U		4.2	J	I	1.7	J	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		1.6	J	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		1.6	J	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			3.2			-			-			-			-		
Total AVOCs	NS		NS	NS	NS	NS	NS	NS	NS	NS	3.0			-			7.4			1.7			-			-			-		
CVOCs																															
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		6.1	J	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	42	J	L	16	U		10	UJ	I	18	UJ	I	9.4	UJ	I	5.3	UJ	I	4.5	UJ	I
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Tetrachloroethene	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		170	J	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Total CVOCs	NS		NS	NS	NS	NS	NS	NS	NS	NS	42			-			176.1			-			-			-			-		
Other VOCs																															
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	97	J	L	7.9	U		8.3	UJ	I	7.7	JEB	L	7.3	UJ	I	5.3	UJ	I	6.1	U	
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	UJ	I
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	1.3	J	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		1.2	J	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	200	J	H
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	2.5	UJ	L	1.9	U		2.0	UJ	I	2.1	UJ	L	2.0	UJ	L	2.1	UJ	I	1.8	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	98.3			-			1.2			7.7			-			-			200		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	143.3			-			184.7			9.4			-			-			200		

TABLE 11D
Summary of Upper Soil Data - Volatile Organic Compounds
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Cocnentrations in µg/kg																	
	Human Health		Ecological								SS-31 / 02-26-01 Peripheral On-Facility Area West of South St.			SS-38 / 04-23-01 Peripheral On-Facility Area West of South St.			SS-59 / 04-26-01 Residential Area East of South St.			SS-62 / 04-17-01 Residential Area East of South St.			SS-67 / 07-11-01 Residential Area West of South St.			SS-70 / 07-10-01 Residential Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels																					
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																												
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	2.2	U		2.4	U		0.90	J		2.1	U		2.2	U		2.1	U	
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			-			-			-			-		
Total AVOCs	NS		NS	NS	NS	NS	NS	NS	NS	NS	-			-			0.90			-			-			-		
CVOCs																												
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	UJ	L	2.1	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	6.4	U	H	10	U		17	U		9.7	U		8.9	UJ	I	5.3	UJ	L
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Tetrachloroethene	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Total CVOCs	NS		NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-		
Other VOCs																												
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	25	U	H	68			4.4	U		7.3	U		5.6	UJ	I	13	UJ	I
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	UJ	L	5.2	UJ	I	2.2	UJ	I	2.1	UJ	I
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		4.2			1.1	J		2.1	U		2.2	U		2.1	U	
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	U		2.4	U		1.8	U		2.1	U		2.2	U		2.1	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			72.2			1.1			-			-			-		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			72.2			2.0			-			-			-		

TABLE 11D
Summary of Upper Soil Data - Volatile Organic Comounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories of Raynham, Massachusetts, performed analyses for volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8260B.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.

"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.

"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.

"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the American Robin.

"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. "†" indicates the MCP Method 2 S-1 standards and PRGs are for 1,3-dichloropropene (isomer unspecified).

7. Total concentrations listed (e.g. Total AVOCs, CVOCs) are the sum of detected concentrations of the relevant suite of compounds. "AVOCs" are non-chlorinated aromatic volatile organic compounds. "CVOCs" are chlorinated volatile organic compounds. "Other VOCs" are non-AVOC and non-CVOC volatile organic compounds.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

Bias:

- "L" Low
- "I" Indeterminate
- "H" High

TABLE 11E
Summary of Upper Soil Data - PCBs/Pesticides
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg											
	Human Health		Ecological								SS-09 / 04-23-01			SS-21 / 04-02-01			SS-25 / 03-29-01			SS-26 / 03-30-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PCB																						
Aroclor-1016	NS	390	NS	NS	NS	**6,520**	NS	NS	NS	NS	5.6	UJ	L	5.1	U		5.7	U		5.5	U	
Aroclor-1221	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	5.6	UJ	L	5.1	U		5.7	U		5.5	U	
Aroclor-1232	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	5.6	UJ	L	5.1	U		5.7	U		5.5	U	
Aroclor-1242	NS	110	NS	NS	339	**329**	NS	NS	NS	NS	5.6	UJ	L	5.1	U		5.7	U		5.5	U	
Aroclor-1248	NS	110	NS	NS	NS	**71**	NS	NS	NS	NS	5.6	UJ	L	5.1	U		5.7	U		5.5	U	
Aroclor-1254	NS	110	NS	NS	149	**111**	NS	NS	NS	NS	5.6	UJ	L	5.1	U		5.7	U		5.5	U	
Aroclor-1260	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	5.6	UJ	I	5.1	U		23			5.5	U	
Total PCBs	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	NS	-			-			23			-		
Pesticides																						
Aldrin	30	29	NS	NS	NS	**733**	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
BHC (alpha-)	NS	90	NS	NS	NS	NS	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
BHC (beta-)	NS	320	NS	NS	NS	**1,470**	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
BHC (delta-)	NS	320	NS	NS	NS	NS	NS	NS	NS	NS	2.6	J	H	0.51	U		0.57	U		1.1	J	H
BHC (gamma-)	400	440	NS	NS	**1,660**	29,300	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
Chlordane (alpha-) †	1,000	1,600	NS	NS	**1,800**	9,100	NS	NS	NS	NS	0.56	U		1.3	J	H	1.3	J	H	0.55	U	
Chlordane (gamma-) †	1,000	1,600	NS	NS	**1,800**	9,100	NS	NS	NS	NS	5.6	J	I	0.51	U		1.9	J	H	0.55	U	
DDD (4,4'-)	2,000	2,400	NS	NS	**2**	2,930	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
DDE (4,4'-)	2,000	1,700	NS	NS	**2**	2,930	NS	NS	NS	NS	**8.6**	J	I	0.51	U		0.57	U		0.55	U	
DDT (4,4'-)	2,000	1,700	NS	NS	**2**	2,930	NS	NS	NS	NS	**13**	J	I	1.2	J	I	0.57	UJ	L	0.55	UJ	L
Dieldrin	30	30	NS	NS	64	73	NS	NS	**0.28**	1.6	0.56	U		0.51	U		0.57	U		0.55	U	
Endosulfan I ‡	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
Endosulfan II ‡	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
Endosulfan sulfate ‡	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	0.56	U		0.51	U		1.1	J	I	0.55	U	
Endrin $	6,000	1,800	NS	NS	**8**	182	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
Endrin aldehyde $	6,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	0.56	U		0.51	U		0.57	U		0.55	U	
Endrin ketone $	6,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	8.9	J	I	0.51	UJ	L	0.57	UJ	L	0.55	UJ	L
Heptachlor	100	110	NS	NS	NS	**476**	NS	NS	NS	NS	0.56	U		0.91	J	I	0.57	U		0.55	U	
Heptachlor epoxide	60	53	NS	NS	NS	NS	NS	NS	NS	NS	4.8	J	I	0.51	U		0.57	U		0.55	U	
Methoxychlor	100,000	31,000	NS	NS	NS	**14,700**	NS	NS	NS	NS	0.56	UJ	L	0.51	UJ	L	0.57	UJ	L	0.55	UJ	L
Toxaphene	NS	440	NS	NS	NS	**29,300**	NS	NS	NS	NS	11	U		10	U		11	U		11	U	
Total Pesticides	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	43.5			3.4			4.3			1.1		

TABLE 11E
Summary of Upper Soil Data - PCBs/Pesticides
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories of Raynham, Massachusetts, performed analyses for pesticides by United States Environmental Protection Agency (USEPA) Method 8081A; and for polychlorinated biphenyls (PCBs) were performed using USEPA Method 8082.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1A RI Data Usability Report (SHA, 2002).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2002. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.
"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.
"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.
"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the American Robin.
"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian (birds) are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. "†" indicates the MCP Method 2 S-1 standards, PRGs, and ORNL benchmarks are for chlordane.
"‡" indicates the MCP Method 2 S-1 standards, PRGs, and ORNL benchmarks are for endosulfan.
"$" indicates the MCP Method 2 S-1 standards, PRGs, and ORNL benchmarks are for endrin.

7. Total concentrations listed (e.g., Total PCBs) are the sum of detected concentrations of the relevant suite of parameters.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA,2002]) for additional detail regarding qualifiers and bias.
Qualifiers:
"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
Bias:
"L" Low
"I" Indeterminate
"H" High

TABLE 12A
Summary of Lower Soil Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SB-31	Peripheral On-Facility Area West of South St.	S-1B	1 - 2	2/26/2001	6.5		
		S-2	2 - 4	2/26/2001	6.5		
		S-3	4 - 6	2/26/2001	6.4		
		S-4	6 - 8	2/26/2001	7.7		
		S-5	8 - 10	2/26/2001	7.7		
SB-32	Peripheral On-Facility Area West of South St.	S-1B	1 - 2	2/22/2001	6.0		
SB-32C	Peripheral On-Facility Area West of South St.	S-2	2 - 3.1	2/22/2001	5.6		
SB-33	Peripheral On-Facility Area West of South St.	S-1B	0.8 - 2	2/23/2001	7.9		
		S-2	2 - 4	2/23/2001	7.9		
SB-34	Peripheral Off-Facility Area West of South St.	S-1B	1 - 2	5/2/2001	5.8		
SB-35	Peripheral Off-Facility Area West of South St.	S-1B	0 - 2	5/2/2001	5.7		
SB-36	Peripheral Off-Facility Area West of South St.	S-1B	1 - 2	2/21/2001	6.1		
		S-2	2 - 4	2/21/2001	6.5		
		S-3	4 - 6	2/21/2001	7.3		
		S-4	6 - 8	2/21/2001	9.9		
SB-37	Peripheral On-Facility Area West of South St.	S-2A	1 - 3	4/23/2001	4.9		
		S-2B	3 - 5	4/23/2001	5.4		
		S-3	5 - 6.2	4/23/2001	5.9		
SB-38	Peripheral On-Facility Area West of South St.	S-1B	1 - 2	4/23/2001	4.9		
		S-2	2 - 4	4/23/2001	5.0		
SB-39	Peripheral On-Facility Area West of South St.	S-1B	1 - 2	2/22/2001	6.6		
		S-2	2 - 4	2/22/2001	7.0		
		S-3	4 - 6	2/22/2001	7.8		
		S-4A	6 - 7	2/22/2001	8.1		
		S-4B	7 - 8	2/22/2001	9.8		
		S-5	8 - 10	2/22/2001	11.2		
SB-40	Peripheral On-Facility Area West of South St.	S-1B	1 - 2	2/26/2001	8.1		
		S-2	2 - 4	2/26/2001	8.4		
		S-4	6 - 8	2/26/2001	7.7		
		S-5	8 - 10	2/26/2001	10.7		
		S-6	10 - 12	2/26/2001	11.1		
SB-41	Industrial Area West of South St.	S-1	3 - 4.8	3/20/2001	5.7		
SB-41A	Industrial Area West of South St.	S-1	3 - 5	3/20/2001	7.2		
		S-2	5 - 7	3/20/2001	6.6		
SB-48	Industrial Area West of South St.	S-1	0.5 - 2	12/14/2000	11.7		
		S-2	2 - 4	12/14/2000	9.5		
SB-49	Industrial Area West of South St.	S-1	0 - 2	4/24/2001	6.3		
		S-2	2 - 4	4/24/2001	5.6		
		S-3	4 - 6	4/24/2001	5.6		
		S-4	6 - 8	4/24/2001	6.0		
		S-5	8 - 10	4/24/2001	7.8		
SB-50	Industrial Area West of South St.	S-1	0 - 2	4/24/2001	6.9		
		S-2	2 - 4	4/24/2001	6.0		
		S-3	4 - 6	4/24/2001	6.3		
		S-4	6 - 8	4/24/2001	6.3		
		S-5	8 - 10	4/24/2001	7.8		
SB-54	Industrial Area West of South St.	S-1	0.4 - 1.4	5/3/2001	9.9		
SB-55	Industrial Area West of South St.	S-1	0.3 - 1.3	5/3/2001	10.6		
SB-56	Industrial Area West of South St.	S-1	0.8 - 1.8	5/3/2001	9.5		
SB-57	Industrial Area West of South St.	S-1	0.5 - 1.5	5/3/2001	8.0		

TABLE 12A
Summary of Lower Soil Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-01D / SB-53	Industrial Area West of South St.	S-1	2.3 - 3	7/13/2001	9.2		
		S-2	5 - 7	7/13/2001	9.9		
		S-3	19 - 21	7/13/2001	11.8		
		S-4	21 - 23	7/13/2001	12.3		
SH-01R	Industrial Area West of South St.	S-01	0 - 2	6/25/2001	7.7		
		S-02	2 - 4	6/25/2001	7.2		
		S-03	5 - 6	6/25/2001	7.4		
		S-04	6 - 8	6/25/2001	7.5		
		S-05	8 - 10	6/25/2001	11.1		
		S-06	10 - 12	6/25/2001	11.8		
		S-07	15 - 17	6/25/2001	11.4		
		S-09	20 - 21	6/25/2001	12.1		
		S-10	25 - 27	6/26/2001	13.1		
		S-11	30 - 32	6/26/2001	13.2		
		S-12	36 - 38	6/26/2001	12.8		
		S-13	40 - 42	6/26/2001	8.3		
SH-02S / SB-46B	Industrial Area West of South St.	S-1	8 - 10	7/18/2001	12.0		
		S-2	10 - 12	7/18/2001	8.1		
SH-02D / SB-46	Industrial Area West of South St.	S-1	3 - 3.5	7/18/2001	10.5		
		S-2	5 - 5.5	7/18/2001	10.1		
		S-3	17 - 19	7/18/2001	10.1		
		S-4	19 - 21	7/18/2001	10.5		
SH-02R	Industrial Area West of South St.	S-01	0 - 2	6/26/2001	11.1		
		S-02	2 - 4	6/26/2001	8.0		
		S-03A	4 - 5	6/26/2001	6.4		
		S-03B	5 - 6	6/26/2001	10.0		
		S-04	6 - 8	6/26/2001	8.2		
		S-05	8 - 10	6/26/2001	9.7		
		S-06	10 - 12	6/26/2001	10.7		
		S-07	15 - 17	6/26/2001	11.2		
		S-08	17 - 19	6/26/2001	11.0		
		S-09	19 - 21	6/26/2001	10.6		
		S-10	25 - 27	6/26/2001	12.1		
		S-11	30 - 32	6/26/2001	7.3		
		S-12	35 - 37	6/26/2001	7.2		
		S-13	40 - 42	6/26/2001	8.1		
SH-03D / SB-45	Industrial Area West of South St.	S-00	0 - 3	7/19/2001	8.5		
		S-01	3 - 5	7/19/2001	9.0		
		S-02	5 - 7	7/19/2001	8.3		
		S-03	7 - 9	7/19/2001	8.0		
		S-04	10 - 12	7/19/2001	6.4		
		S-05	12 - 14	7/19/2001	6.6		
		S-06	15 - 17	7/19/2001	7.3		
		S-07	17 - 18	7/19/2001	7.7		
		S-08	25 - 27	7/19/2001	7.5		
		S-09	27 - 29	7/19/2001	11.1		
		S-10	29 - 31	7/19/2001	11.5		
		S-11	31 - 33	7/19/2001	9.8		
		S-12	35 - 37	7/19/2001	10.2		
		S-13	40 - 41	7/19/2001	8.6		
		S-14	50 - 51	7/20/2001	9.1		
		S-15	51 - 53	7/20/2001	8.2		
		S-16	55 - 57	7/20/2001	8.0		
		S-17	60 - 60.5	7/20/2001	8.3		
		S-18	60.5 - 62	7/20/2001	8.0		
		S-19	63 - 65	7/20/2001	7.9		
		S-20A	65 - 66.5	7/30/2001	8.3		
		S-20B	66.5 - 67.5	7/30/2001	8.2		
		S-23	80 - 81.5	7/30/2001	7.9		
		S-24	85 - 85.5	7/30/2001	8.1		

TABLE 12A
Summary of Lower Soil Data - pH
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-04D	Peripheral On-Facility Area West of South St.	S-01	0 - 2	2/7/2001	5.6		
		S-02	2 - 4	2/7/2001	5.9		
		S-03	4 - 6	2/7/2001	6.4		
		S-04	6 - 8	2/7/2001	8.3		
		S-05	8 - 10	2/7/2001	9.9	J	I
		S-06	13 - 15	2/7/2001	11.0		
		S-07	18 - 20	2/7/2001	11.5		
		S-08	23 - 25	2/8/2001	11.1		
		S-09	28 - 30	2/8/2001	9.5		
		S-10	33 - 35	2/8/2001	9.8	J	I
		S-11	38 - 39.3	2/8/2001	8.5	J	I
		S-12	43 - 43.7	2/8/2001	9.4	J	I
		S-13	48 - 48.2	2/9/2001	8.4	J	I
		S-15	58 - 58.5	2/9/2001	8.6	J	I
		S-16	63 - 63.2	2/12/2001	8.5		
SH-05S	Peripheral On-Facility Area West of South St.	S-01	6.5 - 8.5	2/5/2001	8.8	J	I
SH-05D	Peripheral On-Facility Area West of South St.	S-01	0 - 2	1/29/2001	7.8		
		S-02	2 - 4	1/29/2001	7.9		
		S-03	4 - 6	1/30/2001	7.9		
		S-04	6 - 8	1/30/2001	10.1		
		S-05A	8 - 8.5	1/30/2001	10.1		
		S-05B	8.5 - 10	1/30/2001	10.1		
		S-06	13 - 15	1/30/2001	10.1		
		S-07	18.5 - 20.5	1/30/2001	10.4		
		S-08	23 - 24.4	1/30/2001	9.7		
		S-09	28 - 28.5	1/30/2001	9.6		
		S-10A	33 - 33.7	1/31/2001	8.8		
		S-10B	33.7 - 34.3	1/31/2001	8.0		
		S-11	38 - 38.3	1/31/2001	8.1		
		S-12	43 - 43.2	1/31/2001	8.2		
		S-13	48 - 48.2	1/31/2001	10.1		
SH-06D / SB-47	Industrial Area West of South St.	S-01	1 - 3	7/25/2001	10.4		
		S-02	3 - 5	7/25/2001	7.9		
		S-03	5 - 7	7/25/2001	8.1		
		S-04	7 - 9	7/25/2001	9.6		
		S-05A	9 - 10	7/25/2001	10.1		
		S-05B	10 - 11	7/25/2001	10.8		
		S-06	15 - 17	7/25/2001	11.4		
		S-07	20 - 22	7/25/2001	9.7		
		S-09	30 - 32	7/25/2001	8.6		
		S-10	35 - 37	7/25/2001	8.4		
		S-11	40 - 42	7/25/2001	9.2		
		S-12	43 - 45	7/26/2001	8.1		
SH-07S / SB-48A	Industrial Area West of South St.	S-3	4 - 6	12/14/2000	11.1		
		S-4	6 - 7.3	12/14/2000	8.6		
SH-07D	Industrial Area West of South St.	S-04	15 - 17	6/22/2001	11.7		
		S-05	25 - 27	6/22/2001	12.4		
		S-06	30 - 32	6/22/2001	12.7		
		S-07	35 - 37	6/22/2001	12.4		
		S-08	40 - 42	6/22/2001	10.8		
		S-09	45 - 47	6/25/2001	7.1		
		S-10	50 - 51.5	6/25/2001	7.4		
SH-08S / SB-51	Industrial Area West of South St.	S-1	0.8 - 2	12/7/2000	10.5		
		S-2	2 - 4	12/7/2000	8.8		
		S-3	4 - 6	12/7/2000	8.7		
		S-5	8 - 10	12/7/2000	8.8		
		S-6	10 - 12	12/7/2000	8.6		
		S-8	17 - 18.2	12/8/2000	9.9		

TABLE 12A
Summary of Lower Soil Data - pH
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-08D	Industrial Area West of South St.	S-1	20 - 22	6/20/2001	9.9		
		S-2	25 - 27	6/21/2001	10.4		
		S-3	30 - 32	6/21/2001	11.4		
		S-4	35 - 37	6/21/2001	11.7		
		S-5	40 - 41.5	6/21/2001	11.8		
		S-6	45 - 47	6/21/2001	10.6		
		S-7	49.7 - 50.7	6/21/2001	8.4		
SH-09D / SB-52	Industrial Area West of South St.	S-00B	1 - 2	4/18/2001	7.3		
		S-00C	2 - 3.5	4/18/2001	7.5		
		S-00D	3.5 - 4	4/18/2001	6.7		
		S-01	4 - 6	4/18/2001	7.0		
		S-02	6 - 8	4/18/2001	7.1		
		S-03	8 - 10	4/18/2001	7.2		
		S-04	10 - 12	4/18/2001	8.7		
		S-05	12 - 14	4/18/2001	8.3		
		S-06	14 - 16	4/18/2001	8.1		
		S-07	16 - 18	4/18/2001	9.3		
		S-08	18 - 20	4/18/2001	9.3		
		S-09	23 - 25	4/18/2001	9.2		
		S-10	28 - 28.9	4/19/2001	10.0		
		S-11	33 - 33.1	4/19/2001	9.4		
SH-10S / SB-43	Industrial Area West of South St.	S-1	3 - 4	8/1/2001	7.7		
		S-2	4 - 6	8/1/2001	6.0		
		S-3	6 - 7.8	8/1/2001	6.5		
		S-4	8 - 9	8/1/2001	6.4		
		S-5	15 - 17	8/1/2001	6.7		
		S-6	17 - 17.7	8/1/2001	6.4		
		S-7	17.7 - 18.5	8/1/2001	7.8		
		S-8	26.5 - 29	8/1/2001	7.2		
SH-11S / SB-42	Industrial Area West of South St.	S-01	2.7 - 3.7	7/27/2001	6.9		
		S-02	5 - 7	7/27/2001	7.1		
		S-03	10 - 11.8	7/27/2001	7.0		
		S-04	15 - 15.9	7/27/2001	6.8		
		S-05	20 - 22	7/27/2001	7.0		
		S-06	25 - 27	7/27/2001	8.1		
SH-12D / SB-44	Industrial Area West of South St.	S-01	4 - 6	7/31/2001	6.6		
		S-02	6 - 8	7/31/2001	6.4		
		S-03	8 - 10	7/31/2001	6.4		
		S-04	10 - 12	7/31/2001	6.3		
		S-05	15 - 16	7/31/2001	6.5		
		S-06	16 - 17.5	7/31/2001	7.7		
		S-07	17.5 - 18	7/31/2001	7.6		
		S-08	20 - 22	7/31/2001	7.3		
		S-09	25 - 27	7/31/2001	10.4		
		S-10	30 - 32	7/31/2001	7.4		
		S-11	35 - 37	7/31/2001	11.2		
		S-12	40 - 42	7/31/2001	7.7		
		S-13	45 - 46.5	7/31/2001	7.7		
		S-14	55 - 56.5	7/31/2001	8.3		
		S-15	64 - 65	7/31/2001	8.3		
		S-17	72 - 73	7/31/2001	8.9		
SH-13S / SB-41D	Industrial Area West of South St.	S-1	0 - 2	7/27/2001	6.9		
		S-2	2 - 3.5	7/27/2001	6.5		
		S-3	5.5 - 8.2	7/27/2001	7.1		
		S-4	10 - 12	7/27/2001	7.1		
		S-5	15 - 17	7/27/2001	6.6		
		S-6	20 - 22	7/27/2001	7.0		
		S-7	22 - 23	7/27/2001	6.9		
		S-8	25 - 27	7/27/2001	7.5		
		S-9	27 - 28	7/27/2001	7.5		

TABLE 12A
Summary of Lower Soil Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-14D	Peripheral On-Facility Area West of South St.	S-01	0 - 2	3/2/2001	5.6		
		S-02A	2 - 3	3/2/2001	6.3		
		S-02B	3 - 4	3/2/2001	6.4		
		S-04	6 - 8	3/2/2001	7.0		
		S-05A	11 - 11.8	3/2/2001	7.0		
		S-05B	11.8 - 13	3/2/2001	7.4		
		S-06	16 - 18	3/8/2001	10.1		
		S-07	21 - 23	3/8/2001	8.2		
		S-08A	26 - 26.6	3/8/2001	8.1		
		S-08B	26.6 - 26.8	3/8/2001	7.8		
		S-09	31 - 31.9	3/8/2001	7.8		
		S-10	36 - 37	3/8/2001	7.9		
		S-11	41 - 41.1	3/8/2001	8.7		
SH-15D	Peripheral Off-Facility Area West of South St.	S-01	0 - 2	2/15/2001	11.1		
		S-02	2 - 4	2/15/2001	7.0		
		S-03	4 - 6	2/15/2001	9.7		
		S-04	6 - 8	2/15/2001	10.3		
		S-05	8 - 10	2/15/2001	11.7		
		S-06	13 - 15	2/15/2001	11.0		
		S-07	18 - 20	2/15/2001	9.6		
		S-08	23 - 25	2/15/2001	8.3		
		S-09	28 - 30	2/15/2001	8.0		
		S-10	33 - 35	2/15/2001	7.9		
		S-11	38 - 40	2/16/2001	7.4		
		S-12	43 - 45	2/16/2001	7.5		
		S-13	48 - 48.5	2/16/2001	7.7		
		S-14	53 - 53.6	2/19/2001	11.4		
		S-15	58 - 58.2	2/19/2001	8.3		
SH-16S	Peripheral On-Facility Area West of South St.	S-1	0 - 2	1/26/2001	7.4		
		S-2	2 - 4	1/26/2001	8.3		
		S-4	6 - 8	1/26/2001	8.1		
		S-5	11 - 11.7	1/26/2001	8.1		
SH-16D	Peripheral On-Facility Area West of South St.	S-1	5 - 7	2/27/2001	10.0		
SH-17S	Peripheral On-Facility Area West of South St.	S-1B	1 - 2	2/27/2001	6.1		
		S-2	5 - 7	2/27/2001	6.2		
		S-3	11 - 13	2/27/2001	6.1		
SH-17D	Peripheral On-Facility Area West of South St.	S-2A	2 - 2.8	8/18/2003	6.8		
		S-2B	2.8 - 4	8/18/2003	6.5		
		S-3A	5 - 5.8	8/18/2003	6.3		
		S-3B	5.8 - 7	8/18/2003	6.6		
		S-4	10 - 12	8/18/2003	6.3		
		S-5	15 - 17	8/18/2003	9.2		
		S-6	25.7 - 27.3	8/19/2003	10.8		
		S-7	29 - 29.2	8/19/2003	8.2		
SH-17R	Peripheral On-Facility Area West of South St.	S-1	26 - 26.3	8/20/2003	8.3		
SH-22S	Industrial Area East of South St.	S-1	0.3 - 2	6/28/2001	8.5		
		S-2	2 - 3.8	6/28/2001	8.4		
		S-3	5 - 7	6/28/2001	6.0		
		S-4	7 - 9	6/28/2001	7.5		
		S-5	9 - 11	6/28/2001	7.1		
		S-6	15 - 17	6/28/2001	7.6		
		S-7	20 - 22	6/28/2001	7.7		
SH-24S	Off-Site Area West of South St.	S-1B	1 - 2	8/26/2003	5.5		
		S-2A	2 - 2.6	8/26/2003	5.3		
		S-2B	2.6 - 3	8/26/2003	6.0		
		S-2C	3 - 4	8/26/2003	6.2		
		S-3	9 - 11	8/26/2003	6.9		
		S-4	14 - 14.3	8/26/2003	6.4		

TABLE 12A
Summary of Lower Soil Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Sample Location	Sample Number	Depth of Soil Sample (ft)	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-25D	Peripheral On-Facility Area West of South St.	S-1C	0.6 - 2	8/29/2003	6.2		
		S-2	2 - 4	8/29/2003	7.4		
		S-3	4 - 6	8/29/2003	7.2		
		S-4	9 - 11	8/29/2003	7.3		
		S-5	14 - 16	8/29/2003	7.2		
		S-6	19 - 19.4	8/29/2003	7.2		
		S-7	24 - 24.2	9/2/2003	8.0		
		S-8	29 - 29.4	9/2/2003	7.3		
		S-9	34 - 35.5	9/2/2003	7.4		
		S-10	39 - 39.3	9/2/2003	8.2		
		S-11	44 - 44.2	9/2/2003	7.4		
		S-12	54 - 54.2	9/2/2003	7.9		
SH-26S	Off-Site Area West of South St.	S-1	0 - 2	9/4/2003	5.8		
		S-2	2 - 4	9/4/2003	8.2		
		S-3	4 - 6	9/4/2003	8.0		
		S-4	6 - 8	9/4/2003	7.9		
		S-5	8 - 10	9/4/2003	10.5		
		S-7	14 - 16	9/4/2003	10.5		
SH-27S	Off-Site Area West of South St.	S-1C	1 - 2	10/24/2003	7.2		
		S-2	2 - 4	10/24/2003	6.3		
		S-3	4 - 6	10/24/2003	6.2		
		S-4	6 - 8	10/24/2003	5.9		
		S-5	10 - 12	10/24/2003	7.1		
		S-6	15 - 17	10/24/2003	7.1		
SH-27D	Off-Site Area West of South St.	S-1	15 - 17	10/27/2003	7.3		
		S-2	19 - 21	10/27/2003	7.5		
		S-3	24 - 24.8	10/27/2003	7.5		
		S-5	35 - 35.3	10/27/2003	7.4		
		S-6	37 - 40	10/27/2003	7.3		
SH-28R	Off-Site Area West of South St.	S-1	0 - 2	10/13/2003	5.5		
		S-2A	2 - 2.3	10/13/2003	6.2		
		S-2B	2.3 - 4	10/13/2003	5.7		
		S-3	4 - 6	10/13/2003	6.0		
		S-4	6 - 8	10/13/2003	5.7		
		S-5A	8 - 8.3	10/13/2003	6.0		
		S-5B	8.3 - 8.9	10/13/2003	6.2		
		S-6A	14 - 14.5	10/13/2003	6.4		
		S-6B	14.5 - 16	10/13/2003	6.4		
		S-7	19 - 21	10/13/2003	6.8		
		S-8	24 - 26	10/13/2003	6.9		
		S-9	29 - 31	10/13/2003	6.7		
		S-10	34 - 35.4	10/14/2003	7.7		
		S-11	39 - 39.8	10/14/2003	6.1		
		S-12	44 - 44.5	10/14/2003	7.4		
		S-13	49 - 49.3	10/14/2003	7.7		
		S-14	54 - 54.3	10/14/2003	8.0		

Notes:

1. Soil samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated.
2. Values reported above have been rounded from values measured in the field.
3. Refer to Appendix B for field forms/logs for further information.
4. pH measurements were made using a Beckman 240 pH meter. pH is reported in standard units (s.u.).
5. In general, field measurements of pH were made in accordance with Standard Operating Procedure (SOP) F-1669B (B.7.3), using USEPA "Method 9045C Soil and Waste pH," in Test Methods for Evaluating Soil and Waste and, SW846, Third Edition, January 1995 (Revision 3) method as promulgated in the final update, December 1996. Data verification procedures included in United States Environmental Protection Agency (USEPA)- New England (NE) Quality Assurance Project Plan (QAPP) Worksheet #9c and #23a were also followed.
6. Data validation and data usability assessment performed by SHA. Results are presented in the Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).
7. The following qualifiers and biases were assigned during data validation by SHA. Refer to the Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002], and Appendix B.7 of the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

Bias:

"I" Indeterminate

TABLE 12B
Summary of Deep Soil Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg																				
	Human Health		Ecological								SB-01 / S-1-2 / 05-09-01			SB-04 / S-4-5 / 03-21-01			SB-05 / S-2-3 / 03-19-01			SB-06 / S-4-5 / 03-16-01			SB-07 / S-3 / 03-15-01			SB-08A / S-4-5 / 03-15-01			SB-09 / S-2-3 / 04-23-01			SB-10 / S-3 / 06-07-01			SB-11 / S-2-3 / 06-07-01		
			ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Former Lower Mill Pond			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																					
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**6,410**	J	H	**6,490**			**6,340**			**5,710**			**4,600**			**5,610**			**5,590**	J	H	**5,340**			**4,090**		
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.91	UJ	L	0.28	U		0.29	U		0.28	U		0.27	U		0.29	U		0.80	UJ	L	0.82	UJ	L	0.83	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**1.3**			**1.9**			**2.1**			**1.3**			**1.0**			**1.3**			**3.0**			**1.1**			**1.4**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**33.3**			**18.5**			16.7			15.3			14.6			**18.5**			**64.3**			**24.8**			**56.2**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.36	U		0.52			0.25	U		0.29			0.23	U		0.24	U		0.32			0.33	U		0.34	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.091	U		0.062	J	H	0.079	J	H	0.071	U		0.057	U		0.060	U		**0.78**			0.082	U		0.084	U	
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	614	B		1,760			2,300			1,010			3,560			2,250			3,090			3,540			3,100		
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**8.6**			**11.2**			**10.0**			**8.2**			**6.1**			**9.0**			**20.7**			**10.1**	J	H	**7.7**	J	H
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	2.9			5.5	J	H	5.3	J	H	4.0	J	H	3.2	J	H	4.4	J	H	7.4	J	L	4.8			4.5		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	8.0			11.4			17.3			8.4			9.1			16.3			**110**	J	I	18.1			9.7		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				7,160	J	L	12,100	J	I	11,500	J	I	8,180	J	I	8,900	J	I	12,700	J	I	15,000			11,300			6,720		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**11.9**			**6.6**			**8.4**			**5.5**			**5.0**			**5.0**			**190**			**13.5**	J	H	**30.7**	J	H
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,480			2,900			3,920			1,950			2,000			3,240			4,670	J	H	4,070	J	L	2,300	J	L
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	82.0			191	J	L	241	J	L	116	J	L	163	J	L	262	J	L	168			257			141		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.027	UJ	I	0.028	U		0.029	U		0.031	U		0.032	U		0.033	U		**1.3**			0.026	U		0.027	U	
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	5.9			9.4			8.8			6.6			5.5			8.4			28.2			8.8			6.6		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	137			379			269			231			332			367			349			414			287		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.15	J	I	0.12	J	L	0.11	J	L	0.15	J	L	0.089	J	L	0.078	UJ	L	0.20			0.11	UJ	I	0.11	UJ	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.55	U		0.33	U		0.34	U		0.34	U		0.33	U		0.35	U		0.43	UJ	L	0.49	U		0.50	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	45.6	U		62.4	JB	I	53.9	JB	I	40.7	JB	I	50.5	JB	I	71.8	JB	I	94.1			129			164		
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.054	UJ	I	0.033	UJ	I	0.038	UJ	I	0.042	UJ	I	0.034	UJ	I	0.036	UJ	I	**0.055**	J	I	0.049	UJ	I	0.051	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**18.5**			**22.0**			**18.4**			**15.7**			**16.5**			**22.8**			**44.9**			**22.6**			**14.9**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**22.0**			**26.5**	J	I	**33.4**	J	I	**21.2**	J	I	**24.6**	J	I	**32.6**	J	I	**316**			**47.5**			**47.6**		
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.14	U		0.52			0.41	U		0.46	U		0.50	U		0.35	U		0.51	UJ	L	0.47	U		0.52	U	

Analytes	COPC Screening Levels										Concentrations in mg/kg																				
	Human Health		Ecological								SB-12 / S-1-2 / 04-17-01			SB-13A / S-3-4 / 04-13-01			SB-14 / S-3-4 / 04-13-01			SB-15 / S-2-3 / 04-16-01			SB-16 / S-3-4 / 06-06-01			SB-17 / S-4-5 / 04-05-01			SB-18 / S-2-3 / 04-11-01			SB-19 / S-1-2 / 06-08-01			SB-20 / S-2-3 / 06-12-01		
			ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																					
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**5,800**	J	H	**5,800**	J	L	**6,620**	J	H	**5,410**	J	H	**4,680**			**5,680**	J	L	**5,830**	J	H	**5,850**			**4,740**		
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.63	UJ	L	0.72	UJ	L	0.63	UJ	L	0.61	UJ	L	0.80	UJ	L	0.76	UJ	L	0.54	UJ	L	0.84	UJ	L	0.84	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**1.1**	J	H	**0.93**			**2.3**	J	H	**6.6**	J	H	**1.5**			**0.82**			**1.8**	J	H	**1.6**			**0.72**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	15.3			16.1			**25.7**			**60.8**			14.2			**21.6**			**101**			**18.1**			12.8		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.25	U		0.37	U		0.28	U		0.35			0.34	U		0.30	U		0.26	U		0.36	U		0.36	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.062	U		0.092	U		0.26			**0.68**			0.084	U		0.076	U		**0.62**			0.13			0.090	U	
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,440			1,430	J	L	2,220			3,420			968			2,360	J	L	2,360			1,320			1,330		
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**8.4**			**8.4**	J	L	**11.0**			**58.0**			**9.5**	J	H	**31.6**	J	L	**9.5**			**8.9**	J	H	**7.5**	J	H
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	4.4			3.9	J	L	3.8			5.8			3.0			6.4	J	L	4.3			7.0			4.5		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	14.8			11.1			**273**			**268**			31.3			11.3			21.6			9.8			12.0		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				9,510			9,270			8,620			16,300			8,360			10,700			11,000			7,960			8,510		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**10.2**			**8.7**	J	I	**44.5**			**253**			**6.6**	J	H	**5.0**	J	I	**574**			**23.4**	J	H	**6.2**	J	H
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,660	J	I	2,350	J	L	2,860	J	I	2,600	J	I	1,890	J	L	4,070	J	L	2,990	J	I	1,950	J	L	2,730	J	L
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	163	J	L	180			120	J	L	190	J	L	95.5			151			175	J	L	151			170		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.026	U		0.027	U		**2.4**			**14.0**			0.026	U		0.031	U		**0.11**			0.030	U		0.027	U	
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	6.5			5.1			9.5			**95.0**			7.0			9.7			9.1			7.8			11.3		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	251			244			210			327			241			321			363			350			343		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.11	J	I	0.12	UJ	I	0.30			**0.85**			0.12	J	I	0.099	UJ	I	0.14	J	I	0.12	UJ	I	0.12	J	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.41	U		0.43	U		0.45	U		0.43	U		0.48	U		0.46	U		0.37	U		0.50	U		0.50	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	57.0			85.9			99.0			86.9			67.9			91.9			116			101			103		
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.037	UJ	I	0.055	UJ	I	**0.18**			**0.12**			0.051	UJ	I	0.046	UJ	I	0.040	UJ	I	0.054	UJ	I	0.054	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**18.6**			**18.5**			**21.9**			**199**			**15.1**			**21.7**			**19.7**			**18.4**			**15.6**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**33.9**			**26.0**			**116**			**292**			**28.0**			**28.1**			**982**			**32.5**			**39.3**		
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS		R		0.30	U		0.38	U			R		0.48	U		0.38	U		0.29	U		0.47	U		0.46	UJ	L

TABLE 12B
Summary of Deep Soil Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg																										
	Human Health		Ecological								SB-21 / S-3-4 / 04-02-01			SB-22 / S-3 / 06-13-01			SB-23 / S-2-3 / 04-11-01			SB-24 / S-3-4 / 04-12-01			SB-25 / S-4-5 / 03-29-01			SB-26 / S-2-3 / 03-30-01			SB-27 / S-2-3 / 06-15-01			SB-28 / S-3-4 / 07-23-01			SB-30 / S-4-5 / 03-28-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																					
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**5,710**	J	L	**5,920**	J	L	**4,940**	J	H	**9,780**	J	L	**4,030**			**12,200**			**4,730**			**4,930**	J	H	**5,590**		
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.75	UJ	L	0.80	UJ	L	**0.79**	J	L	0.78	UJ	L	0.28	UJ	L	0.30	UJ	L	0.74	UJ	L	0.74	UJ	L	0.34	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**0.73**			**0.69**			**1.1**	J	H	**1.3**			**4.9**			**2.6**			**1.2**			**0.65**			**0.76**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	13.0			12.9			**33.0**			**36.4**			**20.3**			**143**			**20.0**			12.9			16.3		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.34	U		0.33	U		0.25			0.32	U		0.22	U		0.40			0.33	U		0.25	U		0.27	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.085	U		0.24			0.063			0.11			0.054	U		0.095			0.083	U		0.076			0.19		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,830	J	L	1,570	J	L	1,640			6,250	J	L	1,320	J	L	2,720	J	L	1,580			1,170	J	I	1,700	J	L
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**5.7**	J	L	**12.1**	J	L	**8.8**			**12.4**	J	L	**9.9**			**12.2**			**8.2**	J	H	**4.7**			**8.6**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	3.5	J	L	5.8	J	L	5.0			6.4	J	L	4.2			7.6			**16.1**			2.9	J	I	2.6		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	10.7			13.2			11.0			**99.7**			16.7			11.7			9.9			10.2	J	I	15.3		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				12,500			11,300			9,500			19,200			10,200			11,600			7,790			8,100			9,900		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**4.4**	J	I	**6.2**	J	I	**52.2**			**50.1**	J	I	**5.7**			**43.0**			**7.7**	J	H	**4.7**	J	I	**13.0**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,950	J	L	3,460	J	L	1,920	J	I	4,980	J	L	2,090			2,150			2,080	J	L	1,820	J	I	1,990		
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	222			200			103	J	L	267			96.9			107			169			197			106		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.027	U			R		**0.15**			0.092			0.035	U		0.070			0.025	U		0.029	U		0.066		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	5.4			6.6			5.5			12.6			10.9			11.6			7.1			5.7			5.5		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	245			345			298			487			290			328			292			243			291		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.11	UJ	I	0.11	UJ	I	0.10	J	I	0.12	J	I	**0.50**	J	H	**0.72**	J	H	0.12	J	I	0.082	UJ	I	0.11	J	H
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.45	U		0.48	U		0.38	U		0.47	U		0.34	U		0.36	U		0.45	U		0.44	U		0.41	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	72.9			102			69.1			121			67.6			151			60.2			47.0			55.9		
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.051	UJ	I	0.049	UJ	I	0.037	UJ	I	0.048	UJ	I	0.032	UJ	I	**0.085**			0.050	UJ	I	0.038	UJ	I	0.041	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**18.5**			**19.2**			**19.1**			**30.4**			**18.1**			**26.9**			**16.7**			**16.8**			**23.7**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**30.7**			**39.7**			**139**			**209**			**51.5**			**238**			**25.9**			**18.3**	J	H	**27.6**		
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.30	U		0.45	UJ	L	0.49	U		0.45	U		0.36	U		0.48	U		0.56	UJ	L	0.58	U		0.33	U	

Analytes	COPC Screening Levels										Concentrations in mg/kg																										
	Human Health		Ecological								SB-31 / S-3-4 / 02-26-01			SB-35 / S-1-2 / 05-02-01			SB-38 / S-2-3 / 04-23-01			SB-40 / S-2-3 / 02-26-01			SB-41 / S-1-2 / 03-20-01			SB-41D / S-5-6 / 07-27-01			SB-42 / S-1-2 / 07-27-01			SB-42 / S-3-4 / 07-27-01			SB-43 / S-1-2 / 08-01-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Peripheral On-Facility Area West of South St.			Peripheral Off-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																					
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**6,210**	J	H	**7,760**	J	H	**5,880**	J	L	**3,090**	J	H	**5,350**			**5,580**	J	H	**4,700**	J	H	**3,770**	J	H	**4,770**	J	H
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.36	UJ	L	1.0	UJ	L	0.95	UJ	L	0.37	UJ	L	**3.6**	J	H	0.64	UJ	L	**1.3**	J	L	**2.0**	J	L	**2.0**	J	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**1.3**	J	L	**1.1**			**0.79**			**2.3**	J	L	**40.2**			**3.2**			**7.0**			**5.5**			**4.0**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**20.9**			**63.0**			11.3			12.6			**1,100**			**70.8**			**686**			**123**			**357**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.29	U		0.43	U		0.34	U		0.29	U		0.40			0.25			0.52			0.33			0.27	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.075			0.11	U		0.11			0.074	U		**3.2**	J	H	0.19			**0.82**			**0.46**			**1.1**		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,690	JB	I	2,370			780	J	L	3,980	JB	I	5,190			5,040	J	I	3,800	J	I	3,130	J	I	3,280	J	I
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**9.1**			**9.5**			**9.5**	J	L	**7.4**			**22.6**			**7.7**			**6.5**			**8.2**			**13.1**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	4.2			2.3			3.3	J	L	3.3			5.9	J	H	3.2	J	I	4.1	J	I	4.2	J	I	3.9	J	I
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	10.0			7.3			10.0			8.5			**1,110**			20.8	J	I	21.0	J	I	20.0	J	I	**134**	J	I
Iron	NS	2,300	NS	NS	NS	NS	Note 7				10,400			6,640	J	L	7,820			7,030			41,800	J	I	8,020			8,670			9,830			9,200		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**13.8**			**26.5**			**12.8**	J	I	**31.7**			**4,570**			**161**	J	I	**669**	J	I	**258**	J	I	**1,310**	J	I
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	3,010	J	H	1,230			1,990	J	L	1,780	J	H	4,950			1,760	J	I	885	J	I	818	J	I	1,450	J	I
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	170			196			85.6			110			**482**	J	L	79.3			98.0			108			164		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.029	U		**0.12**	J	I	0.030	U		0.029	U		**1.2**			0.069			**0.12**			0.083			**0.16**		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	6.7			5.1	U		6.2			6.8			**39.7**			5.6			8.3			7.6			6.3		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	273	B	H	129			158			340	B	H	312			198			317			263			416		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.095	UJ	I	**0.51**			0.21	J	I	0.14	J	I	**1.1**	J	L	0.30			**0.67**			**0.86**			0.33		
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.43	U		0.61	U		0.57	U		0.44	U		0.43	U		0.38	U		0.57	U		0.42	U		0.41	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	66.0	B	H	51.0	U		47.7	U		40.1	B	H	71.4	JB	I	63.8			184			73.3			77.1		
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.044	UJ	I	0.064	UJ	I	0.050	UJ	I	0.044	UJ	I	**0.32**			**0.094**			**0.097**	J	I	**0.12**			0.041	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**19.3**			**16.0**			**18.4**			**8.5**			**23.8**			**18.8**			**12.8**			**14.4**			**16.2**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**38.7**			**25.9**			**18.2**			**19.9**			**5,390**	J	I	**582**	J	H	**3,260**	J	H	**1,110**	J	H	**1,310**	J	H
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.11	JB	I	0.34	J	L	0.40	UJ	L	0.059	JB	I	0.42	U		0.47	U		0.54	U		0.55	U		0.53	U	

TABLE 12B
Summary of Deep Soil Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg																				
	Human Health		Ecological								SB-43 / S-3-4 / 08-01-01			SB-44 / S-1-2 / 07-31-01			SB-44 / S-3-4 / 07-31-01			SB-44 / S-7 / 07-31-01			SB-45 / S-1-2 / 07-19-01			SB-45 / S-4-5 / 07-19-01			SB-46 / S-1-2 / 07-18-01			SB-46 / S-3-4 / 07-18-01			SB-46B / S-1-2 / 07-18-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																				
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**5,700**	J	H	**3,300**	J	H	**3,910**	J	H	**4,080**	J	L	**3,750**	J	H	**10,700**	J	H	**4,200**	J	H	**5,320**	J	H	**6,370**	J	H
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	**7.1**	J	L	**1.3**	J	L	**0.91**	J	L	0.77	UJ	L	0.79	UJ	L	0.60	UJ	L	0.65	UJ	L	0.53	UJ	L	0.59	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**12.9**			**3.6**			**4.7**			**0.73**			**5.4**			**2.4**			**4.4**			**0.82**			**1.9**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**1,590**			**264**			**57.9**			11.7			**56.9**			**42.6**			**61.2**			**19.8**			**27.6**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.30	U		0.36	U		0.35	U		0.38	U		0.33	U		0.30			0.25			0.24	U		0.39		
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	**11.5**			**1.4**			0.24			0.096	U		0.24			0.098			**0.43**			0.13			0.14		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	7,680	J	I	1,730	J	I	1,180	J	I	1,270	J	L	2,760	J	I	1,040	J	I	6,850	J	I	3,630	J	I	15,300	J	I
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**8.3**			**18.3**			**10.3**			**12.9**	J	L	**8.4**			**11.1**			**14.4**			**8.7**			**23.4**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	3.6	J	I	4.3	J	I	4.0	J	I	3.0	J	L	3.5	J	I	4.2	J	I	**15.4**	J	I	4.1	J	I	6.3	J	I
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	**43.8**	J	I	**1,740**	J	I	**49.9**	J	I	6.3			**103**	J	I	**51.7**	J	I	**499**	J	I	28.7	J	I	**186**	J	I
Iron	NS	2,300	NS	NS	NS	NS	Note 7				9,670			12,400			11,300			7,810			20,800			11,500			11,900			8,480			10,200		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**12,600**	J	I	**508**	J	I	**215**	J	I	**4.0**	J	I	**96.9**	J	I	**91.6**	J	I	**173**	J	I	**37.7**	J	I	**34.1**	J	I
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,280	J	I	7,320	J	I	2,050	J	I	1,760	J	L	2,160	J	I	1,760	J	I	3,990	J	I	2,200	J	I	2,690	J	I
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	105			218			222			83.5			187			158			**481**			167			183		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	**2.2**			**0.38**			**0.24**			0.030	U		**0.39**			0.042			**0.42**			0.048			0.083		
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	6.2			**51.5**			7.7			4.9			12.6			6.5			24.8			10.9			24.3		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	252			201			204			231			394			186			516			394			514		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	**1.5**			**0.38**			**0.48**			0.17	J	I	0.19	J	I	0.22			0.16	J	I	0.090	J	I	0.10	J	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.46	U		0.49	U		0.38	U		0.46	U		0.47	U		0.36	U		0.39	U		0.32	U		0.35	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	58.1			45.0			58.4			61.6			53.1			78.0			215			1,720			163		
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	**0.11**			0.055	UJ	I	**0.083**	J	I	0.058	UJ	I	0.050	UJ	I	**0.045**	J	I	**0.046**	J	I	0.036	UJ	I	0.038	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**17.9**			**15.2**			**17.3**			**19.5**			**12.9**			**25.4**			**13.6**			**10.3**			**18.2**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**12,700**	J	H	**2,110**	J	H	**201**	J	H	**24.9**			**156**	J	H	**71.0**	J	H	**304**	J	H	**141**	J	H	**283**	J	H
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.57	U		0.55	U		0.59			0.61	U		0.42	U		0.46	U		0.51	U		0.39	U		0.43	U	

Analytes	COPC Screening Levels										Concentrations in mg/kg																				
	Human Health		Ecological								SB-47 / S-1-2 / 07-25-01			SB-47 / S-3-4 / 07-25-01			SB-48 / S-1-2 / 12-14-00			SB-48A / S-3-4 / 12-14-00			SB-49 / S-1-2 / 04-24-01			SB-49 / S-3-4 / 04-24-01			SB-50 / S-1-2 / 04-24-01			SB-50 / S-3-4 / 04-24-01			SB-51 / S-1-2 / 12-7-00		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																				
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**7,190**	J	H	**6,010**	J	H	**6,600**	J	H	**5,330**	J	H	**6,980**	J	H	**6,510**	J	H	**6,250**	J	H	**5,650**	J	H	**3,790**	J	H
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	**1.7**	J	L	**1.3**	J	L	0.34	UJ	L	**4.9**	J	L	0.99	UJ	L	0.90	UJ	L	0.91	UJ	L	0.96	UJ	L	0.32	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**3.8**			**2.3**			**2.1**	J	I	**15.1**	J	I	**9.3**			**7.1**			**3.0**			**1.0**			**2.5**	J	I
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**198**			**171**			**47.9**			**1,680**			**44.6**			**281**			**98.7**			**17.6**			12.2		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.29	U		0.26	U		0.38			0.37			0.42			0.36			0.42			0.29	U		0.26		
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	**0.97**			**0.78**			0.23			**5.1**			0.26			**0.46**			0.14			0.074	U		0.078		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	10,400	J	I	4,130	J	I	12,300			7,910			1,500			1,580			2,130			1,910			3,140		
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**17.1**			**8.5**			**11.0**			**21.6**			**16.3**			**27.1**			**10.8**			**7.7**			**5.0**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	5.0	J	I	2.8	J	I	7.2			6.8			6.1	J	L	10.2	J	L	4.6	J	L	4.5	J	L	2.5		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	**160**	J	I	36.2	J	I	19.7			**142**			26.1	J	I	**165**	J	I	17.6	J	I	9.1	J	I	6.3		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				13,500			10,000			13,700			16,700			13,600			17,400			9,260			9,970			9,000		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**1,600**	J	I	**938**	J	I	**84.3**	J	I	**3,910**	J	I	**108**			**809**			**63.1**			**7.7**			**11.4**	J	I
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	4,880	J	I	2,770	J	I	6,350	J	H	3,930	J	H	3,160	J	H	13,200	J	H	2,230	J	H	2,110	J	H	1,610	J	H
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	258			141			**380**			278			234			**331**			146			153			172		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	**0.25**			**0.48**			0.066	J	I	**1.4**	J	I	**0.53**			**0.41**			0.035			0.028	U		0.028	UJ	I
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	23.4			11.5			**32.3**			20.5			22.2			**117**			18.1			8.0			3.6		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	521			320			874			602			416			348			327			320			349		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.27			0.20			0.083	UJ	I	**6.2**	J	I	**0.41**			**0.34**			**0.41**			0.12	J	I	0.11	JB	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.41	U		0.51	U		0.41	UJ	I	0.44	UJ	I	0.52	UJ	L	0.53	UJ	L	0.49	UJ	L	0.42	UJ	L	0.38	UJ	I
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	106			152			89.3	B	H	96.4	B	H	76.4			81.8			46.1			63.8			32.1	B	H
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	**0.046**	J	I	0.039	UJ	I	**0.054**	J	I	**0.31**	J	I	**0.070**	J	I	**0.067**	J	I	**0.068**	J	I	0.044	UJ	I	**0.042**	J	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**22.8**			**21.1**			**19.1**			**17.9**			**36.0**			**22.8**			**18.1**			**21.1**			**8.3**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**1,190**	J	H	**682**	J	H	**104**			**4,480**			**102**			**382**	J	I	**118**			**23.7**			**28.1**		
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.65			0.55	U		0.0096	UJ	I	0.021	UJ	I	0.54	UJ	L	0.58	UJ	L	0.48	UJ	L	0.53	UJ	L	0.015	UJ	I

TABLE 12B
Summary of Deep Soil Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in mg/kg																				
	Human Health		Ecological								SB-51 / S-5-6 / 12-7-00			SB-52 / S-1-2 / 04-18-01			SB-52 / S-4-5 / 04-18-01			SB-53 / S-1-2 / 07-13-01			SB-53 / S-3-4 / 07-13-01			SB-54 / S-1 / 05-03-01			SB-55 / S-1 / 05-03-01			SB-56 / S-1 / 05-03-01			SB-57 / S-1 / 05-03-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																							
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**4,720**	J	H	**5,310**	J	H	**6,090**	J	H	**5,790**	J	H	**6,990**	J	H	**4,960**	J	H	**4,750**	J	H	**3,890**	J	H	**3,710**	J	H
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	**0.55**	J	L	0.56	UJ	L	0.58	UJ	L	**0.79**	J	L	**0.74**	J	L	**1.5**	J	L	0.74	UJ	L	0.80	UJ	L	0.87	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**2.8**	J	I	**2.9**	J	H	**5.4**	J	H	**12.4**			**4.1**			**2.9**			**1.0**			**0.81**			**0.75**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**59.8**			**57.1**			**212**			**101**			**48.4**			**138**			**47.9**			14.7			11.6		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.30	U		0.27	U		0.46			0.87			0.27	U		0.30	U		0.30	U		0.34	U		0.32	U	
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.25			**1.4**			**1.8**			**0.43**			**0.98**			**0.78**			0.17			0.086	U		0.080	U	
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,230			1,490			3,040			12,500	J	I	1,950	J	I	4,260			1,870			1,890			1,090		
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**11.1**			**13.7**			**12.0**			**24.0**			**36.8**			**13.6**			**8.5**			**6.4**			**8.0**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	5.3			4.8			7.0			6.8	J	I	6.8	J	I	6.9			6.6			3.5			3.2		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	23.2			**225**			**126**			**421**	J	I	**3,580**	J	I	**57.0**			**73.7**			9.8			**7.0**		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				9,050			12,400			22,900			11,500			11,100			8,920	J	L	9,330	J	L	7,620	J	L	8,000	J	L
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**231**	J	I	**386**			**164**			**735**	J	I	**458**	J	I	**442**			**251**			**41.2**	J	I	**8.1**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,520	J	H	2,970	J	I	3,320	J	I	12,500	J	I	10,600	J	I	2,310			2,610			2,060			1,730		
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	146			**330**	J	L	**691**	J	L	199			174			171			191			146			121		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.097	J	I	**0.26**			0.030	U		**0.49**			**0.42**			**5.6**	J	I	0.092	J	I	0.027	UJ	I	0.024	UJ	I
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	13.6			26.4			28.1			**98.7**			**52.3**			12.0			12.7			4.8			4.4	U	
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	287			220			284			718			431			571			357			327			256		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.096	UJ	I	0.12	J	I	0.27			**1.3**			**1.5**			0.099	UJ	I	0.098	UJ	I	0.11	UJ	I	0.10	UJ	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.42	UJ	I	0.43	U		0.45	U		0.38	U		0.44	U		0.47	U		0.44	U		0.48	U		0.52	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	62.0	B	H	60.6			76.9			607			6,970			1,160			1,180			119	B		105	B	
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.044	UJ	I	0.041	UJ	I	0.040	UJ	I	**1.5**			**0.99**			0.046	UJ	I	0.045	UJ	I	0.052	UJ	I	0.048	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**17.1**			**17.4**			**22.3**			**16.7**			**11.8**			**13.2**			**13.3**			**14.3**			**14.7**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**232**			**547**			**1,610**			**458**	J	H	**1,520**	J	H	**694**			**196**			**18.2**			**15.7**		
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.012	UJ	I		R			R		0.49	U		0.57	U		0.14	U		0.14	U		0.13	U		0.13	U	

Analytes	COPC Screening Levels										Concentrations in mg/kg																				
	Human Health		Ecological								SB-58 / S-2-3 / 04-26-01			SB-59 / S-4-5 / 04-26-01			SB-60 / S-4-5 / 04-25-01			SB-61 / S-1-2 / 04-25-01			SB-62 / S-3-4 / 04-17-01			SB-63 / S-1-2 / 04-02-01			SB-64 / S-3-4 / 03-23-01			SB-65 / S-4-5 / 03-26-01			SB-66 / S-3-4 / 07-10-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																							
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**6,650**	J	H	**5,650**	J	L	**5,850**	J	L	**7,500**	J	H	**7,560**	J	L	**10,900**			**5,690**			**5,440**	J	L	**9,950**	J	L
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.91	UJ	L	0.75	UJ	L	0.72	UJ	L	0.88	UJ	L	0.89	UJ	L	0.33	UJ	L	0.28	U		0.68	UJ	L	0.77	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**9.2**			**2.9**			**1.9**			**1.6**			**1.1**			**5.8**			**0.76**			**0.99**			**0.46**		
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**618**			**21.4**			**30.4**			**25.3**			**17.6**			**42.0**			**18.2**			12.0			17.2		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.31	U		0.30	U		0.31	U		0.30			0.37	U		0.36			0.25	U		0.33	U		0.42		
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	**1.2**			0.16			0.083			0.11			0.092	U		**0.82**			0.064	U		0.082	U		0.087	U	
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	45,800			2,230	J	L	2,110	J	L	968			1,890	J	L	1,600	J	L	1,520			2,050	J	L	1,940	JB	I
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**17.5**			**12.6**	J	L	**9.3**	J	L	**10.3**			**9.4**	J	L	**13.1**			**9.0**			**10.1**	J	L	**22.5**	J	L
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	4.5	J	L	4.3	J	L	4.8	J	L	4.4	J	L	4.9	J	L	4.8			4.1	J	H	4.7	J	L	**25.1**	J	L
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	36.5	J	I	12.7			10.6			9.6	J	I	10.7			16.8			9.9			10.2			**41.6**		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				13,700			9,840			10,600			10,800			12,700			13,300			12,500	J	I	10,600			24,700		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**1,140**			**18.4**	J	I	**6.2**	J	I	**21.5**			**10.3**	J	I	**73.3**			**9.0**			**5.5**	J	I	**5.1**	J	I
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	7,650	J	H	3,470	J	L	3,330	J	L	1,970	J	H	2,450	J	L	2,600			3,250			3,020	J	L	4,380	J	L
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	**369**			203			213			207			193			210			235	J	L	189			**482**		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	**0.19**			0.025	U		0.026	U		0.029	U		0.029	U		0.037			0.032	U		0.027	U		0.026	U	
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	11.6			7.1			7.5			7.2			6.4			9.9			6.8			6.1			24.3		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	536			343			436			250			312			296			296			235			196	B	
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	**0.38**			0.099	UJ	I	0.10	UJ	I	0.12	J	I	0.12	UJ	I	0.27	J	H	0.13	J	L	0.12	J	I	0.11	UJ	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.46	UJ	L	0.45	U		0.43	U		0.45	UJ	L	0.53	U		0.39	U		0.38	U		0.41	U		0.46	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	151			88.2			107			43.2			71.1			54.8			75.2	JB	I	62.5	B		63.4	B	
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	**0.059**	J	I	0.046	UJ	I	0.047	UJ	I	0.042	UJ	I	0.055	UJ	I	**0.061**	J	I	0.038	UJ	I	0.049	UJ	I	0.052	UJ	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**26.1**			**17.8**			**20.4**			**22.7**			**29.2**			**32.2**			**21.1**			**18.8**			**21.8**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**1,190**			**67.3**			**28.0**			**31.5**			**22.6**			**183**			**33.0**	J	I	**26.0**			**67.6**		
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.56	UJ	L	0.47	UJ	L	0.41	UJ	L	0.53	UJ	L		R		0.45	U		0.35			0.47	U		0.43	U	

TABLE 12B
Summary of Deep Soil Data - Inorganic Parameters
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Blackburn & Union Privileges Superfund Site
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Analytes	COPC Screening Levels										Concentrations in mg/kg													
	Human Health		Ecological								SB-68 / S-2-3 / 07-11-01			SB-72 / S-1-2 / 07-10-01			SH-05S / S-1 / 02-05-01			SH-18S / S-1-2 / 07-24-01			UST-5 / S-1-2 / 12-12-00		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Ecological Soil Screening Levels				Residential Area West of South St.			Residential Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Industrial Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																								
Aluminum	NS	7,600	50	NS	90.8	**3.825**	Note 6				**7,740**	J	L	**4,860**			**4,590**			**4,500**	J	H	**9,520**	J	H
Antimony	10	3.1	5	NS	NS	**0.248**	NS	78	0.29	NS	0.81	UJ	L	0.87	UJ	L	0.28	UJ	L	0.91	UJ	L	0.35	UJ	L
Arsenic	30	0.39	10	60	4.3	**0.25**	NS	NS	NS	NS	**0.92**			**2.4**			**0.73**			**0.92**			**2.4**	J	I
Barium	1,000	540	500	NS	**17.2**	19.7	NS	330	1,000	NS	**17.7**			16.5			11.2			**31.4**			**66.3**		
Beryllium	0.7	15	10	NS	NS	**2.42**	NS	40	36	NS	0.31	U		0.33			0.24	U		0.34	U		0.39		
Cadmium	30	3.7	4	20	1.2	3.533	32	140	**0.38**	1	0.077	U		0.10			0.061	U		0.086	U		0.14		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,110	JB	I	750	B		1,660			1,810	J	I	19,300		
Chromium †	1,000	22	1	**0.4**	0.83	12.01	NS	NS	NS	NS	**14.2**	J	L	**9.3**			**10.8**			**6.2**			**10.2**		
Cobalt	NS	140	20	NS	NS	NS	**13**	NS	240	190	8.6	J	L	5.6			3.3			3.0	J	I	5.0		
Copper	NS	310	100	50	**38.9**	55.7	NS	NS	NS	NS	18.5			7.3			6.7			8.5	J	I	19.0		
Iron	NS	2,300	NS	NS	NS	NS	Note 7				17,600			7,230			8,220			8,320			16,100		
Lead	300	400	50	500	**0.94**	29.3	110	1,700	59	16	**5.1**	J	I	**27.4**			**4.3**			**4.0**	J	I	**83.5**	J	I
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	4,040	J	L	959			3,000	J	L	1,620	J	I	4,070	J	H
Manganese	NS	180	500	NS	825	**322**	NS	NS	NS	NS	305			141			150			82.2			**446**		
Mercury	20	2.3	0.3	**0.1**	0.37	4.76	NS	NS	NS	NS	0.027	U		0.027	U		0.031	U		0.031	U		0.038	J	I
Nickel	300	160	**30**	200	64.08	146.52	NS	NS	NS	NS	12.7			4.2			6.9			4.9			9.2		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	301	B		207	B		200			278			857		
Selenium	400	39	1	70	**0.331**	0.733	NS	NS	NS	NS	0.10	UJ	I	0.21	J		0.079	UJ	I	0.11	UJ	I	0.14	JB	I
Silver	100	39	**2**	NS	NS	NS	NS	NS	NS	NS	0.49	U		0.48	U		0.34	U		0.55	U		0.42	UJ	I
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	94.8	B		48.3	B		248			72.0			210	B	H
Thallium ‡	8	0.52	1	NS	NS	**0.027**	NS	NS	NS	NS	0.046	UJ	I	**0.052**	J		0.036	UJ	I	0.051	UJ	I	**0.059**	J	I
Vanadium	400	7.8	2	NS	9.439	**0.714**	NS	NS	NS	NS	**25.2**			**13.5**			**13.7**			**18.7**			**21.8**		
Zinc	2,500	2,300	50	200	**12**	586.1	NS	NS	NS	NS	**38.1**			**21.9**	B		**26.7**			**14.5**	J	H	**111**		
Cyanide (weak acid dissociable) $&	100	1.1	NS	NS	NS	**236.5**	NS	NS	NS	NS	0.43	U		0.41	U		0.22	JB	I	0.64	U		0.018	UJ	I

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories of Raynham, Massachusetts, performed analyses for metals (except mercury) by United States Environmental Protection Agency (USEPA) Method 6010B and Method 6020; mercury by Method 7471A; and weak acid dissociable cyanide (WAD cyanide) by Method 4500-CN I.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. Concentrations are presented in milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.
"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.
"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.
"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the American Robin.
"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian (birds) are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. Reference for ESSL for aluminum (OSWER Directive 9285.7-60, as found on the USEPA website www.epa.gov/ecotox/ecossl/) indicates aluminum is a COPC at pHs <5.5. Review of Figure 2.1 of this reference indicates that at the higher pHs observed in some site soils (e.g., pH >8), aluminum solubility increases to levels similar to that at pHs of <5.5.

7. In well aerated soil with pH of 5 to 8, iron is not toxic to plants.

8. "†" indicates that Region IX PRG and ORNL small mammal benchmarks presented are for chromium VI. The MCP 2/S-1 and ORNL avian benchmarks presented are for chromium III. The ORNL earthworm and phytotoxicity benchmarks do not indicate a chromium isomer.
"‡" indicates the Region IX PRG presented is for thallium chloride.
"$" indicates the MCP Method 2 S-1 standard presented is for free, or physiologically available cyanide.
"&" indicates the Region IX PRG presented is for hydrogen cyanide because cyanide in this form easily dissociates and becomes available for uptake as free cyanide.

9. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:
- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
- "R" Indicates data rejected during validation.
- "B" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with sediment metals analyses). The result is usable with possible uncertainty due to the potential for contamination.
- "JB" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with sediment metals analyses). The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision, and with possible uncertainty due to the potential for contamination.

Bias:
- "L" Low
- "I" Indeterminate
- "H" High

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-01 / S-1-2 / 05-09-01			SB-04 / S-4-5 / 03-21-01			SB-05 / S-2-3 / 03-19-01			SB-06 / S-4-5 / 03-16-01			SB-07 / S-3 / 03-15-01			SB-08A / S-4-5 / 03-15-01			SB-09 / S-2-3 / 04-23-01			SB-10 / S-3 / 06-07-01			SB-11 / S-2-3 / 06-07-01			SB-12 / S-1-2 / 04-17-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Former Lower Mill Pond			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Peripheral Off-Facility Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	5.5	U		19			220			5.4	U		5.6	U		5.5	U		**25,000**			5.1	U		5.2	U		11		
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.5	U		49			390			9.8			5.6	U		5.5	U		12,000			5.1	U		77			7.7		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	5.5	U		92			450			10			5.6	U		5.5	U		40,000			9.9			34			33		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	14			240			780			28			8.9			7.0			39,000			7.0			90			100		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	14			180			600			29			8.1			6.7			**35,000**			5.1	U		74			95		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	15			310			930			52			9.4			7.6			39,000			5.1	U		88			92		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	8.1			52			360			30			6.2			5.5	U		9,800			5.1	U		83			75		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	13			150			540			40			6.7			5.5	U		23,000			5.1	U		53			66		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	18			240			880			37			10			7.0			39,000			19			120			110		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	5.5	U		20			110			14			5.6	U		5.5	U		3,500	J		5.1	U		16			13		
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	32			610			2,200			35			20			15			110,000			16			130			230		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	5.5	U		19			200			5.4	U		5.6	U		5.5	U		**35,000**			5.1	U		5.2	U		9.6		
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	8.6			66			420			33			5.6			5.5	U		13,000			5.1	U		50			69		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.5	U		21			340			15			5.6	U		5.5	U		31,000			37			21			5.4	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	5.5	U		21			680			18			5.6	U		5.5	U		82,000			45			56			5.4	U	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	25			250			850			19			12			10			140,000			22			130			150		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	33			450			1,600			30			18			14			85,000			19			130			210		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	180.7			2,789			11,550			399.8			104.9			67.3			761,300			174.9			1152			1,271.3		
Other SVOCs																																					
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	120	J	L	210	UJ	L	210	UJ	L	38	J	L	220	UJ	L	220	UJ	L	5,400	UJ	L		R		200	J	L	60	J	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	UJ	L	200	U		210	U		220	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		96	UJ		96	UJ		98	UJ		100	UJ		100	UJ		950	UJ		35	UJ		37	UJ		38	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	UJ	L	220	UJ	L	220	UJ	L	220	UJ	L	5,400	U		200	U		210	U		220	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	220	U		210	U		210	U		220	U		39	J		220	U		5,400	U		85	J		37	J		220	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		40	J		210	U		220	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		66	J		220	U		220	U		220	U		23,000			45	J		210	U		220	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		180	J		220	U		220	U		220	U		28,000			200	U		210	U		220	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	UJ	L	210	UJ	L	220	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	UJ	L
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	38	UJ		62	UJ		62	UJ		64	UJ		66	UJ		64	UJ		950	UJ		35	UJ		37	UJ		38	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	540	U		530	U		530	U		540	U		560	U		550	U		14,000	U		510	U		520	U		540	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	1,100	U		530	UJ	L	530	U		540	U		560	U		550	U		27,000	U		1,000	UJ	L	1,000	UJ	L	1,100	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	540	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	UJ	L
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		88	J		210	U		220	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		80	UJ		80	UJ		81	UJ		84	UJ		82	UJ		950	UJ		35	UJ		37	UJ		38	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		510	U		520	U		220	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		210	U		220	U		220	U		220	U		5,400	U		200	U		210	U		220	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	120			-			246			38			39			-			51,000			258			237			60		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	300.7			2,789			11,796			437.8			143.9			67.3			812,300			432.9			1,389			1,331.3		

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-13A / S-3-4 / 04-13-01			SB-14 / S-3-4 / 04-13-01			SB-15 / S-2-3 / 04-16-01			SB-16 / S-3-4 / 06-06-01			SB-17 / S-4-5 / 04-05-01			SB-18 / S-2-3 / 04-11-01			SB-19 / S-1-2 / 06-08-01			SB-20 / S-2-3 / 06-12-01			SB-21 / S-3-4 / 04-02-01			SB-22 / S-3 / 06-13-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	7.7			15,000			2,400	J		18			36			1,400			5.5	U		9.4			5.2	U		5.1	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	11			36,000			4,700			250			21			430	J		5.5	U		5.1	U		7.4			5.1	U	
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	32			66,000			8,300			1,100			34			2,800			10			30			5.2	U		5.1	U	
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	49			83,000			20,000			1,300			37			6,200			14	J	I	67			25			5.1	U	
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	40			**72,000**			**21,000**			200			33			**6,500**			11	J	I	60			21			5.1	U	
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	51			89,000			25,000			410			40			6,700			12	J	I	73			30			5.1	U	
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	24			14,000			5,000			48			23			1,000			5.8			52			12			5.1	U	
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	24			45,000			14,000			270			21			7,500			6.7			34			9.8			5.1	U	
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	44			71,000			21,000			1,600			35			6,000			13	J	I	61			33			5.1	U	
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	6.8			6,100			1,800	J		12			7.9			320	J		5.5	U		7.1			5.2	U		5.1	U	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	130			210,000			43,000			6,700			100			15,000			39	J	I	180			60			7.0		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	18			**44,000**			4,000			120			64			1,200			5.5	U		9.4			5.2	U		5.1	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	24			21,000			6,500			60			23			1,300			5.6			44			12			5.1	U	
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		17,000			3,400			8.7			27			430	J		5.5	U		5.1	U		5.2	U		5.1	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	6.7			14,000			5,500			11			27			470	J		5.5	U		5.1	U		5.2	U		5.1	U	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	160			200,000			30,000			1,100			170			13,000			35	J	I	130			40			5.3		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	110			150,000			39,000			6,700			74			14,000			28	J	I	130			59			5.2		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	738.2			1,153,100			254,600			19,907.7			772.9			84,250			180.1			886.9			309.2			17.5		
Other SVOCs																																					
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	4,800	UJ	L	2,500	UJ	L		R		210	UJ	L	1,000	UJ	L		R			R		210	UJ	L		R	
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	4,800	U		2,500	U		210	UJ	L	210	U		1,000	U		220	U		200	U		210	U		200	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		840	UJ		440	UJ		36	UJ		37	UJ		180	UJ		39	UJ		36	UJ		36	UJ		36	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	UJ	L	210	U		1,000	U		220	U		200	U		210	U		200	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	220	U		4,800	U		2,500	U		45	J		210	U		1,000	U		220	U		200	U		210	U		200	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		200	J		200	U		210	U		55	J	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	17,000			3,800			430			210	UJ	L	1,300			220	U		200	U		210	UJ	L	200	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		27,000			1,600	J		210	U		46	J		780	J		220	U		200	U		210	U		200	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	UJ	L	210	U		1,000	U		220	UJ	L	200	UJ	L	210	U		200	UJ	L
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	UJ	L	210	UJ	L	210	U		1,000	U		220	U		200	U		210	U		200	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	38	UJ		840	UJ		440	UJ		36	UJ		37	UJ		180	UJ		39	UJ		36	UJ		36	UJ		36	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	12,000	U		6,200	U			R		210	U		2,500	U		550	U		510	U		210	U		510	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	540	UJ	L	24,000	UJ	L	12,000	UJ	L		R		530	UJ	L	5,000	UJ	L	1,100	UJ	L	1,000	UJ	L	520	UJ	L	1,000	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	4,800	UJ	L	2,500	UJ	L	210	UJ	L	210	UJ	L	1,000	UJ	L	220	U		200	U		210	UJ	L	200	U	
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	4,800	U		2,500	U		210	U		210	UJ	L	1,000	U		220	U		200	U		210	UJ	L	200	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	4,800	U		2,500	U		210	U		210	UJ	L	1,000	U		220	U		200	U		210	UJ	L	200	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	UJ	L	210	U		1,000	U		220	U		200	U		210	U		200	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		840	UJ		440	UJ		36	UJ		37	UJ		180	UJ		39	UJ		36	UJ		36	UJ		36	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		520	U		210	U		1,000	U		550	U		510	U		210	U		510	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	220	U		4,800	U		2,500	U		210	U		210	U		1,000	U		220	U		200	U		210	U		200	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			44,000			5,400			475			46			2,080			200			-			-			55		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	738.2			1,197,100			260,000			20,382.7			818.9			86,330			380.1			886.9			309.2			72.5		

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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-23 / S-2-3 / 04-11-01			SB-24 / S-3-4 / 04-12-01			SB-25 / S-4-5 / 03-29-01			SB-26 / S-2-3 / 03-30-01			SB-27 / S-2-3 / 06-15-01			SB-28 / S-3-4 / 07-23-01			SB-30 / S-4-5 / 03-28-01			SB-31 / S-3-4 / 02-26-01			SB-35 / S-1-2 / 05-02-01			SB-38 / S-2-3 / 04-23-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral Off-Facility Area West of South St.			Peripheral On-Facility Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.3	U		5.4	U		6.4			6.0	U		6.0	U		9.9			5.6	U		6.6	U		6.2	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.3	U		5.4	U		6.2			6.0	U		6.0	U		38			5.6	U		6.6	U		6.2	U	
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.3	U		5.4	U		36			6.0	U		6.0	U		41			5.6	U		6.6	U		6.2	U	
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	8.4			12			14			99			8.6			6.0	U		160			28			8.0			6.2	U	
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	6.5			11			12			92			6.2			6.0	U		160			26			9.0			6.2	U	
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	7.7			17			13			82			8.5			6.0	U		130			36			11			6.2	U	
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	9.9			11			11			53			6.0	U		6.0	U		110			14	J	L	7.1			6.2	U	
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		6.7			11			64			6.0	U		6.0	U		100			23			9.5			6.2	U	
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	19			15			22			99			10			6.0	U		200			40	J	L	12			6.2	U	
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.3	U		5.4	U		11			6.0	U		6.0	U		18			5.6	U		6.6	U		6.2	U	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	8.4			32			26			180			18			6.0	U		290			76			18			8.8		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	5.4	U		5.3	U		5.4	U		10			6.0	U		6.0	U		29			5.6	UJ	L	6.6	U		6.2	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	6.6			8.8			9.4			53			6.0	U		6.0	U		93			19			7.5			6.2	U	
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.3	U		5.4	U		7.3			6.0	U		6.0	U		26			5.6	U		6.6	U		6.2	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		6.2			5.4	U		12			6.0	U		6.0	U		48			8.6	J	L	6.6	U		6.2	U	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	9.1			23			21			110			20			6.0	U		360			41	J	L	12			7.8		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	10			27			39			160			14			6.0	U		430			65			17			7.3		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	85.6			169.7			178.4			1,080.9			85.3			-			2242.9			376.6			111.1			23.9		
Other SVOCs																																					
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	210	UJ	L	220	U		110	J		600	UJ	L	240	UJ	L	240	U		72	J	L	210	J	I	74	J	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	UJ	L	240	U			R		260	U		250	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		37	UJ		38	UJ		41	UJ		42	UJ		42	UJ		41	UJ		100	UJ	L	46	UJ		43	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	UJ	L	220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	UJ	L
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	UJ	L	240	U		240	U		220	UJ	L	260	U		250	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	UJ	L	240	U		240	U		220	UJ	L	260	U		250	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	UJ	L	240	U		240	U		220	U		260	U		250	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	UJ	L	240	U		240	U		220	UJ	L	260	UJ	L	250	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		160	J		260	U		250	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	UJ	I	250	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	38	UJ		37	UJ		38	UJ		41	UJ		42	UJ		42	UJ		41	UJ		65	UJ		46	UJ		43	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	540	U		210	U		540	U		580	U		600	U		240	UJ	L	590	U		560	UJ	L	660	U		250	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	1,100	UJ	L	530	UJ	L	1,100	U		1,200	U			R		600	UJ	L	1,200	U		560	UJ	L	1,300	UJ	I	610	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	UJ	L	240	U		240	U		220	U		260	U		250	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	210	UJ	L	220	U		230	U			R		240	UJ	L	240	U		560	UJ	L	660	U		250	UJ	L
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	UJ	L	240	U		240	U		220	UJ	L	260	U		250	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	UJ	L	220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	UJ	L
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	UJ	L	220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	UJ	L
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		37	UJ		38	UJ		41	UJ		42	UJ		42	UJ		41	UJ		84	UJ		46	UJ		43	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		600	U		240	U		240	U		220	UJ	L	260	U		250	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	U		260	U		250	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	220	U		210	U		220	U		230	U		240	U		240	U		240	U		220	UJ	L	260	U		250	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			110			-			-			-			232			210			74		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	85.6			169.7			178.4			1,190.9			85.3			-			2242.9			608.6			321.1			97.9		

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-40 / S-2-3 / 02-26-01			SB-41 / S-1-2 / 03-20-01			SB-41D / S-5-6 / 07-27-01			SB-42 / S-1-2 / 07-27-01			SB-42 / S-3-4 / 07-27-01			SB-43 / S-1-2 / 08-01-01			SB-43 / S-3-4 / 08-01-01			SB-44 / S-1-2 / 07-31-01			SB-44 / S-3-4 / 07-31-01			SB-44 / S-7 / 07-31-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Peripheral On-Facility Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	5.6	U		98			6.4	U		230	U		13	U		44			24			100	J		28			6.3	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.6	U		120			6.4	U		230	U		13	U		75			53			190	J		21			6.3	U	
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	7.1	J	L	360			12			49	J		16			170			49			950			60			6.3	U	
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	32			610	J	H	35			160	J		56			340			130			2,900			250			6.3	U	
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	30	J	L	640			42			110	J		76	J	L	360			210			1,700			190			6.3	U	
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	28			760	J	H	54			140	J		86	J	L	400			450			1,900			230			6.3	U	
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	17	J	L	250	J	L	46			98	J		20	J	L	140			190			380			100			6.3	U	
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	19	J	L	380			39			120	J		43	J	I	210			320			1,100			120			6.3	U	
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	34	J	L	630	J	H	66			380			100			390			190			2,500			250			6.3	U	
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	5.6	UJ	L	68			9.2			46	J		13	UJ	L	45			51			150	J		29			6.3	U	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	54			1,500	J	H	88			210	J		65			840			170			4,100			460			6.3	U	
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	5.6	UJ	L	140			6.4	U		45	J		13	U		85			21			280			26			6.3	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	20			260			39			57	J		14	J	L	150			150			480			100			6.3	U	
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	6.4			150			9.4			100	J		75			45			43			260			41			6.3	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	18	J	L	340			26			92	J		34			62			92			340			89			6.3	U	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	37	J	L	1,200	J	H	75			430			160			930			240			3,500			460			6.3	U	
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	70			1,200	J	H	86			190	J		96			650			210			4,700			470			6.3	U	
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	372.5			8,706			626.6			2,227			841			4,936			2,593			25,530			2,924			-		
Other SVOCs																																					
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	73	J	L	690	J	L	260	UJ	L	120	J	L	92	J	L	960	J	L	380	J	L	160	J	L	190	J	L	250	UJ	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS		R		260	U		260	UJ	L	230	UJ	L	260	UJ	L	260	UJ	L	230	UJ	L	240	UJ	L	250	UJ	L	250	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	100	UJ	L	120	UJ		45	UJ		41	UJ		46	UJ		46	UJ		41	UJ		43	UJ		44	UJ		44	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	UJ	L	260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	220	U		110	J		260	U		230	U		260	U		58	J		230	U		46	J		250	U		250	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		85	J		260	U		230	U		260	U		56	J		230	U		220	J		250	U		250	UJ	L
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	UJ	L	260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	120	J		260	U		230	U		260	U		260	U		230	U		88	J		250	U		250	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	66	UJ		78	UJ		45	UJ		41	UJ		46	UJ		46	UJ		41	UJ		43	UJ		44	UJ		44	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS		R			R		260	UJ	L	230	UJ	L	260	UJ	L	260	UJ	L	230	UJ	L	240	UJ	L	250	UJ	L	250	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS		R			R		640	UJ	L	580	UJ	L	650	UJ	L	660	UJ	L	580	UJ	L	610	UJ	L	630	UJ	L	630	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		180	J		260	U		230	U		240	U		250	U		250	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	560	UJ	L		R		260	UJ	L	230	UJ	L	260	UJ	L	260	UJ	L	230	UJ	L	240	UJ	L	250	UJ	L	250	UJ	L
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	UJ	L	260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	2,000			260	U		230	U		260	U		9,200			1,900			360			290			250	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	UJ	L	260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	UJ	L
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		260	UJ	L	260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	UJ	L
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	84	UJ		100	UJ		45	UJ		41	UJ		46	UJ		46	UJ		41	UJ		43	UJ		44	UJ		44	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		310			72	J		240	U		250	U		250	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	220	UJ	L	260	U		260	U		230	U		260	U		260	U		230	U		240	U		250	U		250	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	73			3,005			-			120			272			10,584			2,352			874			480			-		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	445.5			11,711			626.6			2,347			1,113			15,520			4,945			26,404			3,404			-		

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-45 / S-1-2 / 07-19-01			SB-45 / S-4-5 / 07-19-01			SB-46 / S-1-2 / 07-18-01			SB-46 / S-3-4 / 07-18-01			SB-46B / S-1-2 / 07-18-01			SB-47 / S-1-2 / 07-25-01			SB-47 / S-3-4 / 07-25-01			SB-48 / S-1-2 / 12-14-00			SB-48A / S-3-4 / 12-14-00			SB-49 / S-1-2 / 04-24-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	840	J		6.8			100	J		9.5			13			310			140	J		15			410			170	J	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	210	J		6.5			120	J		7.4			13			69	J		44	J		94			770			500		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	1,700			26			220	J		33			18			520			220	J		100	J	L	1,300	J	L	640		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	2,800			64			410			57			75			1,100			400			150			2,600			2,000		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	**2,400**			52			350			39			72			850			380			180			**2,900**			**2,300**		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	1,900			58			280			42			81			720			370			130			3,100			2,800		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	710	J		28			190	J		24			53			300			100	J		76			1,800			740		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	1,800			35			270			28			50			570			290			140	J	L	2,100	J	L	2,000		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	3,000			76			440			50			100			1,100			440			180	J	L	3,200	J	L	2,300		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	250	J		8.0			64	J		6.9			13			92	J		57	J		29			300			260	J	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	7,400			140			840			88			150			1,700			840			240			6,700			4,100		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	980	J		11			160	J		18			10			280			130	J		14	U		480			220	J	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	790	J		29			190	J		21			49			300			150	J		70			1,900	J	I	970		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	550	J		6.9			180	J		23			23			220			65	J		28			540			210	J	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	1,500			18			270			42			57			540			150	J		34	J	L	930	J	L	270	J	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	9,500			130			1,000			130			90			2,100			770			210			6,000			2,600		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	6,000			130			760			94			140			1,900			750			340			6,500			3,700		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	42,330			825.2			5,844			712.8			1,007			12,671			5,296			2,016			41,530			25,780		
Other SVOCs																																					
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	UJ	L	41	J	L	54	J	L	220	UJ	L	230	UJ	L	120	J	L	65	J	L	1,400	UJ	L	1,400	UJ	L	460	UJ	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	UJ	L	240	UJ	L	220	UJ	L	220	UJ	L	230	UJ	L	220	UJ	L	220	UJ	L	570	UJ	L	580	UJ	L	460	UJ	L
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	190	UJ		43	UJ		39	UJ	L	38	UJ		40	UJ		39	UJ		39	UJ		260	UJ		260	UJ		81	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	UJ	L	220	U		230	U		220	U		220	U		570	UJ	L	580	UJ	L	460	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		40	J		220	U		220	U		570	U		580	U		460	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	UJ	L	220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100			240	U		85	J		220	U		440			160	J		120	J		570	U		760			250	J	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U	L	570	UJ	L	580	U		460	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	UJ	L	220	UJ	L	220	U		230	U		220	U		220	U		570	UJ	L	580	UJ	L	460	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U	L	570	UJ	L	580	U		460	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	980	J		240	U		63	J		220	U		230	U		120	J		53	J		570	U		650			200	J	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	UJ	L	220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	UJ	L	220	UJ	L	220	U		230	U		220	U		220	U		570	UJ	L	580	UJ	L	460	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	UJ	L	580	U		460	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	1,100	U		240	U		38	J		220	U		75	J		220	U		220	U		570	U		580	U		460	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	UJ	L		R		220	UJ	L	230	UJ	L	220	U		220	U		570	UJ	L	580	UJ	L	460	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	190	UJ		43	UJ		39	UJ		38	UJ		40	UJ		39	UJ		39	UJ		160	UJ		170	UJ		81	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	1,100	UJ	L	240	UJ	L	220	UJ	L	220	UJ	L	230	UJ	L	220	UJ	L	220	UJ	L	1,400	UJ	L	1,400	UJ	L	1,200	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	2,600	UJ	L	610	UJ	L		R		550	UJ	L	580	UJ	L	560	UJ	L	560	UJ	L	1,400	UJ	L	1,400	UJ	L	2,300	U	
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	UJ	L	460	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U			R		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	UJ	L	580	UJ	L	460	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	1,100	UJ	L	240	UJ	L		R		220	UJ	L	230	UJ	L	220	UJ	L	220	UJ	L	570	UJ	L	580	UJ	L	460	U	
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	UJ	L	220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		78	J		220	U		220	U		570	U		580	U		460	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	1,100	U		240	U		220	UJ	L	220	U		230	U		220	U		220	U		570	UJ	L	580	U		460	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	240	J		65	J		220	UJ	L	220	U		230	U		100	J		220	U		570	UJ	L	580	U		460	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		1,400	U		1,400	U		460	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	UJ	L	220	U		230	U		220	U		220	U		1,400	UJ	L	1,400	UJ	L	460	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	UJ	L	220	U		230	U		220	U		220	U		1,400	U		1,400	U		460	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	UJ	L	580	U		460	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		1,400	UJ	L	1,400	U		460	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	190	UJ		43	UJ		39	UJ		39	UJ		40	UJ		39	UJ		39	UJ		210	UJ		220	UJ		81	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		1,400	UJ	L	1,400	U		460	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		51	J		220	U		570	UJ	L	580	U		460	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	U		580	U		460	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		1,400	UJ	L	1,400	U		460	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	1,100	U		240	U		220	U		220	U		230	U		220	U		220	U		570	UJ	L	580	U		460	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,320			106			240			-			633			551			238			-			1,410			450		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	44,650			931.2			6,084			712.8			1,640			13,222			5,534			2,016			42,940			26,230		

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-49 / S-3-4 / 04-24-01			SB-50 / S-1-2 / 04-24-01			SB-50 / S-3-4 / 04-24-01			SB-51 / S-1-2 / 12-7-00			SB-51 / S-5-6 / 12-7-00			SB-52 / S-1-2 / 04-18-01			SB-52 / S-4-5 / 04-18-01			SB-53 / S-1-2 / 07-13-01			SB-53 / S-3-4 / 07-13-01			SB-54 / S-1 / 05-03-01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																								
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	940	J	I	42			5.8	U		3.0	U		500			2,000	J	L	7.1			97	J		**140,000**			220	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	J		22			5.8	U		3.0	U		420			930	U		5.7	U		250	U		500,000			81	J	
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	1,500	J	I	95			5.8	U		3.0	J	L	590	J	L	2,200	J	L	16			250			270,000			95	J	
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	3,100	J	I	190			5.8	U		6.0			920			3,700	J	L	44			610			140,000			360		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	**3,300**	J	I	150			5.8	U		8.0			800			**3,400**	J	L	37			360			**110,000**			350		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	3,600	J	I	150			5.8	U		8.0			550			3,700	J	L	33			650			81,000			420		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	770	J	I	88			5.8	U		6.0			570			1,500	J	L	22			290			32,000	J		180	J	
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	2,600	J	I	120			5.8	U		6.0	J	L	450	J	L	2,300	J	L	34			420			43,000	J		210	J	
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	3,200	J	I	220			5.8	U		8.0	J	L	1,400	J	L	4,000	J	L	47			1,300			140,000			390		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	290	J	I	16			5.8	U		3.0	U		87			420	J		5.7	U		91	J		10,000	J		58	J	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	7,800	J	I	440			5.8	U		11			1,200			9,800	J	L	100			1,300			290,000			620		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	990	J	I	58			5.8	U		3.0	U		810			1,400			7.3			210	J		**400,000**			220	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	1,000	J	I	89			5.8	U		5.0			360			1,700			25			240	J		36,000	J		200	J	
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	470	J	I	29			5.8	U		3.0	U		8,500			890	J		5.7	U		180	J		930,000			220	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	1,400	J	I	78			5.8	U		3.0	UJ	L	1,400	J	L	2,000	J	L	16			660			1,900,000			44	J	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	7,200	J	I	480			7.1			6.0			3,800			13,000	J	L	75			1,600			1,000,000			330		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	5,900	J	I	370			5.8	U		14			2,200			7,900	J	L	90			1,300			370,000			590		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	44,280			2,637			7.10			81			24,557			59,910			553.4			9,558			6,392,000			3,928		
Other SVOCs																																								
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	400	J	L	250	J	L	110	J	L	260	UJ	L	1,200	UJ	L	930	UJ	L	73	J	L	52	J	L	54,000	UJ	L	72	J	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	470	UJ	L	230	UJ	L	230	UJ	L	100	U		470	U		930	UJ	L	230	U		250	UJ	L	54,000	UJ	L	220	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	83	UJ		40	UJ		41	UJ		100	U		220	UJ		160	UJ		40	UJ		43	UJ		9,500	UJ		38	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	UJ	L	470	UJ	L	930	U		230	U		250	U		54,000	U		220	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	470	U		46	JEB		230	U		80	J		470	UJ	L	930	U		230	U		250	U		54,000	U		220	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	UJ	L	930	U		230	U		250	U		54,000	U		220	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	1,200	J	I	83	J		230	U		100	U		470	U		1,600			230	U		110	J		20,000	J		220	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	UJ	L	470	UJ	L	930	U		230	U		250	U		54,000	U		220	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	790	J	I	54	J		230	U		100	U		470	U		1,600			230	U		88	J		60,000			220	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	UJ	L	470	UJ	L	930	U		230	U		250	U		54,000	U		220	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	UJ	L	470	UJ	L	930	UJ	L	230	UJ	L	250	UJ	L	54,000	UJ	L	220	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	83	UJ		40	UJ		41	UJ		31	UJ		140	UJ		160	UJ		40	UJ		43	UJ		9,500	UJ		38	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	1,200	U		560	U		580	U		260	UJ	L	1,200	UJ	L		R		570	U		250	UJ	L	54,000	UJ	L	550	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	2,400	U		1,100	U		1,200	U		260	UJ	L	1,200	UJ	L		R		1,100	UJ	L	610	UJ	L	140,000	UJ	L	1,100	U	
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	UJ	L	470	UJ	L	930	U		230	U		250	U		54,000	U		220	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	UJ	L	470	UJ	L		R		230	UJ	L	250	UJ	L	54,000	UJ	L	550	U	
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	160	J	I	230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		260	U		1,200	U		930	U		230	U		250	U		54,000	U		220	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		260	UJ	L	1,200	UJ	L	930	U		230	U		250	U		54,000	U		220	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		260	U		1,200	U		930	U		230	U		250	U		54,000	U		220	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		260	U		1,200	U		930	U		230	U		250	U		54,000	U		220	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	83	UJ		40	UJ		41	UJ		39	UJ		180	UJ		160	UJ		40	UJ		43	UJ		9,500	UJ		38	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		260	U		1,200	U		930	U		230	U		250	U		54,000	U		220	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	120	J	I	230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		260	U		1,200	U		930	U		230	U		250	U		54,000	U		220	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	470	U		230	U		230	U		100	U		470	U		930	U		230	U		250	U		54,000	U		220	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,670			433			110			80			-			3,200			73			250			80,000			72		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	46,950			3,070			117.1			161			24,557			63,110			626.4			9,808			6,472,000			4,000		

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-55 / S-1 / 05-03-01			SB-56 / S-1 / 05-03-01			SB-57 / S-1 / 05-03-01			SB-58 / S-2-3 / 04-26-01			SB-59 / S-4-5 / 04-26-01			SB-60 / S-4-5 / 04-25-01			SB-61 / S-1-2 / 04-25-01			SB-62 / S-3-4 / 04-17-01			SB-63 / S-1-2 / 04-02-01			SB-64 / S-3-4 / 03-23-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.			Residential Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																									
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	22			5.0	UJ	I	5.1	U		45			5.1	U		5.4	U		5.5	U		6.0	U		6.0	U		5.3	U	
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	11			5.0	U		5.1	U		42			5.1	U		5.4	U		5.5	U		6.0	U		13			5.3	U	
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	86			5.0	UJ	I	5.1	U		120			5.1	U		5.4	U		7.0			6.0	U		16			6.6		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	250			7.0	J	I	5.1	U		270			7.7			5.4	U		25			10			71			11		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	230			6.5	J	I	5.1	U		240			6.9			5.4	U		24			11			66			10		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	170			6.6	J	I	5.1	U		270			7.4			5.4	U		27			19			66			12		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	120			5.0	UJ	I	5.1	U		100			5.1	U		5.4	U		17			8.6			39			5.3	U	
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	160			5.2	J	I	5.1	U		210			5.7			5.4	U		20			6.5			58			6.9		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	250			7.0	J	I	5.1	U		330			8.2			5.4	U		33			14			88			11		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	23			5.0	U		5.1	U		18			5.1	U		5.4	U		5.5	U		6.0	U		7.8			5.3	U	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	330			13	J	I	5.1	U		620			17			9.6			63			28			150			25		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	24			5.0	U		5.1	U		56			5.1	U		5.4	U		5.5	U		6.0	U		6.0	U		5.3	U	
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	130			5.0	UJ	I	5.1	U		91			5.1	U		5.4	U		17			8.3			40			5.3	U	
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	33			5.0	U		5.1	U		47			5.1	U		5.4	U		5.5	U		6.0	U		6.0	U		5.3	U	
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	28			5.0	U		5.1	U		61			5.1	U		5.4	U		5.5	U		6.0	U		7.7			5.3	U	
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	340			8.6	J	I	5.1	U		570			12			8.2			43			14			100			21		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	440			12	J	I	5.1	U		500			17			7.8			57			23			150			22		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,647			65.9			-			3,590			81.9			25.6			333			142.4			872.5			125.5		
Other SVOCs																																									
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	210	UJ	L	41	J	L	45	J	L	240	J	L	200	UJ	L	220	UJ	L	95	J	L	240	UJ	L	240	U		210	UJ	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	UJ	L	200	U		220	U		220	UJ	L	240	U		240	U		210	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	37	UJ		35	UJ		36	UJ		41	UJ		36	UJ		38	UJ		38	UJ		42	UJ		42	UJ		96	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	210	U		200	U		210	U		55	JEB		200	U		220	U		220	U		240	U		240	U		210	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		93	J		200	UJ	L	220	UJ	L	220	U		240	UJ	L	240	U		210	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		65	J		200	U		220	U		220	U		240	U		240	U		210	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	37	UJ		35	UJ		36	UJ		41	UJ		36	UJ		38	UJ		38	UJ		42	UJ		42	UJ		62	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	520	U		500	U		510	U		590	U		200	U		220	U		550	U		240	U		600	U		530	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	1,000	U		1,000	U		1,000	U		1,200	U		510	UJ	L	540	UJ	L	1,100	U		600	UJ	L	1,200	U		530	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	UJ	L	200	U		220	U		220	U		240	U		240	U		210	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	520	U		500	U		510	U		240	U		200	UJ	L	220	UJ	L	220	U		240	UJ	L	240	U		210	U	
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	UJ	L	220	UJ	L	220	U		240	UJ	L	240	U		210	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	UJ	L	220	UJ	L	220	U		240	UJ	L	240	U		210	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	37	UJ		35	UJ		36	UJ		41	UJ		36	UJ		38	UJ		38	UJ		42	UJ		42	UJ		79	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	210	U		200	U		210	U		240	U		200	U		220	U		220	U		240	U		240	U		210	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			41			45			453			-			-			95			-			-			-		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,647			106.9			45			4,043			81.9			25.6			428			142.4			872.5			125.5		

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																										
	Human Health		Ecological								SB-65 / S-4-5 / 03-26-01			SB-66 / S-3-4 / 07-10-01			SB-68 / S-2-3 / 07-11-01			SB-72 / S-1-2 / 07-10-01			SH-05S / S-1 / 02-05-01			SH-18S / S-1-2 / 07-24-01			UST-1 / S-1-2 / 04/04/01			UST-1 / S-3-4 / 04/04/01			UST-2 / S-1-2 / 04/05/01			UST-2 / S-3-4 / 04/05/01		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Residential Area East of South St.			Residential Area West of South St.			Residential Area West of South St.			Residential Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																								
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		9.3			5.6	U		6.4	U		2,100	U		1,100	U		1,700	J		22		
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		16			5.6	UJ	L	6.4	U		3,800			990	J		2,800			69		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		31			5.6	UJ	L	6.4	U		2,200			880	J		2,700			34		
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		140			5.6	UJ	L	6.4	U		12,000			3,400			8,900			50		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		98			5.6	UJ	L	6.4	U		**16,000**			**4,000**			**12,000**			110		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	6.5			5.5	U		5.6	U		100			5.6	UJ	L	6.4	U		16,000			4,100			15,000			85		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		42			5.6	UJ	L	6.4	U		4,100			1,000	J		2,900			41		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		80			5.6	UJ	L	6.4	U		12,000			3,400			10,000			52		
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	6.1			5.5	U		5.6	U		140			5.6	UJ	L	6.4	U		13,000			3,400			9,100			91		
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		16			5.6	UJ	L	6.4	U		1,500	J		330	J		1,100	J		11	U	
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	11			5.5	U		5.6	U		250			7.4	J	L	6.4	U		19,000			6,000			12,000			100		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		17			5.6	UJ	L	6.4	U		410	J		280	J		2,000	J		34		
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		58			5.6	UJ	L	6.4	U		5,600			1,300			4,100			46		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		6.5			5.6	UJ	L	6.4	U		550	J		720	J		3,400			23		
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	5.4	U		5.5	U		5.6	U		17			5.6	UJ	L	6.5			1,200	J		780	J		8,800			46		
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	7.8			5.5	U		5.6	U		130			10	J	L	10			4,200			2,400			5,600			100		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	10			5.5	U		5.6	U		200			11			6.4	U		20,000			6,400			13,000			300		
Total PAHs	NS		NS	NS	NS	NS	NS	NS	NS	NS	41.4			-			-			1,350.8			28.4			16.5			131,560			39,380			115,100			1,203		
Other SVOCs																																								
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	220	UJ	L	220	UJ	L	57	J	I	220	UJ	L	260	UJ	L	2,100	U		1,100	U		2,300	U		2,100	UJ	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	UJ	L	220	U		260	UJ	L	2,100	U		1,100	U		2,300	U		2,100	UJ	L
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		39	UJ		39	UJ		40	UJ		102	UJ		45	UJ		380	UJ		190	UJ		410	UJ		2,100	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	220	U		220	U		220	U		230	U		200	J		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	220	UJ	L	220	UJ	L	230	U		220	UJ	L	260	U		450	J		1,100	U		760	J		2,100	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	UJ	L	260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		210	J		2,000	J		2,100	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	UJ	L	260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	38	UJ		39	UJ		39	UJ		40	UJ		66	UJ		45	UJ		380	UJ		190	UJ		410	UJ		2,100	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		580	U		560	UJ	L	260	UJ	L	5,400	U		2,700	U		5,800	U		2,100	U	
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	540	UJ	L	550	UJ	L	560	UJ	L	580	UJ	I		R		640	UJ	L	11,000	U		5,400	U		12,000	U		2,100	U	
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	220	UJ	L	220	UJ	L	230	U		220	UJ	L	260	UJ	L	2,100	U		1,100	U		2,300	U		2,100	U	
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	220	UJ	L	220	UJ	L	230	U		220	UJ	L	260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	220	UJ	L	220	UJ	L	220	UJ	L	230	U		220	UJ	L	260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	38	UJ		39	UJ		39	UJ		40	UJ		84	UJ		45	UJ		380	UJ		190	UJ		410	UJ		2,100	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		580	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	UJ	L
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	220	U		220	U		220	U		230	U		220	U		260	U		2,100	U		1,100	U		2,300	U		2,100	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			57			200			-			450			210			2,760			-		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	41.4			-			-			1,407.8			228.4			16.5			132,010			39,590			117,860					

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																	
	Human Health		Ecological								UST-3 / S-1-2 / 04/04/01			UST-3 / S-3-4 / 04/04/01			UST-4 / S-1-2 / 12/11/00			UST-4 / S-3-4 / 12/10/00			UST-5 / S-1-2 / 12/12/00			UST-5 / S-3-4 / 12/13/00			UST-6 / S-1-2 / 12/13/00			UST-6 / S-3-4 / 12/13/00		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																				
Acenaphthene	1,000,000	370,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	110	J		13			210			11			25			6.0			3.0			310		
Acenaphthylene	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	67	J		11			37			6.0			150			24			27			240		
Anthracene	1,000,000	2,200,000	NS	NS	NS	NS	NS	NS	NS	NS	350			28			200	J	L	20	J	L	180	J	L	31	J	L	30	J	L	280	J	L
Benzo(a)anthracene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	1,100			78			670			67			250			48			88			300		
Benzo(a)pyrene	700	62	NS	NS	NS	**1,980**	NS	NS	NS	NS	1,100			61			610			52			270			46			100			180		
Benzo(b)fluoranthene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	1,600			62			580			45			200			29			87			170		
Benzo(g,h,i)perylene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	280			28			360			36			180			22			59			230		
Benzo(k)fluoranthene	7,000	6,200	NS	NS	NS	NS	NS	NS	NS	NS	1,100			52			420	J	L	42	J	L	220	J	L	37	J	L	82	J	L	160	J	L
Chrysene	7,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	1,200			85			820	J	L	72	J	L	280	J	L	55	J	L	95	J	L	580	J	L
Dibenz(a,h)anthracene	700	62	NS	NS	NS	NS	NS	NS	NS	NS	80	J		5.1	U		63			6.0			28			5.0			10			56		
Fluoranthene	1,000,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	2,000			150			1,600			110			430			76			110			500		
Fluorene	1,000,000	270,000	NS	**30,000**	NS	NS	NS	NS	NS	NS	130	J		14			160			6.0			16			9.0			3.0	U		650		
Indeno(1,2,3-cd)pyrene	700	620	NS	NS	NS	NS	NS	NS	NS	NS	310			26			370			29			170			20			61			140		
Methylnaphthalene (2-)	500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	130	J		14			96			13			65			16			8.0			4,900		
Naphthalene	100,000	5,600	NS	NS	NS	NS	NS	NS	NS	NS	61	J		6.8			130.0	J	L	14	UJ	L	86	J	L	10	J	L	9.0	J	L	320	J	L
Phenanthrene	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	1,500			140			1,900			100			380			91			37			2,300		
Pyrene	700,000	230,000	NS	NS	NS	NS	NS	NS	NS	NS	2,300			140			1,500			130			480			96			140			680		
Total PAHs	NS		NS	NS	NS	NS	NS	NS	NS	NS	13,418			908.8			9,726			745			3,410			621			946			11,996		
Other SVOCs																																				
Benzoic acid	NS	24,000,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		94	J	L	69	J	L	2,100	UJ	L	280	UJ	L	270	UJ	L	270	UJ	L	1,300	UJ	L
Benzyl Alcohol	NS	1,800,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	UJ	L	120	U		2,100	U		110	U		110	U		110	U		530	UJ	L
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
bis(2-Chloroethyl)ether	700	220	NS	NS	NS	NS	NS	NS	NS	NS	2,100	UJ		36	UJ		120	U		2,100	U		110	U		110	U		110	U		240	UJ	
bis(2-Chloroisopropyl)ether	NS	2,900	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	UJ	L	2,100	UJ	L	110	UJ	L	110	UJ	L	110	UJ	L	530	UJ	L
bis(2-Ethylhexyl)phthalate	200,000	35,000	NS	NS	**910**	36,000	NS	NS	NS	NS	**2,100**	J		37	J		63	J		**2,100**	J		110	U		110			110	U		530	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Butylbenzylphthalate	NS	1,200,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Carbazole	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	J		200	U		160			2,100	U		110	U		110	U		110	U		530	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Chloroaniline (4-)	100,000	24,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	UJ	L	2,100	UJ	L	110	UJ	L	110	UJ	L	110	UJ	L	530	UJ	L
Chloronaphthalene (2-)	NS	490,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Chlorophenol (2-)	100,000	6,300	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Dibenzofuran	NS	15,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		130			2,100	U		110	U		110	U		110	U		530	U	
Dichlorobenzene (1,2-)	100,000	110,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Dichlorobenzene (1,3-)	100,000	53,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Dichlorobenzene (1,4-)	40,000	3,400	NS	**20,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Dichlorobenzidine (3,3'-)	1,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	UJ	L	2,100	UJ	L	110	UJ	L	110	UJ	L	110	UJ	L	530	UJ	L
Dichlorophenol (2,4-)	40,000	18,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Diethylphthalate	1,000,000	4,900,000	**100,000**	NS	NS	9,084,000	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Dimethylphenol (2,4-)	400,000	120,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	UJ	L	2,100	UJ	L	110	UJ	L	110	UJ	L	110	UJ	L	530	UJ	L
Dimethylphthalate	1,000,000	61,000,000	NS	**200,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Di-n-butylphthalate	NS	610,000	200,000	NS	**90**	1,090,000	NS	NS	NS	NS	2,100	UJ		36	UJ		34	UJ		2,100	UJ		33	UJ		32	UJ		33	UJ		160	UJ	
Dinitro-2-methylphenol (4,6-)	NS	610	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		510	U		290	UJ	L	2,100	UJ	L	280	UJ	L	270	UJ	L	270	UJ	L	1,300	UJ	L
Dinitrophenol (2,4-)	40,000	12,000	**20,000**	NS	NS	NS	NS	NS	NS	NS	2,100	U		1,000	U		290	UJ	L	2,100	UJ	L	280	UJ	L	270	UJ	L	270	UJ	L	1,300	UJ	L
Dinitrotoluene (2,4-)	1,000	12,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Dinitrotoluene (2,6-)	NS	6,100	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Di-n-octylphthalate	NS	240,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	UJ	L	2,100	U		110	U		110	UJ	L	110	U		530	UJ	L
Hexachlorobenzene	700	300	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Hexachlorobutadiene	5,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Hexachlorocyclopentadiene	NS	37,000	**10,000**	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	UJ	L	2,100	UJ	L	110	UJ	L	110	UJ	L	110	UJ	L	530	UJ	L
Hexachloroethane	6,000	6,100	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Isophorone	NS	510,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		65	J		120	U		2,100	U		110	U		110	U		110	U		530	U	
Methylphenol (2-)	NS	310,000	NS	NS	NS	**1,043,900**	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Methylphenol (4-)	NS	31,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Nitroaniline (2-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		290	U		2,100	U		280	U		270	U		270	U		1,300	U	
Nitroaniline (3-)	NS	1,800	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		290	UJ	L	2,100	UJ	L	280	UJ	L	270	UJ	L	270	UJ	L	1,300	UJ	L
Nitroaniline (4-)	NS	18,000	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		290	U		2,100	U		280	U		270	U		270	U		1,300	U	
Nitrobenzene	NS	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Nitrophenol (4-)	NS	NS	NS	**7,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		290	U		2,100	U		280	U		270	U		270	U		1,300	U	
Nitroso-di-n-propylamine (N-)	NS	69	NS	NS	NS	NS	NS	NS	NS	NS	2,100	UJ		36	UJ		44	UJ		2,100	UJ		42	UJ		40	UJ		40	UJ		200	UJ	
Nitrosodiphenylamine (N-)	NS	99,000	NS	**20,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Pentachlorophenol	7,000	3,000	**3,000**	6,000	NS	NS	NS	NS	NS	NS	2,100	U		200	UJ	L	290	U		2,100	U		280	U		270	U		270	U		1,300	U	
Phenol	500,000	1,800,000	70,000	**30,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Trichlorobenzene (1,2,4-)	400,000	6,200	NS	**20,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Trichlorophenol (2,4,5-)	1,000,000	610,000	**4,000**	9,000	NS	NS	NS	NS	NS	NS	2,100	U		200	U		290	U		2,100	U		280	U		270	U		270	U		1,300	U	
Trichlorophenol (2,4,6-)	40,000	610	NS	**10,000**	NS	NS	NS	NS	NS	NS	2,100	U		200	U		120	U		2,100	U		110	U		110	U		110	U		530	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	4,200			196			422			2,100			-			110			-			-		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	17,618			1,104.8			10,148			2,845			3,410			731			946			11,996		

TABLE 12C
Summary of Lower Soil Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels).

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.
"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.
"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.
"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the American Robin.
"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian (birds) are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

"R" Indicates data rejected during validation.

"JEB" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The compound was detected in an associated equipment blank. The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision, and with possible uncertainty due to the potential for contamination.

Bias:

"L" Low

"I" Indeterminate

"H" High

8. Total concentrations listed (e.g. Total PAHs) are the sum of detected concentrations of the relevant suite of compounds. "PAHs" are polycyclic aromatic hydrocarbons. "Other SVOCs" are non-PAH semi-volatile organic compounds.

TABLE 12D
Summary of Lower Soil Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Cocnentrations in µg/kg																				
	Human Health		Ecological								SB-06 / S-4-5 / 03-16-01			SB-09 / S-2-3 / 04-23-01			SB-10 / S-3 / 06-07-01			SB-11 / S-2-3 / 06-07-01			SB-12 / S-1-2 / 04-17-01			SB-13A / S-3-4 / 04-13-01			SB-14 / S-3-4 / 04-13-01			SB-15 / S-2-3 / 04-16-01			SB-16 / S-3-4 / 06-06-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Peripheral Off-Facility Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																																							
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	2.1	U		1.5	J	I	1.9	U		1.8	U		2.2	U		2.1	U		15	J	I	2.2	U		1.8	U	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		7.6	J	I	1.9	U		1.8	U		2.2	U		2.1	U		16	J	I	2.2	U		1.8	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.5	J	I	1.9	U		1.8	U		2.2	U		2.1	U		49	J	I	2.2	U		1.8	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	2.1	U		160			1.9	U		1.8	U		2.2	U		2.1	U		31	J	I	2.2	U		1.8	U	
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		100			1.9	U		1.8	U		2.2	U		2.1	U		210	J	I	2.2	U		1.8	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		57	J		1.9	U		1.8	U		2.2	U		2.1	U		120	J	I	2.2	U		1.8	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			157			-			-			-			-			330			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			327.6			-			-			-			-			441			-			-		
CVOCs (µg/kg)																																							
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		64	J		1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	5.5	U		9.5	UJ	I	9.0	U		7.0	U		14	U		13	U		14	UJ	I	9.5	U		7.6	U	
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Tetrachloroethane	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	2.1	U		**4,500**			1.9	U		1.8			2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			4,564			-			1.8			-			-			-			-			-		
Other VOCs (µg/kg)																																							
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	5.1	U		48	J	I	6.6	JEB		9.0	U		8.1	U		12	U		42	UJ	I	5.5	UJ	L	9.0	U	
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	UJ	L	1.8	UJ	L	2.2	UJ	I	5.2	UJ	I	5.2	UJ	I	2.2	UJ	I	1.8	UJ	L
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		9.8	J	H
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		1.9	UJ	I	1.9	U		1.8	U		2.2	U		2.1	U		2.1	UJ	I	2.2	U		1.8	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			48			6.6			-			-			-			-			-			9.8		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			4,939.6			6.6			1.8			-			-			441			-			9.8		
VPH (µg/kg)																																							
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													21,000	U														
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													6,100	U														
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													12,000	U														
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS													-															
EPH (µg/kg)																																							
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													3,200	U														
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													4,300	U														
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													9,200	U														
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS													-															

TABLE 12D
Summary of Lower Soil Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Cocnentrations in µg/kg																				
	Human Health		Ecological								SB-17 / S-4-5 / 04-05-01			SB-18 / S-2-3 / 04-11-01			SB-19 / S-1-2 / 06-08-01			SB-20 / S-2-3 / 06-12-01			SB-21 / S-3-4 / 04-02-01			SB-22 / S-3 / 06-13-01			SB-23 / S-2-3 / 04-11-01			SB-24 / S-3-4 / 04-12-01			SB-25 / S-4-5 / 03-29-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																																							
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	2.0	U		1.1	J	L	2.6			1.9	U		1.9	U		1.8	U		1.7	J		1.9	U		1.7	U	
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	3.1			1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.2	J		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			4.3			-			-			-			-			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			1.1			6.9			-			-			-			1.7			-			-		
CVOCs (µg/kg)																																							
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	7.9	U		14	UJ	I	6.6	U		7.5	UJ	L	17	U		7.5	UJ	L	27	U		13	U		5.5	U	
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Tetrachloroethane	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-			-		
Other VOCs (µg/kg)																																							
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	11	EB		14	UJ	I	11	EB		9.3	U		7.0	EB		9.0	U		17	U		13	U		17	U	
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		4.7	UJ	I	1.8	UJ	L	1.9	U		1.9	U		1.8	U		4.5	UJ	I	4.8	UJ	I	1.7	U	
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		3.9		
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.0	J		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	2.0	U		1.9	UJ	L	1.8	U		1.9	U		1.9	U		1.8	U		1.8	U		1.9	U		1.7	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	11			-			11			1.0			7.0			-			-			-			3.9		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	11			1.1			17.9			1.0			7.0			-			1.7			-			3.9		
VPH (µg/kg)																																							
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	19,000	U																							20,000	U	
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5,300	U																							37,000	J	I
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	11,000	U																							17,000	J	I
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-																								54,000		
EPH (µg/kg)																																							
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	7,200																								92,000		
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	6,200																								45,000	J	I
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	8,800	U																							16,000		
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	13,400																								153,000		

TABLE 12D
Summary of Lower Soil Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Cocnentrations in µg/kg																				
	Human Health		Ecological								SB-26 / S-2-3 / 03-30-01			SB-27 / S-2-3 / 06-15-01			SB-35 / S-1-2 / 05-02-01			SB-40 / S-2-3 / 02-26-01			SB-41 / S-1-2 / 03-20-01			SB-41D / S-5-6 / 07-27-01			SB-42 / S-1-2 / 07-27-01			SB-42 / S-3-4 / 07-27-01			SB-43 / S-1-2 / 08-01-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Peripheral On-Facility Area West of South St.			Peripheral Off-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																																							
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		1.7	J			R		2.3	UJ	I	1.5	J	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		1.6	J		1.9	J	L	2.3	UJ	L	9.4		
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			-			-			-			-				R		-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			3.3			1.9			-			10.9		
CVOCs (µg/kg)																																							
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	UJ	L	1.8	UJ	L	2.5	UJ	L	2.5	U			R		2.3	UJ	L	2.3	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	5.5	UJ	I	9.3	UJ	L	5.2	U		8.1	UJ	I	10	U		6.2	UJ	I		R		5.7	UJ	I	5.7	UJ	I
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Tetrachloroethene	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	2.2	UJ	I	5.1	J	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	UJ	L	2.5	U			R		2.3	UJ	L	2.3	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			5.1			-			-			-			-			-			-			-		
Other VOCs (µg/kg)																																							
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	5.5	UJ	I	10	UJ	L	5.2	U		31	UJ	I	11	U		63	UJ	I	150	J	L	24	UJ	I	100	UJ	I
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		4.3	J	L	2.5	U		16				R		2.3	UJ	I	17		
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		0.90	J	L	2.5	U		2.5	U			R		2.3	UJ	I	6.1		
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		6.2	UJ	I		R		5.7	UJ	L	5.7	UJ	I
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	L	2.3	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	4.5	J	H	1.8	UJ	L	2.5	U		250	J	H	85	J	L	25	J	I	130	J	H
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	2.0	UJ	L	2.1	U		1.8	UJ	L	2.5	U		2.5	U			R		2.3	UJ	I	2.3	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			4.5			5.2			-			266			235			25			153.1		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			5.1			4.5			5.2			-			269.3			236.9			25			164		
VPH (µg/kg)																																							
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
EPH (µg/kg)																																							
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																													

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Analytes	COPC Screening Levels										Cocnentrations in µg/kg																				
	Human Health		Ecological								SB-43 / S-3-4 / 08-01-01			SB-44 / S-1-2 / 07-31-01			SB-44 / S-3-4 / 07-31-01			SB-45 / S-1-2 / 07-19-01			SB-45 / S-4-5 / 07-19-01			SB-46 / S-1-2 / 07-18-01			SB-46 / S-3-4 / 07-18-01			SB-46B / S-1-2 / 07-18-01			SB-47 / S-1-2 / 07-25-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																																							
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	2.1	U		3.3			2.2	U		2.1	U		2.2	U		2.2	UJ	L	9.6	J	H	1.2	J	L	2.0	U	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	2.1	U		2.6			2.2	U		1.7	J		2.2	U		2.8	J	L	2.0	J	H	3.3	J	L	2.0	U	
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	1.6	J	H	1.9	J		2.2	U		2.1	U		2.2	U		2.2	UJ	L	2.1	J	H	2.0	UJ	L	2.0	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	1.6			1.9			-			-			-			-			2.1			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.6			7.8			-			1.7			-			2.8			13.7			4.5			-		
CVOCs (µg/kg)																																						
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U			R		1.9	U		2.0	UJ	L	2.0	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	5.2	UJ	I	5.4	UJ	I	5.4	UJ	I	5.3	UJ	I	5.5	UJ	I	10	UJ	I	9.6	UJ	I	5.6	UJ	I	5.0	UJ	I
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Tetrachloroethene	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-			-		
Other VOCs (µg/kg)																																						
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	130	J	I	98	J	I	76	UJ	I	41	U		43	U		33	UJ	L	28	U		130	J	L	5.0	U	
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	UJ	I	2.2	UJ	I	2.2	UJ	I	1.9	UJ	I	2.0	UJ	I	2.0	UJ	I
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	58	J	H	24			24			5.8			7.1			4.3	J	L	5.1	J	H	15	J	L	2.0	U	
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	5.4	J	H	33			2.2	U		9.2			2.2	U		13	J	L	22	J	H	24	J	L	2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.2	UJ	I	5.4	UJ	I	5.4	UJ	I	2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	96	J	H	78	J	H	49	J	H	96	J	H	74	J	H	57	J	L	120	J	H	2.0	UJ	L	2.0	U	
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	2.1	U		2.2	U		2.2	U		2.1	U		2.2	U		2.2	UJ	L	1.9	U		2.0	UJ	L	2.0	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	289.4			233			73			111			81.1			74.3			147.1			169			-		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	291			240.8			73			112.7			81.1			77.1			160.8			173.5			-		
VPH (µg/kg)																																						
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																												
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																												
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																												
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																												
EPH (µg/kg)																																						
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																												
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																												
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																												
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																												

TABLE 12D
Summary of Lower Soil Data - Volatile Organic Compounds and VPH/EPH
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Walpole, Massachusetts

Analytes	COPC Screening Levels										Cocnentrations in µg/kg																	
	Human Health		Ecological								SB-47 / S-3-4 / 07-25-01			SB-48 / S-1-2 / 12-14-00			SB-48A / S-3-4 / 12-14-00			SB-49 / S-1-2 / 04-24-01			SB-49 / S-3-4 / 04-24-01			SB-50 / S-1-2 / 04-24-01			SB-50 / S-3-4 / 04-24-01			SB-51 / S-1-2 / 12-7-00			SB-51 / S-5-6 / 12-7-00		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
			Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																																						
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	1.5	J		2.0	UJ	L	2.0	UJ	L	2.0	U		2.1	U		1.9	J		2.1	U		2.0	U		2.0	U	
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	J		2.1	U		2.0	U		2.0	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.0	J		2.1	U		2.0	U		2.0	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			-			-			-			2.9			-			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.5			-			-			-			-			4.8			-			-			-		
CVOCs (µg/kg)																																						
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U	H	2.0	U	H
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	UJ	L	2.0	UJ	L
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	4.7	UJ	I	6.0	UJ	I	5.0	U	H	10	U		22	U		9.7	U		10	U		5.0	UJ	I	6.0	UJ	I
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Tetrachloroethene	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-			-		
Other VOCs (µg/kg)																																						
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	38	U		3.0	JEB	I	5.0	JEB	H	56			12	U		4.9	U		5.4	U		5.0	U		17	U	H
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	1.9	UJ	I	2.0	UJ	L	2.0	U		2.0	U		2.1	UJ	L	1.9	UJ	L	2.1	UJ	L	5.0	UJ	L	6.0	UJ	L
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	4.9			2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		5.0	U		6.0	U	
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	3.1			2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	L	2.0	U		2.0	U		2.1	U		1.9	U		2.1	U		2.0	U		2.0	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	8.0			3.0			5.0			56			-			-			-			-			-		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	9.5			3.0			5.0			56			-			4.8			-			-			-		
VPH (µg/kg)																																						
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS				21,000	U		21,000	U		22,000	U		21,000	U		21,000	U		19,000	U		18,000	U		22,000	U	
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS				6,000	U		6,000	U		6,400	U		6,100	U		5,900	U		5,400	U		5,300	U		6,200	U	
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS				12,000	U		12,000	U		13,000	U		12,000	U		12,000	U		11,000	U		11,000	U		12,000	U	
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS				-			-			-			-			-			-			-			-		
EPH (µg/kg)																																						
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS				3,200	UJ	L	20,000	J	L	4,500			4,600			3,400	U		3,400	U		3,100	UJ	L	250,000	J	L
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS				41,000			660,000			21,000			24,000			4,500	U		4,600	U		7,400			530,000		
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS				9,200	U		400,000			39,000			33,000			9,800			9,700	U		8,700	U		470,000		
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS				41,000			1,080,000			64,500			61,600			9,800			-			7,400			1,250,000		

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Walpole, Massachusetts

Analytes	COPC Screening Levels										Cocnentrations in µg/kg																				
	Human Health		Ecological								SB-52 / S-1-2 / 04-18-01			SB-52 / S-4-5 / 04-18-01			SB-53 / S-1-2 / 07-13-01			SB-53 / S-3-4 / 07-13-01			SB-54 / S-1 / 05-03-01			SB-55 / S-1 / 05-03-01			SB-56 / S-1 / 05-03-01			SB-57 / S-1 / 05-03-01			SB-62 / S-3-4 / 04-17-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Residential Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																																							
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		49,000			2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		32,000			2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		160,000			2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		7.9			**140,000**			2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		140,000			2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		68,000			2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			-			**208,000**			-			-			-			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			7.9			589,000			-			-			-			-			-		
CVOCs (µg/kg)																																							
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	1.5	J	L	2.1	U		2.3	U		12,000	U		1.3	J		2.1	U		1.8	U		1.9	U		2.2	U	
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	20	UJ	I	14	U		8.0	UJ	I	44,000	UJ	I	14	U		22	U		4.5	U		4.6	U		22	U	
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Tetrachloroethane	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.5			-			-			-			1.3			-			-			-			-		
Other VOCs (µg/kg)																																							
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	19	UJ	I	5.3	UJ	L	22	U		31,000	U		5.9	U		5.3	U		4.5	U		4.6	U		8.5	U	
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	I	5.3	UJ	I	2.3	UJ	I	12,000	UJ	I	2.0	U		2.1	U		1.8	U		1.9	U		2.2	UJ	I
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		7.7			12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	2.2	UJ	L	2.1	U		2.3	U		12,000	U		2.0	U		2.1	U		1.8	U		1.9	U		2.2	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			7.7			-			-			-			-			-			-		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.5			-			15.6			589,000			1.3			-			-			-			-		
VPH (µg/kg)																																							
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
EPH (µg/kg)																																							
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS																													
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS																													

TABLE 12D
Summary of Lower Soil Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Cocnentrations in µg/kg																				
	Human Health		Ecological								SB-64 / S-3-4 / 03-23-01			SB-68 / S-2-3 / 07-11-01			SH-05S / S-1 / 02-05-01			SH-18S / S-1-2 / 07-24-01			UST-1 / S-1-2 / 04-04-01			UST-1 / S-3-4 / 04-04-01			UST-2 / S-1-2 / 04-05-01			UST-2 / S-3-4 / 04-05-01			UST-3 / S-1-2 / 04-04-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Residential Area East of South St.			Residential Area West of South St.			Peripheral On-Facility Area West of South St.			Peripheral On-Facility Area West of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																																							
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	UJ	L	2.5	U		9.4	J	L	36	J	L	2.3	J	L	5.0			1.9	UJ	L
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	3.0	J	H	1.9	UJ	L
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	UJ	L	2.5	U		6.8	J	L	8.7	J	L	3.7	UJ	L	1.1	J		2.4	J	L
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.6	J	L	4.0	J	L	3.7	UJ	L	1.1	J	H	1.9	UJ	L
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	1.3	J	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			-			-			1.6			5.3			-			1.1			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			17.8			50			2.3			10.2			2.4		
CVOCs (µg/kg)																																							
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	UJ	L	2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	7.1	U		5.0	UJ	L	5.0	U	H	6.1	UJ	I	4.6	UJ	L	16	UJ	I	9.3	UJ	L	20	U		4.7	UJ	L
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Tetrachloroethene	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	UJ	L	2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-			-		
Other VOCs (µg/kg)																																						
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	9.1	U		5.0	UJ	I	10	U	H	6.1	U		4.6	UJ	L	20	JEB	L	110	J	L	24	EB		9.6	JEB	L
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	UJ	I	2.0	UJ	L	2.5	UJ	I	1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		6.1			2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	4.1			1.9	UJ	L
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	1.9	U		2.0	U		2.0	U		2.5	U		1.9	UJ	L	2.0	UJ	L	3.7	UJ	L	1.8	U		1.9	UJ	L
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			6.1			-			-			20			110			28.1			9.6		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			6.1			-			17.8			70			112.3			38.3			12		
VPH (µg/kg)																																						
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													19,000	U		21,000	U		23,000			19,000	U		19,000	U	
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													12,000			18,000			36,000			5,500	U		5,600	U	
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													11,000	U		12,000	U		14,000			11,000	U		11,000	U	
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS													12,000			18,000			73,000			-			-		
EPH (µg/kg)																																						
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													12,000			30,000			13,000			3,100			210,000		
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													44,000			130,000			52,000			4,200			290,000		
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS													170,000			140,000			190,000			15,000			82,000		
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS													226,000			300,000			255,000			22,300			582,000		

TABLE 12D
Summary of Lower Soil Data - Volatile Organic Compounds and VPH/EPH
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Analytes	COPC Screening Levels										Cocnentrations in µg/kg																	
	Human Health		Ecological								UST-3 / S-3-4 / 04-04-01			UST-4 / S-1-2 / 12-11-00			UST-4 / S-3-4 / 12-11-00			UST-5 / S-1-2 / 12-12-00			UST-5 / S-3-4 / 12-13-00			UST-6 / S-1-2 / 12-13-00			UST-6 / S-3-4 / 12-13-00		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs (µg/kg)																														
Benzene	40,000	640	NS	NS	NS	**52,200**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	J	L	2.0	U		2.0	J	L
Ethylbenzene	500,000	190,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Styrene	20,000	440,000	**300,000**	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Toluene	500,000	66,000	200,000	NS	NS	**51,500**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	1.0	J	L	2.0	U		13	J	L
Xylene (m,p-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Xylene (o-)	NS	27,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Xylenes (total)	500,000	27,000	NS	NS	NS	**4,162**	NS	NS	NS	NS	-			-			-			-			-			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			3.0			-			15		
CVOCs (µg/kg)																														
Carbon tetrachloride	7,000	220	NS	NS	NS	**58,600**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Chlorobenzene	500,000	15,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Chloroethane	NS	3,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Chloroform	200,000	220	NS	NS	NS	**55,000**	NS	NS	NS	NS	1.8	U		2.0	U	H	2.0	U	H	2.0	UJ	L	2.0	UJ	L	2.0	U		1.0	J	L
Chloromethane	NS	4,700	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloroethane (1,1-)	100,000	51,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloroethane (1,2-)	10,000	280	NS	NS	**14,200**	103,000	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloroethene (1,1-)	2,000	12,000	NS	NS	NS	**109,900**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloroethene (cis-1,2-)	NS	4,300	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloroethene (trans-1,2-)	500,000	6,900	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloropropane (1,2-)	8,000	340	NS	**700,000**	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloropropene (cis-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dichloropropene (trans-1,3-)†	3,000	780	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Methylene chloride	100,000	9,100	NS	NS	NS	**21,400**	NS	NS	NS	NS	5.7	U		6.0	U	H	5.0	U	H	5.0	UJ	I	14	UJ	I	11	U	H	5.0	UJ	I
Tetrachloroethane (1,1,2,2-)	500	410	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Tetrachloroethene	20,000	480	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Trichloroethane (1,1,1-)	100,000	200,000	NS	NS	NS	**2,060,000**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Trichloroethane (1,1,2-)	2,000	730	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Trichloroethene	70,000	53	NS	NS	NS	**1,387**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Vinyl chloride	300	79	NS	NS	NS	**623**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			1.0		
Other VOCs (µg/kg)																														
Acetone	500,000	1,400,000	NS	NS	NS	**36,600**	NS	NS	NS	NS	9.4	EB		7.0	U	H	6.0	U	H	7.0	UJ	I	26	JEB	I	15	EB	H	25	JEB	I
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Bromodichloromethane	20,000	820	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Bromoform	100,000	62,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Bromomethane	50,000	390	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Butanone (2-)	500,000	2,200,000	NS	NS	NS	**6,487,000**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Carbon disulfide	NS	36,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Dibromochloromethane	10,000	1,100	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Methyl-2-pentanone (4-)	100,000	530,000	NS	NS	NS	**91,600**	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Methyl-tert Butyl Ether	100,000	17,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Trichlorofluoromethane	NS	39,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0			7.0	J	L	2.0	J	L	3.0			2.0	UJ	L
Vinyl acetate	NS	43,000	NS	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.0	U		2.0	U		2.0	UJ	L	2.0	UJ	L	2.0	U		2.0	UJ	L
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	9.4			-			2.0			7.0			28			18			25		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	9.4			-			2.0			7.0			31			18			41		
VPH (µg/kg)																														
C5-C8 Aliphatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	19,000	U		21,000	U		20,000	U		18,000	U		20,000	U		20,000	U		20,000	U	
C9-C12 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	5,500	U		6,100	U		5,800	U		5,300	U		5,700	U		5,800	U		5,900		
C9-C10 Aromatic	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	11,000	U		12,000	U		12,000	U		11,000	U		11,000	U		12,000	U		11,000	U	
Total VPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			5,900		
EPH (µg/kg)																														
C9-C18 Aliphatic	1,000,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	65,000			3,400	UJ	L	3,600	UJ	L	3,300	UJ	L	3,100	UJ	L	3,100	UJ		1,300,000	J	L
C19-C36 Aliphatic	2,500,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	130,000			11,000			4,900	U		10,000			10,000			4,100	U		2,000,000		
C11-C22 Aromatic	800,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	17,000			11,000			10,000	U		9,400	U		8,900	U		8,700	U		1,800,000		
Total EPH	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	212,000			22,000			-			10,000			10,000			-			5,100,000		

TABLE 12D
Summary of Lower Soil Data - Volatile Organic Compounds and VPH/EPH
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8260B; and extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) by Massachusetts Department of Environmental Protection (MADEP) methods MADEP-EPH-98-1 and MADEP-VPH-98-1, respectively.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.
"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.
"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.
"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the American Robin.
"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian (birds) are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. "†" indicates the MCP Method 2 S-1 standards and PRGs are for 1,3-dichloropropene.

7. Total concentrations listed (e.g. Total AVOCs, CVOCs) are the sum of detected concentrations of the relevant suite of compounds. "AVOCs" are non-chlorinated aromatic volatile organic compounds. "CVOCs" are chlorinated volatile organic compounds. "Other VOCs" are non-AVOC and non-CVOC volatile organic compounds. "VPH" are volatile petroleum hydrocarbons. "EPH" are extractable petroleum hydrocarbons.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002], and Appendix B.7 of the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
- "R" Indicates data rejected during validation.
- "EB" The compound was detected in an associated equipment blank. The result is usable with possible uncertainty due to the potential for contamination.
- "JEB" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s) and detection in an associated equipment blank. The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision, with possible uncertainty due to the potential for contamination.

Bias:

- "L" Low
- "I" Indeterminate
- "H" High

TABLE 12E
Summary of Lower Soil Data - PCBs and Pesticides
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg													
	Human Health		Ecological								SB-13A / S-3-4 / 04-13-01			SB-19 / S-1-2 / 06-08-01			SB-22 / S-3 / 06-13-01			SB-26 / S-2-3 / 03-30-01			SB-41 / S-1-2 / 03-20-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area East of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PCBs																								
Aroclor 1016	NS	390	NS	NS	NS	**6,520**	NS	NS	NS	NS	5.5	UJ	L	2.2	U		2.0	U		5.8	U		6.6	U	
Aroclor 1221	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	5.5	UJ	L	2.2	U		2.0	U		5.8	U		6.6	U	
Aroclor 1232	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	5.5	UJ	L	2.2	U		2.0	U		5.8	U		6.6	U	
Aroclor 1242	NS	110	NS	NS	339	**329**	NS	NS	NS	NS	5.5	UJ	L	2.2	U		2.0	U		5.8	U		6.6	U	
Aroclor 1248	NS	110	NS	NS	NS	**71**	NS	NS	NS	NS	5.5	UJ	L	2.2	U		2.0	U		5.8	U		6.6	U	
Aroclor 1254	NS	110	NS	NS	149	**111**	NS	NS	NS	NS	5.5	UJ	L	2.2	U		2.0	U		5.8	U		6.6	U	
Aroclor 1260	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	5.5	UJ	L	2.2	U		2.0	U		5.8	U		6.6	U	
Total PCBs	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-		
Pesticides																								
Aldrin	30	29	NS	NS	NS	**733**	NS	NS	NS	NS	0.84	J	H	0.11	U		0.10	U		0.58	U		0.13	U	
BHC (alpha-)	NS	90	NS	NS	NS	NS	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
BHC (beta-)	NS	320	NS	NS	NS	**1,470**	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
BHC (delta-)	NS	320	NS	NS	NS	NS	NS	NS	NS	NS	0.77	J	H	0.11	U		0.10	U		0.58	U		0.13	UJ	I
BHC (gamma-)	400	440	NS	NS	**1,660**	29,300	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	UJ	I
Chlordane (alpha-)	1,000	1,600	NS	NS	**1,800**	9,100	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
Chlordane (gamma-)	1,000	1,600	NS	NS	**1,800**	9,100	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	UJ	I
DDD (4,4'-)	2,000	2,400	NS	NS	**2**	2,930	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
DDE (4,4'-)	2,000	1,700	NS	NS	**2**	2,930	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
DDT (4,4'-)	2,000	1,700	NS	NS	**2**	2,930	NS	NS	NS	NS	0.66	J	I	0.11	U		0.18	J	H	0.58	UJ	L	0.13	UJ	L
Dieldrin	30	30	NS	NS	64	73	NS	NS	**0.28**	1.6	**0.56**	J	H	0.11	U		0.10	U		0.58	U		0.13	U	
Endosulfan I	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
Endosulfan II	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
Endosulfan sulfate	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
Endrin	6,000	1,800	NS	NS	**8**	182	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	UJ	I
Endrin aldehyde	6,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	U	
Endrin ketone	6,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	0.55	UJ	I	0.11	U		0.10	U		0.58	UJ	L	2.5	J	L
Heptachlor	100	110	NS	NS	NS	**476**	NS	NS	NS	NS	0.55	U		0.11	U		0.10	U		0.58	U		0.13	UJ	L
Heptachlor epoxide	60	53	NS	NS	NS	NS	NS	NS	NS	NS	0.70	J	H	0.11	U		0.10	U		0.58	U		0.13	U	
Methoxychlor	100,000	31,000	NS	NS	NS	**14,700**	NS	NS	NS	NS	0.55	U		0.54	U		0.51	U		0.58	UJ	L	0.66	UJ	L
Toxaphene	NS	440	NS	NS	NS	**29,300**	NS	NS	NS	NS	11	U		11	U		10	U		12	U		13	U	
Total Pesticides	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	3.5			-			0.18			-			2.5		

TABLE 12E
Summary of Lower Soil Data - PCBs and Pesticides
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels										Concentrations in µg/kg																	
	Human Health		Ecological								SB-42 / S-3-4 / 07-27-01			SB-46 / S-1-2 / 07-18-01			SB-47 / S-1-2 / 07-25-01			SB-49 / S-3-4 / 04-24-01			SB-53 / S-3-4 / 07-13-01			SB-56 / S-1 / 05-03-01		
			ORNL Toxicological Benchmarks				USEPA Eco. Soil Screening Levels				Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.			Industrial Area West of South St.		
	MCP Method 2 S-1 Soil	USEPA Region IX Res. Soil PRG	Phyto-toxicity	Earth-worm	Avian	Mammal	Plant	Inverte-brate	Mammal	Avian	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PCBs																												
Aroclor 1016	NS	390	NS	NS	NS	**6,520**	NS	NS	NS	NS	13	U		11	U		11	U		5.9	U		14	U		5.1	UJ	L
Aroclor 1221	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	13	U		11	U		11	U		5.9	U		14	U		5.1	UJ	L
Aroclor 1232	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	13	U		11	U		11	U		5.9	U		14	U		5.1	UJ	L
Aroclor 1242	NS	110	NS	NS	339	**329**	NS	NS	NS	NS	13	U		11	U		11	U		5.9	U		14	U		5.1	UJ	L
Aroclor 1248	NS	110	NS	NS	NS	**71**	NS	NS	NS	NS	13	U		11	U		11	U		5.9	U		14	U		5.1	UJ	L
Aroclor 1254	NS	110	NS	NS	149	**111**	NS	NS	NS	NS	13	U		11	U		11	U		5.9	U		14	U		5.1	UJ	L
Aroclor 1260	NS	110	NS	NS	NS	NS	NS	NS	NS	NS	13	U		11	U		11	U		5.9	U		14	U		5.1	U	
Total PCBs	2,000	NS	**40,000**	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-		
Pesticides																												
Aldrin	30	29	NS	NS	NS	**733**	NS	NS	NS	NS	9.7	J	H	0.55	U		0.56	U		2.1	J	I	25	J	I	0.51	U	
BHC (alpha-)	NS	90	NS	NS	NS	NS	NS	NS	NS	NS	3.4	J	I	0.55	U		0.56	U		0.59	U		0.68	U		0.51	U	
BHC (beta-)	NS	320	NS	NS	NS	**1,470**	NS	NS	NS	NS	0.66	U		0.55	U		0.56	U		0.59	U		0.68	U		0.51	U	
BHC (delta-)	NS	320	NS	NS	NS	NS	NS	NS	NS	NS	0.66	U		0.55	U		0.56	U		4.6	J	I	0.68	U		0.51	U	
BHC (gamma-)	400	440	NS	NS	**1,660**	29,300	NS	NS	NS	NS	0.66	U		0.55	UJ	L	0.56	U		0.59	U		0.68	UJ	L	0.51	U	
Chlordane (alpha-)	1,000	1,600	NS	NS	**1,800**	9,100	NS	NS	NS	NS	3.4	J	H	2.2	J	H	0.56	U		0.59	U		0.68	U		0.51	U	
Chlordane (gamma-)	1,000	1,600	NS	NS	**1,800**	9,100	NS	NS	NS	NS	3.5	J	I	0.55	U		0.56	U		1.6	J	I	0.68	U		0.51	U	
DDD (4,4'-)	2,000	2,400	NS	NS	**2**	2,930	NS	NS	NS	NS	**12**	J	H	**3.0**	J	I	**7.5**	J	H	**23**	J	I	**56**	J	I	0.51	U	
DDE (4,4'-)	2,000	1,700	NS	NS	**2**	2,930	NS	NS	NS	NS	**4.3**	J	I	**8.9**	J	H	**6.1**	J	H	**8.3**	J	H	0.68	U		0.51	U	
DDT (4,4'-)	2,000	1,700	NS	NS	**2**	2,930	NS	NS	NS	NS	**8.2**	J	I	0.55	U		0.56	U		**37**	J	H	0.68	U		0.51	U	
Dieldrin	30	30	NS	NS	64	73	NS	NS	**0.28**	1.6	**4.1**	J	H	0.55	U		**27**	J	H	0.59	UJ	I	**23**	J	H	0.51	U	
Endosulfan I	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	3.0	J	H	0.55	U		0.56	U		2.9	J	I	0.68	U		0.51	U	
Endosulfan II	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	10	J	I	0.55	U		0.56	U		9.5	J	I	33	J	H	0.51	U	
Endosulfan sulfate	100,000	37,000	NS	NS	8,300	**550**	NS	NS	NS	NS	0.66	U		4.0	J	H	3.3	J	H	0.59	U		88	J	H	0.51	U	
Endrin	6,000	1,800	NS	NS	**8**	182	NS	NS	NS	NS	5.3	J	H	0.55	U		0.56	U		0.59	U		0.68	U		0.51	U	
Endrin aldehyde	6,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	0.66	U		0.55	U		0.56	U		0.59	U		0.68	U		0.51	U	
Endrin ketone	6,000	1,800	NS	NS	NS	NS	NS	NS	NS	NS	15	J	H	7.9	J	H	8.4	J	H	10	J	I	34	J	H	0.51	U	
Heptachlor	100	110	NS	NS	NS	**476**	NS	NS	NS	NS	0.66	U		0.55	U		0.56	U		0.59	U		0.68	U		0.51	U	
Heptachlor epoxide	60	53	NS	NS	NS	NS	NS	NS	NS	NS	8.5	J	I	0.55	U		0.56	U		2.9	J	I	0.68	U		0.51	U	
Methoxychlor	100,000	31,000	NS	NS	NS	**14,700**	NS	NS	NS	NS	3.3	U		2.8	U		2.8	U		0.59	UJ	L	3.4	U		0.51	U	
Toxaphene	NS	440	NS	NS	NS	**29,300**	NS	NS	NS	NS	66	U		55	U		56	U		12	U		68	U		10	U	
Total Pesticides	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	90.4			26			52.3			101.9			259			-		

TABLE 12E
Summary of Lower Soil Data - PCBs and Pesticides
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2B for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, by United States Environmental Protection Agency (USEPA) performed analyses for pesticides by Method 8081A; and for polychlorinated biphenyls (PCBs) by USEPA Method 8082.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1A RI Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections which exceed the lower of the human health screening levels (shaded value) are shaded. Analyte detections which exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"MCP Method 2 S-1" indicates Massachusetts Contingency Plan (MCP) Method 2 S-1 Soil Standards for Direct Contact Exposure (310 CMR 40.0000). These values were obtained from the Massachusetts Department of Environmental Protection website www.state.ma.us/dep/bwsc/files/mcp/0975_6a.htm, on April 30, 2004.

"USEPA Region IX Res. Soil PRG" indicates USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2002. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999).

"ORNL Toxicological Benchmarks" indicates ecological toxicological benchmarks established by the Oak Ridge National Laboratory (ORNL), as noted below.

"Phytotoxicity" indicates data are from the ORNL paper, "Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision," by Efroymson, R.A., et al.

"Earthworm" indicates data are from the ORNL paper, "Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision," by Efroymson, R.A., et al.

"Avian" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the American Robin.

"Mammal" indicates data are from the ORNL paper, "Toxicological Benchmarks for Wildlife: 1996 Revision," by Sample, B.E., et al. Values presented are NOAEL-Based benchmarks for food ingestions for the Short-tailed Shrew.

"USEPA Ecological Soil Screening Levels" indicates data for plants, soil invertebrates, mammals, and avian (birds) are USEPA Ecological Soil Screening Levels (ESSLs) from the USEPA website www.epa.gov/ecotox/ecossl/, last updated 01/30/04.

6. "†" indicates the MCP Method 2 S-1 standards, PRGs, and ORNL benchmarks are for chlordane.
"‡" indicates the MCP Method 2 S-1 standards, PRGs, and ORNL benchmarks are for endosulfan.
"$" indicates the MCP Method 2 S-1 standards, PRGs, and ORNL benchmarks are for endrin.

7. Total concentrations listed (e.g., Total PCBs) are the sum of detected concentrations of the relevant suite of parameters.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA,2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

Bias:

- "L" Low
- "I" Indeterminate
- "H" High

TABLE 13A
Summary of Groundwater Data - Field Screening Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Monitoring Location	Temperature (˚C)			Specific Conductance (µS/cm)			Dissolved Oxygen (mg/l)			ORP (mV)			Turbidity (NTU)		
	Sep-01	May-02	Oct/Nov-03	Sep-01	May-02	Oct/Nov-03	Sep-01	May-02	Oct/Nov-03	Sep-01	May-02	Oct/Nov-03	Sep-01	May-02	Oct/Nov-03
SH-01D	11.8	12.7	14.0	120,000	120,000	99,000	0.0	0.0	0.0	-514	-565	-518	6.8	6.7	8.0
SH-01R	15.2	12.4	12.3	75,000	64,000	66,000	0.0	0.5	0.0	-476	-416	-365	2.6	12	3.8
SH-01S	12.7	9.9	13.5	590	850	1,500	1.3	0.4	0.2	-137	-44	-92	14	10	40
SH-02D	14.7	14.5	12.9	5,500	17,000	3,800	0.0	0.0	2.1	-266	-490	-38	120	470	5.7
SH-02R	15.5	13.1	10.8	1,000	1,200	780	0.6	1.2	4.9	-56	-103	-59	11	3.9	2.1
SH-02S	13.6	10.9	13.4	920	760	930	0.4	1.9	18.2	-116	-43	-116	2.1	1.9	1.0
SH-03D	17.6	13.9	13.9	350	270	210	1.2	0.8	4.3	-51	62	72	22	650	1,000
SH-03S	17.9	10.9	16.0	1,200	1,100	690	5.5	0.7	9.6	-148	-116	-79	0.91	2.0	2.5
SH-04D	14.9	11.8	10.3	170	190	200	2.4	1.3	1.6	74	82	152	85	24	97
SH-04S	13.5	10.1	12.5	3,900	2,200	2,600	0.6	0.1	0.2	-189	-57	-212	33	11	9.0
SH-05D	14.8	12.2	11.4	330	330	340	2.0	0.8	3.5	153	185	209	9.8	7.9	25
SH-05R-A	NI	NI	12.4	NI	NI	90	NI	NI	1.2	NI	NI	165	NI	NI	NM
SH-05R-A	NI	NI	11.6	NI	NI	110	NI	NI	2.5	NI	NI	165	NI	NI	12
SH-05R-B	NI	NI	10.9	NI	NI	100	NI	NI	2.8	NI	NI	117	NI	NI	5.3
SH-05S	13.7	10.7	13.6	3,200	2,200	790	2.8	0.0	3.1	-47	-150	-122	52	8.0	5.6
SH-06D	13.9	11.5	13.3	24,000	19,000	27,000	0.1	0.0	0.4	-334	-247	-198	5.2	13	14
SH-06R-A	NI	NI	11.4	NI	NI	1,100	NI	NI	2.6	NI	NI	190	NI	NI	6.1
SH-06R-B	NI	NI	12.8	NI	NI	1,300	NI	NI	1.6	NI	NI	217	NI	NI	2.4
SH-06S	14.8	11.8	14.7	1,600	1,500	1,300	0.1	0.0	0.4	277	-210	-172	180	60	5.7
SH-07D	15.4	12.9	12.9	53,000	58,000	68,000	0.4	0.5	0.1	-194	-208	-163	2.4	2.1	2.6
SH-07S	16.5	11.5	15.6	1,900	1,600	1,700	0.2	0.7	3.7	-29	124	-223	10	22	4.3
SH-08D	14.6	11.5	15.6	1,500	1,500	1,300	0.2	0.3	1.6	-273	28	45	>1000	81	350
SH-08S	23.4	13.5	16.1	290	340	320	NM	NM	2.4	NM	NM	-6	NM	NM	0.020
SH-09D	13.9	13.1	12.3	2,600	2,400	2,200	0.2	0.6	0.4	178	36	-78	5.2	4.3	11
SH-09S	15.8	11.0	13.6	760	660	540	0.3	1.3	8.3	276	133	206	28	29	19
SH-10S	16.2	14.9	13.7	430	660	580	1.1	1.3	8.9	103	-67	63	9.4	14	36
SH-11S	14.6	11.4	15.1	470	830	720	6.7	2.8	2.3	-96	182	248	1.7	12	14
SH-12D	15.1	11.9	13.4	270	260	250	2.8	1.1	1.8	-314	-47	160	93	36	23
SH-12S	17.9	11.9	14.3	550	720	710	3.9	0.6	2.1	-39	-46	-72	0.72	11	4.9
SH-13S	15.6	12.5	13.7	590	610	590	3.8	0.1	1.6	-83	99	-70	3.4	58	140
SH-14D	14.5	11.4	11.5	170	160	180	0.9	2.0	1.3	349	204	170	3.0	9.5	19
SH-14S	14.6	10.4	13.1	530	590	430	0.5	*	2.1	0	-101	62	4.8	5.2	38
SH-15D	15.8	13.0	10.5	180	190	140	2.2	2.3	3.9	127	182	135	49	74	63
SH-15S	16.6	9.6	12.9	1,600	1,100	1,600	0.1	0.6	0.2	-220	-53	-171	7.8	52	7.0
SH-16S	15.5	12.0	11.4	600	470	590	1.4	1.3	2.0	13	242	199	12	20	7.8
SH-17D	NI	NI	11.2	NI	NI	2,300	NI	NI	1.0	NI	NI	146	NI	NI	13
SH-17R	NI	NI	10.8	NI	NI	1,800	NI	NI	1.5	NI	NI	151	NI	NI	4.9
SH-17S	13.1	9.1	12.0	140	430	230	2.8	7.6	4.1	-5	259	146	0.62	0.59	3.9
SH-18D	15.8	13.7	NM	400	350	NM	8.8	7.0	NM	137	334	NM	1.9	3.9	NM
SH-18S	15.0	12.3	NM	390	430	NM	*	0.5	NM	57	48	NM	0.60	1.2	NM
SH-19D	16.3	14.4	NM	390	350	NM	3.9	5.0	NM	10	269	NM	36	15	NM
SH-19R	14.3	14.9	NM	120	110	NM	1.7	1.7	NM	-237	140	NM	53	4.6	NM
SH-19S	16.9	13.0	NM	550	680	NM	1.7	1.9	NM	-22	69	NM	3.2	7.8	NM
SH-20S	14.6	10.8	NM	430	570	NM	0.4	1.2	NM	25	46	NM	0.80	2.9	NM
SH-21S	14.4	11.9	NM	400	500	NM	7.7	7.1	NM	190	156	NM	0.96	27	NM
SH-22S	17.6	12.7	NM	380	440	NM	6.3	9.2	NM	37	218	NM	8.4	6.4	NM
SH-23S	17.0	10.4	11.7	530	330	380	7.0	7.9	13.3	-35	267	179	41	8.1	37
SH-24R	NI	NI	11.8	NI	NI	90	NI	NI	2.0	NI	NI	164	NI	NI	33
SH-24S	NI	NI	13.2	NI	NI	220	NI	NI	5.1	NI	NI	225	NI	NI	4.2
SH-25D	NI	NI	10.4	NI	NI	280	NI	NI	4.5	NI	NI	140	NI	NI	9.2
SH-25S	NI	NI	11.9	NI	NI	400	NI	NI	3.8	NI	NI	165	NI	NI	12
SH-26S	NI	NI	12.3	NI	NI	1,400	NI	NI	0.1	NI	NI	-71	NI	NI	360
SH-27D	NI	NI	11.9	NI	NI	510	NI	NI	2.1	NI	NI	172	NI	NI	61
SH-27R	NI	NI	11.5	NI	NI	540	NI	NI	2.4	NI	NI	-212	NI	NI	14
SH-27S	NI	NI	11.0	NI	NI	520	NI	NI	5.7	NI	NI	186	NI	NI	24
SH-28D	NI	NI	12.8	NI	NI	210	NI	NI	2.1	NI	NI	130	NI	NI	47
SH-28R	NI	NI	12.5	NI	NI	110	NI	NI	3.1	NI	NI	152	NI	NI	45
SH-28S	NI	NI	13.9	NI	NI	330	NI	NI	2.0	NI	NI	172	NI	NI	8.8
WP-01	NI	NI	11.2	NI	NI	310	NI	NI	3.7	NI	NI	-14	NI	NI	4.1
WP-02	NI	NI	11.3	NI	NI	480	NI	NI	7.0	NI	NI	48	NI	NI	2.6
WP-03	NI	NI	10.8	NI	NI	150	NI	NI	1.8	NI	NI	201	NI	NI	1.5
WP-04	NI	NI	10.6	NI	NI	190	NI	NI	13.1	NI	NI	270	NI	NI	NM
WP-05	NI	NI	10.7	NI	NI	140	NI	NI	6.4	NI	NI	232	NI	NI	6.8
WP-06	NI	NI	12.6	NI	NI	440	NI	NI	0.4	NI	NI	189	NI	NI	0.13
WP-07	NI	NI	15.8	NI	NI	1,200	NI	NI	2.0	NI	NI	-87	NI	NI	38

Notes:
1. Field screening was completed by Sanborn, Head & Associates, Inc. at the time of sample collection on the dates indicated.
2. Values reported above have been rounded from values measured in the field.
3. Refer to Appendix B for field forms/logs for further information.
4. Unless otherwise noted, field parameters (e.g., temperature, specific conductance, dissolved oxygen, pH [presented on Table 13C], oxidation/reduction potential [ORP]) were monitored using a YSI 600 multi-parameter sonde (with low flow cell) connected to a MDS 650 display unit; turbidity was monitored upstream and external of the flow cell using a HACH Company Model 2100P Portable Turbidimeter.
5. Monitoring well SH-08S contained suspected NAPL based on information generated during well development. Therefore, in accordance with the SOP modification approved by USEPA on September 5, 2001, the well was purged of approximately 3 well volumes prior to sample collection during the September 2001 and May 2002 groundwater sampling rounds. Field parameters were not measured with a flow cell. Groundwater was screened for pH and specific conductance using a Beckman Model 240 pH meter and a Hach Model 44600 conductivity/TDS meter.
6. "NM" indicates not measured.
"NI" indicates not installed.
"mg/L" indicates milligrams per liter, equivalent to parts per million (ppm).
"mV" indicates milliVolts.
"µS/cm" indicates microSiemens per centimeter.
"ºC" indicates degrees Centigrade.
"NTU" indicates nephelometric turbidity units.
7. "*" indicates the dissolved oxygen probe was malfunctioning at the time of sample collection. The instrument was subsequently sent out for repairs.

TABLE 13B
Summary of Groundwater Data - Density/Kinematic Viscosity
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Collection Date	Density (g/cm^3)	Kinematic Viscosity (Centipoise)	pH (s.u.)
SH-01D	11/28/2001	1.0674	1.3652	14.0
SH-01R	11/28/2001	1.0089	1.1134	13.4
SH-06D	12/13/2001	1.0062	1.01566	11.9
SH-15S	12/11/2001	1.0016	1.00791	10.4
SH-04S	11/28/2001	1.0007	1.0041	9.6
SH-08D	11/28/2001	1.0007	1.0041	9.2

Notes:

1. Samples collected by SHA on the dates indicated using single-use disposable bailers.

2. Density and kinematic viscosity analyses were performed by Camin Cargo Control, Inc. (CCCI) of Chelsea, Massachusetts, a subcontractor to Eastern Analytical, Inc. (EAI) of Concord, New Hampshire. These analyses were not anticipated in the QAPP and were submitted to EAI/CCCI for analyses because Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts did not have the capability to perform these analyses.

4. pH measurements were made in the field by SHA using a Beckman Model 240 pH meter on the dates provided, and have been rounded from values measured in the field.

5. Samples were analyzed for density using American Society of Testing Materials (ASTM) Method D-4052 and for kinematic viscosity by ASTM Method D-445.

6. pH is reported in standard units (s.u.). Density results are presented in grams per cubic centimeter (g/cm^3) the density of water (at 20°C) is 0.99823 g/cm^3 (Weast, 1982). Kinematic viscosity results are presented in Centipoise (0.01 x g/[cm x sec]); the kinematic viscosity of water at 20°C is 1.0019 Centipoise (Weast, 1982).

TABLE 13C
Summary of Groundwater Data - pH
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Monitoring Location	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-01D	9/12/2001	14.1	J	I
SH-01D	5/22/2002	14.0	J	I
SH-01D	10/29/2003	13.5	J	I
SH-01R	9/13/2001	13.2	J	I
SH-01R	5/22/2002	13.9	J	I
SH-01R	10/30/2003	13.4	J	I
SH-01S	9/12/2001		R	I
SH-01S	5/21/2002	9.4		
SH-01S	10/28/2003	11.2		
SH-02D	9/13/2001	11.9		
SH-02D	5/23/2002	12.6	J	I
SH-02D	10/30/2003	6.6		
SH-02R	9/12/2001	7.2		
SH-02R	5/16/2002	7.3		
SH-02R	11/4/2003	7.4		
SH-02S	9/12/2001	6.7		
SH-02S	5/24/2002	6.7		
SH-02S	10/29/2003	6.8		
SH-03D	9/12/2001	7.2		
SH-03D	5/23/2002	7.0		
SH-03D	11/3/2003	7.1		
SH-03S	9/11/2001	6.3		
SH-03S	5/16/2002	6.5		
SH-03S	11/3/2003	6.3		
SH-04D	9/11/2001	7.1		
SH-04D	5/21/2002	7.1		
SH-04D	11/5/2003	7.2		
SH-04S	9/11/2001	11.9		
SH-04S	5/20/2002	11.4		
SH-04S	10/28/2003	11.3		
SH-05D	9/11/2001	7.2		
SH-05D	5/21/2002	6.9		
SH-05D	11/4/2003	6.9		
SH-05R-A	11/10/2003	8.0		
SH-05R-B	11/11/2003	8.5		
SH-05S	9/11/2001	12.0		
SH-05S	5/21/2002	11.7		
SH-05S	10/29/2003	9.7		
SH-06D	9/6/2001	12.5	J	I
SH-06D	5/22/2002	13.1	J	I
SH-06D	10/29/2003	12.8		
SH-06R-A	11/5/2003	6.7		
SH-06R-B	11/6/2003	6.8		
SH-06S	9/6/2001	9.9		
SH-06S	5/22/2002	10.0		
SH-06S	10/29/2003	9.9		

TABLE 13C
Summary of Groundwater Data - pH
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Walpole, Massachusetts

Monitoring Location	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-07D	9/7/2001	13.2	J	I
SH-07D	5/22/2002	13.8	J	I
SH-07D	10/30/2003	13.4	J	I
SH-07S	9/7/2001	9.0		
SH-07S	5/22/2002	7.2		
SH-07S	10/29/2003	8.8		
SH-08D	9/7/2001	10.3		
SH-08D	5/20/2002	10.2		
SH-08D	10/29/2003	10.0		
SH-08S	9/6/2001	6.6		
SH-08S	5/21/2002	6.7		
SH-08S	10/28/2003	6.7		
SH-09D	9/7/2001	11.1		
SH-09D	5/23/2002	11.8		
SH-09D	10/28/2003	11.6		
SH-09S	9/7/2001	7.5		
SH-09S	5/17/2002	6.6		
SH-09S	10/31/2003	7.4		
SH-10S	9/10/2001	6.2		
SH-10S	5/23/2002	6.3		
SH-10S	10/31/2003	5.9		
SH-11S	9/7/2001	6.6		
SH-11S	5/16/2002	6.3		
SH-11S	11/3/2003	6.3		
SH-12D	9/12/2001	6.5		
SH-12D	5/17/2002	6.4		
SH-12D	11/3/2003	6.0		
SH-12S	9/11/2001	6.2		
SH-12S	5/17/2002	6.4		
SH-12S	11/3/2003	6.5		
SH-13S	9/11/2001	6.5		
SH-13S	5/16/2002	6.5		
SH-13S	11/3/2003	6.5		
SH-14D	9/10/2001	6.2		
SH-14D	5/20/2002	6.4		
SH-14D	11/4/2003	6.7		
SH-14S	9/10/2001	6.4		
SH-14S	5/20/2002	6.9		
SH-14S	11/4/2003	6.6		
SH-15D	9/10/2001	6.0		
SH-15D	5/17/2002	5.9		
SH-15D	11/4/2003	6.1		
SH-15S	9/10/2001	10.3		
SH-15S	5/20/2002	11.9		
SH-15S	10/28/2003	10.1		

TABLE 13C
Summary of Groundwater Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Monitoring Location	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SH-16S	9/11/2001	7.6		
SH-16S	5/17/2002	7.3		
SH-16S	11/19/2003	7.3		
SH-17D	11/20/2003	10.9		
SH-17R	11/20/2003	10.0		
SH-17S	9/6/2001	6.0		
SH-17S	5/20/2002	6.4		
SH-17S	11/19/2003	6.3		
SH-18D	9/4/2001		R	I
SH-18D	5/15/2002	6.1		
SH-18S	9/4/2001		R	I
SH-18S	5/15/2002	5.9		
SH-19D	9/5/2001	5.8		
SH-19D	5/16/2002	5.6		
SH-19R	9/5/2001		R	I
SH-19R	5/16/2002	7.6		
SH-19S	9/5/2001	6.0		
SH-19S	5/21/2002	5.8		
SH-20S	9/5/2001	6.1		
SH-20S	5/17/2002	6.1		
SH-21S	9/6/2001	5.9		
SH-21S	5/16/2002	5.9		
SH-22S	9/5/2001		R	I
SH-22S	5/17/2002	6.0		
SH-23S	9/4/2001	6.1		
SH-23S	5/15/2002	6.0		
SH-23S	11/4/2003	6.1		
SH-24R	11/6/2003	7.9		
SH-24S	11/6/2003	5.9		
SH-25D	11/5/2003	6.5		
SH-25S	11/5/2003	6.4		
SH-26S	10/28/2003	11.0		
SH-27D	11/19/2003	6.7		
SH-27R	11/20/2003	6.7		
SH-27S	11/21/2003	5.8		
SH-28D	11/6/2003	6.9		
SH-28R	11/7/2003	7.8		
SH-28S	11/6/2003	5.9		
WP-01	11/4/2003	6.3		
WP-02	11/4/2003	6.2		
WP-03	11/5/2003	5.3		
WP-04	11/7/2003	5.6		
WP-05	11/7/2003	5.2		
WP-06	10/28/2003	10.1		
WP-07	10/27/2003	10.8		

TABLE 13C
Summary of Groundwater Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Groundwater pH measurements were recorded by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated.

2. Values reported above have been rounded from values measured in the field.

3. pH is reported in standard units (s.u.).

4. Refer to Appendix B for field forms/logs for further information.

5. Groundwater samples were collected using low flow techniques, consistent with the SOP for Groundwater Sampling (SOP S-1669F), using a YSI 600 sonde with flow through cell. Monitoring well SH-08S contained suspected NAPL based on information generated during well development. Therefore, in accordance with the SOP modification approved by USEPA on September 5, 2001, the well was purged of approximately 3 well volumes prior to sample collection during the September 2001 and May 2002 groundwater sampling rounds. Field parameters were not measured with a flow cell. Groundwater was screened for pH and specific conductance (presented on Table 13a) using a Beckman Model 240 pH meter and a Hach Model 44600 conductivity/TDS meter.

6. Data validation and data usability assessment were performed by SHA; the following qualifiers and biases were assigned during data validation by SHA. Refer to SHA's Data Usability Memoranda (included in the Data Usability Report [SHA, 2002], and the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" - The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"R" - Indicates data rejected during validation.

Bias:

"I" - Indeterminate

TABLE 13D
Summary of Groundwater Data - Inorganic Parameters
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L (except as noted)																											
	COPC Screening Levels		SH-01D									SH-01R								SH-01S								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/22/2002			10/29/2003			9/13/2001			5/22/2002			10/30/2003			9/12/2001			5/21/2002			10/28/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																												
Aluminum	NS	**3,600**	**43,400**	J	I	**44,000**	J	I	**58,000**	J	H	**44,100**	J	I	**23,000**	J	I	**32,000**			1,100			460	J	L	1,400		
Antimony	NS	**1.5**	50.0	UJ	I	**42.0**	J	I	25.0	U		50.0	UJ	I	**20.0**	J	I	**20.0**			11.1	U		**7.6**			**12.0**		
Arsenic	NS	**0.045**	**812**	J	I	**650**	J	H	**57.0**	J	H	**343**	J	I	**300**	J	H	**450**	J	H	**5.9**			**6.7**			**15.0**		
Barium	NS	**260**	9.4	J	I	120	UJ	I	27.0			13.1	J	I	25.0	UJ	I	25.0			12.5	J	I	18.0			71.0		
Beryllium	NS	**7.3**	5.0	UJ	I	12.0	UJ	I	25.0	U		5.0	UJ	I	2.5	UJ	I	5.0	U		1.1	U		0.56	U		1.0	U	
Cadmium	NS	**1.8**	5.0	UJ	I	0.50	UJ	I	25.0	U		5.0	UJ	I	0.50	UJ	I	5.0	U		1.1	U		0.11	U		1.0	U	
Calcium	NS	NS	110,000	J	I	500,000	UJ	I	27,000	J	L	109,000	J	I	100,000	UJ	I	57,000			26,800	U		36,000			8,000		
Chromium†	NS	**11**	**22.1**	J	I	**21.0**	J	I	25.0	U		**24.0**	J	I	**15.0**	J	I	**16.0**			**20.4**	J	I	3.3			8.7		
Cobalt	NS	**73**	9.0	J	I	4.1	J	I	25.0	U		5.5	J	I	3.6	J	I	7.4			1.1	U		0.70			2.7		
Copper	NS	**150**	**467**	J	I	**200**	J	I	**450**			**311**	J	I	96.0	J	I	90.0			53.4			47.0			120		
Iron	NS	**1,100**	6,250	UJ	I	50,000	UJ	I	**4,800**			**8,760**	J	I	**10,000**	J	I	**2,800**			784	J	L	710	J	L	**4,600**		
Lead‡	NS	***15***	7.8	J	I	5.1	UJ	I	25.0	U		5.4	J	I	***17.0***	J	I	***62.0***			***109***	J	I	***110***			***360***		
Magnesium	NS	NS	6,250	UJ	I	250,000	UJ	I	12,000	U		6,250	UJ	I	50,000	J	I	25,000	U		19,100			20,000	J	L	1,200	JB	H
Manganese	NS	**88**	**1,620**	J	I	**850**	J	I	250	U		**208**	J	I	**280**	J	I	**550**			35.9			22.0			**140**		
Mercury	0.068	**1.1**	**1.9**			**1.8**			1.0	U		0.44			0.37			0.25			0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	**412**	J	I	**280**	J	I	**330**			**286**	J	I	**150**	J	I	**160**			11.3			16.0			16.0		
Potassium	NS	NS	171,000	J	I	210,000	J	I	240,000	J	H	131,000	J	I	75,000	J	I	34,000			4,370			3,900	J	L	2,700	B	H
Selenium	NS	**18**	**18.6**	J	I	5.0	UJ	I	25.0	U		5.5	J	I	5.0	UJ	I	5.0	U		1.1	U		2.4			1.0	U	
Silver	NS	**18**	5.0	UJ	I	6.4	J	I	25.0	U		5.0	UJ	I	2.8	J	I	5.0	U		1.1	U		0.11	UJ	L	1.0	U	
Sodium	NS	NS	32,800,000	J	I	32,000,000	J	I	45,000,000			23,600,000	J	I	14,000,000	J	I	14,000,000			176,000			160,000			360,000		
Thallium	NS	**0.24**	1.5	UJ	I	3.8	UJ	I	1.9	UJ	I	1.5	UJ	I	0.75	UJ	I	0.38	UJ	I	0.32	UJ	I	0.17	UJ	I	0.20		
Vanadium	NS	**3.6**	**3,750**	J	I	**3,700**	J	H	**2,600**	J	H	**1,390**	J	I	**1,100**	J	H	**1,400**	J	H	11.1	U		2.9			**22.0**		
Zinc	NS	**1,100**	540	J	I	610	UJ	I	**1,600**			278	J	I	210	UJ	I	410			116	U		86.0			160		
Cyanide (weak acid dissociable)*	NS	**0.62**		R		5.0	U						R		25.0	U						R		5.0	U				
Natural Attenuation Parameters																												
Alkalinity (mg/l)	NS	NS	55,000			85,000			78,000			41,000			35,000			37,000			420			420			690		
Chloride (mg/l)	NS	NS	160			220			130			92.0			110			140			13.0			8.7			13.0	B	H
Nitrate (mg/l)	NS	**10**	1.0	UJ	L	2.2			1.0	U			R		1.0	U		0.50	U		0.10	U		1.1	J	L	0.050	U	
Sulfate (mg/l)	NS	NS	260			260			150			160			170			240			46.0			78.0			46.0		
Sulfide (mg/l)	NS	NS							0.20	UJ	L							0.20	UJ	L							0.20	UJ	L
Total Dissolved Solids (mg/l)	NS	NS							150,000									66,000									1,000		
TKN (mg/l)	NS	NS	8.5	J	I	0.80	J	I	4.3			2.3	J	I	1.7	J	I	6.0			0.50	UJ	I	0.60			1.1		
Total Organic Carbon (mg/l)	NS	NS							86.0									78.0									9.3		

TABLE 13D
Summary of Groundwater Data - Inorganic Parameters
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Analytes	Concentrations in µg/L (except as noted)																										
	COPC Screening Levels		SH-02D									SH-02R								SH-02S							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/13/2001			5/23/2002			10/30/2003			9/12/2001			5/16/2002			11/4/2003			9/12/2001			5/24/2002			10/29/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																													
Aluminum	NS	**3,600**	1,700			3,600	J	I	500	U		235			78.0	J	L	50.0	UJ	L	62.2			11.0	UJ	L	50.0	UJ	L
Antimony	NS	**1.5**	11.1	U		5.0	UJ	I	1.0	U		11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U	
Arsenic	NS	**0.045**	**65.2**			**210**	J	H	**9.8**			**3.8**			**3.4**			**2.7**			**0.45**	J	I	**1.3**			**0.85**		
Barium	NS	**260**	12.1	J	I	26.0	J	I	53.0			9.1	J	I	9.9			8.4			32.7	J	I	94.0			130		
Beryllium	NS	**7.3**	1.1	U		2.5	UJ	I	1.0	U		1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.50	UJ	I	1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Calcium	NS	NS	36,200	U		83,000	J	I	630,000			82,700			79,000			110,000			67,200			94,000			120,000		
Chromium†	NS	**11**	8.5	J	I	**24.0**	J	I	1.7			8.0	J	I	1.8			1.0	U		**28.4**	J	I	1.4			1.7		
Cobalt	NS	**73**	25.9			64.0	J	I	**170**			1.4			1.2			2.2			1.1	U		2.7			1.0		
Copper	NS	**150**	69.9			46.0	J	I	3.2	U		3.5	U		2.2	U		1.5			4.2	U		7.4			2.9		
Iron	NS	**1,100**	**4,960**	J	L	2,000	UJ	I	**11,000**			985	J	L	820	J	L	**1,400**			**11,400**	J	L	**2,000**	J	L	**18,000**		
Lead‡	NS	***15***	***95.6***	J	I	9.5	UJ	I	1.0	U		1.1	UJ	I	0.86			1.0	U		1.1	UJ	I	2.4			1.9		
Magnesium	NS	NS	22,800			29,000	J	I	330,000	J	H	25,600			19,000	J	L	21,000	J	L	29,800			13,000	J	L	22,000	J	L
Manganese	NS	**88**	**1,180**			**770**	J	I	**9,100**			**262**			**400**			**590**			**1,320**			**1,300**			**1,700**		
Mercury	0.068	**1.1**	0.20	U		0.40			0.20	U		0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L
Nickel	NS	**73**	**258**			**630**	J	I	**1,000**			29.0			25.0			36.0			4.8			24.0			10.0	U	
Potassium	NS	NS	3,630	U		7,900	J	I	4,600			1,120	U		830	J	L	780	J	L	6,870			7,400	J	L	7,600	J	L
Selenium	NS	**18**	10.9	J	H	**25.0**	J	I	**23.0**			2.3	J	H	2.6			2.5			1.1	U		1.1	U		1.0	U	
Silver	NS	**18**	1.1	U		0.52	J	I	1.0	U		1.1	U		0.11	UJ	L	1.0	U		1.1	U		0.11	UJ	L	1.0	U	
Sodium	NS	NS	1,450,000			4,400,000	J	I	250,000			119,000			97,000			130,000			107,000			75,000			100,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.75	UJ	I	0.082	J	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	**234**	J	H	**550**	J	H	**6.9**			11.1	U		1.5			1.0	U		11.1	U		1.1	U		2.3		
Zinc	NS	**1,100**	78.5	U		50.0	UJ	I	13.0			107	U		11.0	U		10.0	UJ	L	11.1	U		69.0			10.0	UJ	L
Cyanide (weak acid dissociable)*	NS	**0.62**		R		5.0	U						R		5.0	U						R		5.0	U				
Natural Attenuation Parameters																													
Alkalinity (mg/l)	NS	NS	2,900			10,000			830			170			160			180			410			400			480		
Chloride (mg/l)	NS	NS	140			140			380			84.0			80.0			95.0			17.0			9.0			9.3		
Nitrate (mg/l)	NS	**10**	0.10	U		0.25			0.50	U		0.10	U		0.10	UJ	L	0.050	U		0.10	U		0.56	J	L	0.050	U	
Sulfate (mg/l)	NS	NS	380			420			1,400			240			210			47.0			66.0			62.0			33.0		
Sulfide (mg/l)	NS	NS							0.20	UJ	L							0.20	U								0.20	UJ	L
Total Dissolved Solids (mg/l)	NS	NS							3,800									660									610		
TKN (mg/l)	NS	NS	1.8	J	I	1.0	J	I	5.0	U		0.50	UJ	I	0.50	U		0.50	U		1.9	J	I	0.80			1.9		
Total Organic Carbon (mg/l)	NS	NS							65.0									4.6									13.0		

TABLE 13D
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Analytes	Concentrations in µg/L (except as noted)																												
	COPC Screening Levels		SH-03D									SH-03S									SH-04D								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/23/2002			11/3/2003			9/11/2001			5/16/2002			11/3/2003			9/11/2001			5/21/2002			11/5/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																													
Aluminum	NS	**3,600**	451			**12,000**	J	L	**4,100**	J	L	55.6	U		56.0	UJ	L	50.0	UJ	L	1,820			650			1,900	J	L
Antimony	NS	**1.5**	11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U	
Arsenic	NS	**0.045**	**0.41**	J	I	**3.5**			**1.2**	B	H	**10.0**			**3.3**			**7.8**	B	H	**0.47**	J	I	0.59	UJ	I	**0.39**		
Barium	NS	**260**	12.5	J	I	67.0			29.0	B	H	120	J	I	110			130			12.5			6.8	U		12.0		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Calcium	NS	NS	49,200			23,000			24,000	B	H	82,100			58,000			56,000	B	H	16,400	J	H	15,000	U		18,000		
Chromium†	NS	**11**	1.1	UJ	I	**22.0**			7.7			3.8	J	I	3.4			2.3			4.6	J	I	2.2			3.6		
Cobalt	NS	**73**	1.2			8.7			5.5	B	H	1.7			3.9			2.0	B	H	1.3			0.51	U		1.8		
Copper	NS	**150**	49.9			17.0			12.0	B	H	4.1	U		2.2	U		3.4	B	H	2.3	U		1.0	U		3.5		
Iron	NS	**1,100**	1,050	J	L	**15,000**	J	L	**7,200**			**40,200**	J	L	**24,000**	J	L	**34,000**			**2,430**			880			**3,300**		
Lead‡	NS	***15***	10.4	J	I	4.4			5.6			1.1	UJ	I	1.2			3.0			1.1			0.50	U		1.5		
Magnesium	NS	NS	18,100			11,000	J	L	8,500	JB	I	33,300			17,000	J	L	12,000	JB	I	8,480			7,800	U		8,000	J	L
Manganese	NS	**88**	**1,720**			**1,200**			**1,000**			**4,180**			**4,000**			**2,600**			**101**			46.0	U		**150**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L
Nickel	NS	**73**	15.7			18.0			10.0	U		5.6			4.4			10.0	U		9.4	J	I	1.8	U		10.0	U	
Potassium	NS	NS	2,000	U		3,500	J	L	1,300	JB	I	10,600			6,400	J	L	4,900	JB	I	929	U		520	U		850	J	L
Selenium	NS	**18**	1.1	U		1.1	U		1.0	U		2.5	J	H	1.4			1.0	U		1.1	U		1.1	U		1.0	U	
Silver	NS	**18**	1.1	U		0.11	UJ	L	1.0	U		1.1	U		0.11	UJ	L	1.0	U		1.1	U		0.11	U		1.0	U	
Sodium	NS	NS	20,500	U		10,000			10,000	B	H	109,000			99,000			84,000			8,370			8,000	U		9,100		
Thallium	NS	**0.24**	0.32	UJ	I	0.25	J	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	11.1	U		**22.0**			**5.0**			11.1	U		2.1			1.8			11.1	U		1.4			2.0		
Zinc	NS	**1,100**	85.0	U		43.0			24.0	JB	I	50.1	U		13.0			10.0	UJ	L	37.5	UJ	I	11.0	U		10.0	UJ	L
Cyanide (weak acid dissociable)*	NS	**0.62**		R		5.0	U						R		5.0	U					5.0	U		5.0	U				
Natural Attenuation Parameters																													
Alkalinity (mg/l)	NS	NS	69.0			53.0			46.0			550			330			320			53.0			51.0	B	H	53.0		
Chloride (mg/l)	NS	NS	45.0			28.0			25.0	B	H	41.0			46.0			34.0	B	H	24.0			22.0	B	H	23.0		
Nitrate (mg/l)	NS	**10**	0.26			0.42	J	L	0.46	B	H	0.10	U		0.10	UJ	L	0.20	B	H	0.74			0.69			0.71		
Sulfate (mg/l)	NS	NS	94.0			45.0			26.0	B	H	16.0			40.0			26.0	B	H	10.0			9.2	B	H	9.3		
Sulfide (mg/l)	NS	NS							0.20	U								0.20	U								0.20	U	
Total Dissolved Solids (mg/l)	NS	NS							150									490									140		
TKN (mg/l)	NS	NS	0.50	UJ	I	0.50	U		0.50	U		7.9	J	I	3.8			4.0	B	H	0.50	U		0.50	U		0.50	U	
Total Organic Carbon (mg/l)	NS	NS							1.0	U								12.0									1.0	U	

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Analytes	Concentrations in µg/L (except as noted)																									
	COPC Screening Levels		SH-04S									SH-05D									SH-05R-A			SH-05R-B		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/11/2001			5/20/2002			10/28/2003			9/11/2001			5/21/2002			11/4/2003			11/10/2003			11/11/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																										
Aluminum	NS	**3,600**	1,120			480			500	U		66.3			220			160	J	L	220			100	U	
Antimony	NS	**1.5**	11.1	U		1.1			1.2			11.1	U		1.1	U		1.0	U		1.0	U		1.0	U	
Arsenic	NS	**0.045**	**61.4**			**38.0**			**35.0**			**0.33**	J	I	0.45	UJ	I	**0.27**			**20.0**	J	L	**22.0**	J	L
Barium	NS	**260**	9.7	J	I	11.0			17.0			16.8			14.0	U		12.0			19.0			7.3		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.0	U		1.0	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.0	U		1.0	U	
Calcium	NS	NS	6,850	U		12,000			10,000			37,500	J	H	29,000	U		37,000			13,000			13,000		
Chromium†	NS	**11**	9.6	J	I	3.4			3.1			6.3	J	I	1.1	U		1.0	U		1.0	U		1.0	U	
Cobalt	NS	**73**	1.7			0.87			1.3			1.1	U		0.52	U		1.1			1.0	U		1.0	U	
Copper	NS	**150**	19.9			10.0			8.8			1.1	U		0.56	U		1.1			1.4	U		1.0	U	
Iron	NS	**1,100**	**1,240**	J	L	760			**1,600**			211	U		310			560			240			140		
Lead‡	NS	***15***	6.2	J	I	2.2	U		6.5			1.1	U		0.27	U		1.0	U		1.0	U		1.0	U	
Magnesium	NS	NS	482	U		2,800			1,300	JB	H	16,000			16,000	U		17,000	J	L	2,600			2,700		
Manganese	NS	**88**	57.6			69.0			79.0			62.6			51.0	U		64.0			23.0			24.0		
Mercury	0.068	**1.1**	0.20			0.20	U		0.20	U		0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U	
Nickel	NS	**73**	47.8			24.0			24.0			4.2	J	I	4.0	U		10.0	U		10.0	U		10.0	U	
Potassium	NS	NS	2,010	U		2,000			2,000	B	H	834	U		730	U		760	J	L	860			500	U	
Selenium	NS	**18**	1.1	J	H	1.4			1.4			1.9			2.8			2.0			1.0	U		1.0	U	
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.0	U		1.0	U	
Sodium	NS	NS	899,000			560,000			710,000			14,600			14,000	U		16,000			6,900			6,600		
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.080	UJ	I	0.080	UJ	I
Vanadium	NS	**3.6**	**140**	J	H	**78.0**			**84.0**	J	I	11.1	U		1.1	U		1.0	U		1.2			1.0	U	
Zinc	NS	**1,100**	19.5	U		11.0	U		10.0	U		28.5	UJ	I	13.0	U		10.0	UJ	L	10.0	U		10.0	U	
Cyanide (weak acid dissociable)*	NS	**0.62**		R		5.0	U					5.0	U		5.0	U					0.0050	U		0.0050	U	
Natural Attenuation Parameters																										
Alkalinity (mg/l)	NS	NS	1,700			1,200			1,400			71.0			67.0			76.0			45.0			46.0		
Chloride (mg/l)	NS	NS	47.0			47.0			46.0			44.0			43.0	B	H	50.0			2.3			2.3		
Nitrate (mg/l)	NS	**10**	0.10	U		0.10	U		0.050	U		0.72			0.77			0.76			0.30			0.30		
Sulfate (mg/l)	NS	NS	52.0			41.0			42.0			38.0			56.0			72.0			8.0			7.8		
Sulfide (mg/l)	NS	NS							0.27	J	L							0.20	U		0.20	U		0.20	U	
Total Dissolved Solids (mg/l)	NS	NS							2,200									280			130			42.0		
TKN (mg/l)	NS	NS	2.0	J	I	1.7			2.1			0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Total Organic Carbon (mg/l)	NS	NS							15.0									1.2			1.0	U		1.0	U	

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Analytes	Concentrations in µg/L (except as noted)																									
	COPC Screening Levels		SH-05S									SH-06D									SH-06R-A			SH-06R-B		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/11/2001			5/21/2002			10/29/2003			9/6/2001			5/22/2002			10/29/2003			11/5/2003			11/6/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																										
Aluminum	NS	**3,600**	1,190			490			500	U		**3,880**	J	I	5,000	UJ	I	12,000	U		100	U		100	U	
Antimony	NS	**1.5**	11.1	U		**2.8**			1.0	U		**14.0**	J	I	**14.0**	J	I	**20.0**			1.0	U		1.0	U	
Arsenic	NS	**0.045**	**27.3**			**21.0**			**6.4**			**539**	J	I	**520**	J	H	**800**	J	H	**1.3**	J	L	**1.1**	J	L
Barium	NS	**260**	11.4	J	I	10.0			9.1			5.8	J	I	25.0	UJ	I	12.0			27.0			120		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.0	U		1.1	UJ	I	5.0	UJ	I	5.0	U		1.0	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	UJ	I	0.50	UJ	I	5.0	U		1.0	U		1.0	U	
Calcium	NS	NS	4,650	U		6,200			30,000			19,800	J	I	100,000	UJ	I	59,000			140,000			120,000		
Chromium†	NS	**11**	5.9	J	I	5.2	J	I	2.5			**11.3**	J	I	9.4	J	I	10.0			1.0	U		1.0	U	
Cobalt	NS	**73**	2.3			1.6			1.0	U		6.2	J	I	6.5	UJ	I	5.0	U		16.0			17.0		
Copper	NS	**150**	24.5			12.0			6.7			108	J	I	56.0	J	I	61.0			9.9	U		8.9	U	
Iron	NS	**1,100**	**2,080**	J	L	**1,200**			920			231	J	I	10,000	UJ	I	**1,600**			150			50.0	U	
Lead‡	NS	***15***	***25.7***	J	I	***23.0***			12.0			10.5	J	I	***17.0***	J	I	6.8			1.0	U		1.0	U	
Magnesium	NS	NS	562	U		2,200	U		5,300	J	H	1,390	UJ	I	50,000	UJ	I	12,000	U		44,000			39,000		
Manganese	NS	**88**	**90.7**			**93.0**			**170**			**205**	J	I	180	UJ	I	**140**			**120**	B	H	**380**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	21.2			15.0			10.0	U		**261**	J	I	200	UJ	I	**230**			72.0			**95.0**		
Potassium	NS	NS	1,040	U		1,100	U		3,100			7,330	J	I	25,000	UJ	I	12,000	U		2,200			5,900		
Selenium	NS	**18**	2.4	J	H	1.1	U		1.0	U		11.7	J	I	7.4	J	I	7.3			4.3			8.0		
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.1	UJ	I	0.80	J	I	5.0	U		1.0	U		1.0	U	
Sodium	NS	NS	660,000			590,000			230,000			7,190,000	J	I	5,500,000	J	I	8,300,000			38,000			130,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.21	J	I	0.075	UJ	I	0.32	UJ	I	0.75	UJ	I	0.38	UJ	I	0.080	UJ	I	0.080	UJ	I
Vanadium	NS	**3.6**	**96.7**	J	H	**58.0**			**15.0**	J	I	**2,860**	J	I	**1,700**	J	H	**2,800**	J	H	1.5			1.6		
Zinc	NS	**1,100**	11.8	U		11.0	U		20.0			12.9	UJ	I	50.0	UJ	I	50.0	U		12.0			10.0	U	
Cyanide (weak acid dissociable)*	NS	**0.62**		R		5.0	U					5.0	UJ	L	5.0	U					0.0050	U		0.0050	U	
Natural Attenuation Parameters																										
Alkalinity (mg/l)	NS	NS	1,200			1,200			540			17,000			13,000			18,000			150			190		
Chloride (mg/l)	NS	NS	22.0			23.0			5.9			120			140			130			150			150		
Nitrate (mg/l)	NS	**10**	0.10	U		0.10	U		0.050	U		0.32			1.0	UJ	I	0.50	U		0.54			1.6		
Sulfate (mg/l)	NS	NS	28.0			18.0			8.2			150			180	J	L	180			30.0			250		
Sulfide (mg/l)	NS	NS							0.20	UJ	L							0.20	UJ	L	0.20	U		0.20	U	
Total Dissolved Solids (mg/l)	NS	NS							730									32,000			860			900		
TKN (mg/l)	NS	NS	1.3	J	I	1.1			5.0	U		8.7			5.6	J	I	5.8			0.50	U		0.50	U	
Total Organic Carbon (mg/l)	NS	NS							9.9									74.0			3.0			4.9		

TABLE 13D
Summary of Groundwater Data - Inorganic Parameters
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Walpole, Massachusetts

Analytes	Concentrations in µg/L (except as noted)																											
	COPC Screening Levels		SH-06S									SH-07D								SH-07S								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/6/2001			5/22/2002			10/29/2003			9/7/2001			5/22/2002			10/30/2003			9/7/2001			5/22/2002			10/29/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																												
Aluminum	NS	**3,600**	**10,200**			1,500	J	L	660			**19,900**	J	I	**21,000**	J	I	**30,000**			539			400	J	L	500	U	
Antimony	NS	**1.5**	11.1	U		**5.3**			**4.8**			50.0	UJ	I	**35.0**	J	I	**42.0**			11.1	U		**5.5**			**4.1**		
Arsenic	NS	**0.045**	**14.2**			8.4	U		**7.7**			**436**	J	I	**520**	J	H	**790**	J	H	**2.3**			2.6	U		**2.5**		
Barium	NS	**260**	111			39.0	U		26.0			14.8	J	I	25.0	UJ	I	26.0			16.9			19.0	U		18.0		
Beryllium	NS	**7.3**	1.1	U		1.1	U		1.0	U		5.0	UJ	I	5.0	UJ	I	5.0	U		1.1	U		1.1	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.20			1.0	U		5.0	UJ	I	0.50	UJ	I	5.0	U		1.1	U		0.13			1.0	U	
Calcium	NS	NS	11,800			18,000	UJ	I	19,000			70,800	J	I	100,000	UJ	I	60,000			7,050			21,000	UJ	I	14,000		
Chromium†	NS	**11**	**25.9**	J	I	10.0	J	I	7.0			**33.6**	J	I	**39.0**	J	I	**76.0**			9.0	J	I	5.5	J	I	4.4		
Cobalt	NS	**73**	7.2			3.2	U		1.9			5.5	J	I	5.7	UJ	I	14.0			2.7			4.7	U		2.8		
Copper	NS	**150**	96.3			33.0			20.0			**400**	J	I	130	J	I	**190**			45.6			20.0			30.0		
Iron	NS	**1,100**	**8,290**			**2,100**	J	L	**1,800**			250	UJ	I	10,000	UJ	I	**22,000**			**1,800**			720	J	L	**2,100**		
Lead‡	NS	***15***	***575***			***190***			***140***			12.0	J	I	4.0	J	I	6.3			***67.9***			***22.0***			***48.0***		
Magnesium	NS	NS	2,130			2,500	UJ	I	2,200	J	H	6,250	UJ	I	50,000	UJ	I	25,000	U		1,870			5,200	UJ	I	2,300	J	H
Manganese	NS	**88**	**241**			**320**			**120**			**595**	J	I	**580**	J	I	**1,700**			**121**			130	U		**140**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	U		0.24			0.46			1.0	U		0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	29.6	J	I	16.0	U		15.0			**164**	J	I	110	UJ	I	**150**			7.2	J	I	6.7	U		10.0	U	
Potassium	NS	NS	4,620			4,300	U		6,300			44,100	J	I	43,000	J	I	20,000			3,000			3,400	U		4,800		
Selenium	NS	**18**	2.4			2.4			1.2			8.5	J	I	11.0	J	I	10.0			1.1	U		12.0			1.1		
Silver	NS	**18**	1.1	U		0.13			1.0	U		5.0	UJ	I	1.0	J	I	5.0	U		1.1	U		0.11	U		1.0	U	
Sodium	NS	NS	427,000			410,000			410,000			11,400,000	J	I	16,000,000	J	I	18,000,000			491,000			440,000			560,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	1.5	UJ	I	0.75	UJ	I	0.38	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	**68.5**			**28.0**			**30.0**	J	I	**2,290**	J	I	**2,400**	J	H	**3,400**	J	H	**14.1**			**7.3**			**11.0**		
Zinc	NS	**1,100**	182	UJ	I	79.0	U		42.0			165	UJ	I	50.0	UJ	I	58.0			52.9	UJ	I	47.0	U		42.0		
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U					5.0	UJ	L	5.0	U					5.0	U		5.0	U				
Natural Attenuation Parameters																												
Alkalinity (mg/l)	NS	NS	880			810			850			29,000			36,000			48,000			1,000			880			1,000		
Chloride (mg/l)	NS	NS	20.0			15.0	B	H	9.4			250			290			440			10.0			15.0	B	H	8.1		
Nitrate (mg/l)	NS	**10**	0.10	U		0.10	U		0.050	U		1.0	U		2.2			2.2			0.10	U		1.6			0.050	U	
Sulfate (mg/l)	NS	NS	31.0			41.0	JB	I	30.0			190			220	J	L	290			10.0			43.0	JB	I	4.4		
Sulfide (mg/l)	NS	NS							0.20	UJ	L							0.20	UJ	L							0.20	UJ	L
Total Dissolved Solids (mg/l)	NS	NS							1,000									78,000									1,200		
TKN (mg/l)	NS	NS	4.2			5.9			4.1			5.0			3.1	J	I	6.0			2.0			1.2			0.50	U	
Total Organic Carbon (mg/l)	NS	NS							34.0									75.0									18.0		

TABLE 13D
Summary of Groundwater Data - Inorganic Parameters
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Walpole, Massachusetts

Analytes	Concentrations in µg/L (except as noted)																										
	COPC Screening Levels		SH-08D									SH-08S								SH-09D							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/7/2001			5/20/2002			10/29/2003			9/6/2001			5/21/2002			10/28/2003			9/7/2001			5/23/2002			10/28/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																													
Aluminum	NS	**3,600**	**13,800**			3,300	J	L	**8,500**			55.6	U		11.0	U		500	U		1,120			1,300			1,400		
Antimony	NS	**1.5**	11.1	U		**1.9**			**1.6**			11.1	U		1.1	U		1.0	U		11.1	U		**1.6**			**1.8**		
Arsenic	NS	**0.045**	**15.5**			**18.0**			0.046	UJ	I	**7.4**			**0.79**			**4.5**			**72.0**			**61.0**			**76.0**	J	H
Barium	NS	**260**	145			44.0	U		83.0			60.6			42.0			51.0			5.5			5.6	U		7.5		
Beryllium	NS	**7.3**	1.1	U		1.1	U		1.0	UJ	L	1.1	U		0.56	U		1.0	U		1.1	U		1.1	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Calcium	NS	NS	4,530			5,500	UJ	I	14,000			37,200			52,000			50,000			2,510			1,900			3,000	B	H
Chromium†	NS	**11**	**21.7**	J	I	7.2	J	I	**14.0**			1.3			5.5			1.0	U		**34.1**	J	I	2.0			2.0		
Cobalt	NS	**73**	13.0			2.7	U		7.9			1.8			1.1	J	I	1.4			1.3			0.87			1.3		
Copper	NS	**150**	71.8			16.0			45.0			1.1	U		0.99	U		1.6	U		33.4			20.0			26.0		
Iron	NS	**1,100**	**15,300**			**3,100**	J	L	**13,000**			**5,780**			**2,400**			**4,000**			**1,210**			480			940		
Lead‡	NS	***15***	13.7			3.2			9.8			1.1	U		0.24	U		1.0	U		1.1	U		0.57			1.4		
Magnesium	NS	NS	3,670			1,000	UJ	I	2,500	J	H	2,810			2,600			3,600	J	H	55.6	U		560	U		500	U	
Manganese	NS	**88**	**961**			**380**			**1,700**			**1,150**			**280**			**680**			31.5			20.0			51.0		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	22.7	J	I	5.8	U		16.0			1.4			4.0			10.0	U		6.6	J	I	3.7			10.0	U	
Potassium	NS	NS	2,720			1,400	U		2,800			6,780			7,400			9,100			334	U		290			630	B	H
Selenium	NS	**18**	1.1	U		1.1	U		1.2			1.1	U		1.1	U		1.0	U		1.5			2.2			1.5		
Silver	NS	**18**	1.1	U		0.23			1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.40			1.0	U	
Sodium	NS	NS	432,000			400,000			360,000			12,400			7,800			15,000	B	H	538,000			540,000			520,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	**44.6**			**46.0**			**100**	J	I	11.1	U		1.1	U		1.0	U		**255**			**190**			**260**	J	H
Zinc	NS	**1,100**	54.5	UJ	I	13.0	U		33.0			11.1	U		11.0	U		10.0	U		11.1	UJ	I	11.0	U		10.0	U	
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U					5.0	U		5.0	U					5.0	U		5.0	U				
Natural Attenuation Parameters																													
Alkalinity (mg/l)	NS	NS	1,100			770			770			140			150			160			970			810			850		
Chloride (mg/l)	NS	NS	7.5			12.0	B	H	4.8			1.0			1.5	B	H	1.0	U		120			140			130		
Nitrate (mg/l)	NS	**10**	0.10	U		0.10	U		0.050	U		0.29			0.63			0.41	B	H	0.10	U		0.10	U		0.30	B	H
Sulfate (mg/l)	NS	NS	2.0			3.1	JB	I	2.8			3.4			20.0			3.8			92.0			86.0			68.0		
Sulfide (mg/l)	NS	NS							0.20	UJ	L							0.20	UJ	L							0.20	UJ	L
Total Dissolved Solids (mg/l)	NS	NS							980									190									1,300		
TKN (mg/l)	NS	NS	1.0	U		0.50	U		0.50	U		0.80			0.50	U		0.50	U		1.4			0.90			1.3		
Total Organic Carbon (mg/l)	NS	NS							13.0									3.3									18.0		

TABLE 13D
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Walpole, Massachusetts

Analytes	Concentrations in µg/L (except as noted)																										
	COPC Screening Levels		SH-09S									SH-10S								SH-11S							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/7/2001			5/17/2002			10/31/2003			9/10/2001			5/23/2002			10/31/2003			9/7/2001			5/16/2002			11/3/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																													
Aluminum	NS	**3,600**	1,570			730			460	J	L	55.6	U		47.0			93.0	J	L	55.6	U		11.0	U		50.0	UJ	L
Antimony	NS	**1.5**	11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U		11.1	U		**3.2**			**4.5**		
Arsenic	NS	**0.045**	**54.3**			**23.0**			**41.0**			**0.95**			2.0	UJ	I	**1.5**			**3.2**			0.66	UJ	I	**0.37**	B	H
Barium	NS	**260**	16.2			14.0			8.5			81.1			180			88.0			138			230			**270**		
Beryllium	NS	**7.3**	1.1	U		1.1	U		1.0	U		1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		**2.1**			**2.8**		
Calcium	NS	NS	556	U		2,400			650			25,200	J	H	38,000	U		25,000			47,600			150,000			170,000		
Chromium†	NS	**11**	3.0	J	I	1.9			1.0	U		2.1	J	I	1.1	U		1.0	U		1.1	UJ	I	3.5			1.0	U	
Cobalt	NS	**73**	1.1	U		1.3			1.0	U		2.7			5.3	U		1.0	U		1.1	U		0.40	U		1.0	U	
Copper	NS	**150**	49.8			28.0			29.0			1.6	U		1.2	U		2.6			1.1	U		4.1	U		5.1	B	H
Iron	NS	**1,100**	**1,260**			650			480			**4,710**			**24,000**			**5,000**			**21,600**			**4,900**			**5,500**		
Lead‡	NS	***15***	2.8			1.4			1.0	U		1.6			1.4	U		3.9			1.1	U		1.7	U		1.7		
Magnesium	NS	NS	276	U		840			140	J	L	4,780			5,800	U		4,400	J	L	9,320			9,400	U		7,600	JB	I
Manganese	NS	**88**	44.4			**190**			34.0			**542**			**1,200**			**130**			**2,400**			6.6	U		10.0	U	
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L
Nickel	NS	**73**	2.0	J	I	2.3			10.0	U		2.8	J	I	3.2	U		10.0	U		1.9	J	I	29.0	U		34.0		
Potassium	NS	NS	438	U		460			360	J	L	2,320			2,500	U		2,300	J	L	4,020			4,200	U		5,000	JB	I
Selenium	NS	**18**	1.6			1.4			1.1			1.1	U		1.4			1.0	U		1.1	U		7.7			12.0		
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Sodium	NS	NS	170,000			160,000			150,000			64,000			60,000	U		88,000			24,200			11,000	U		7,300	B	H
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	**57.0**			**30.0**			**48.0**			11.1	U		1.1	U		1.2			11.1	U		1.1	U		1.0	U	
Zinc	NS	**1,100**	62.5	UJ	I	44.0			10.0	UJ	L	101	UJ	I	250	U		68.0	J	L	29.5	UJ	I	**6,800**			**7,700**	J	L
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U					**6.8**			5.0	U					5.0	U		5.0	U				
Natural Attenuation Parameters																													
Alkalinity (mg/l)	NS	NS	180			110			140			68.0			110			47.0			180			360			360		
Chloride (mg/l)	NS	NS	22.0			20.0			14.0			110			120	B	H	160			40.0			28.0	B	H	7.8	B	H
Nitrate (mg/l)	NS	**10**	4.7			4.7			4.1			0.81			0.86			0.94			0.10	U		5.6			6.9	B	H
Sulfate (mg/l)	NS	NS	110			140			120			13.0			8.0	B	H	10.0			1.1			39.0			35.0	B	H
Sulfide (mg/l)	NS	NS							0.20	U								0.20	U								0.20	U	
Total Dissolved Solids (mg/l)	NS	NS							410									360									500		
TKN (mg/l)	NS	NS	1.8			0.70			0.80			0.60			0.70			0.50	U		1.8			0.50	U		0.50	U	
Total Organic Carbon (mg/l)	NS	NS							8.4									1.5									4.0		

TABLE 13D
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Analytes	Concentrations in µg/L (except as noted)																										
	COPC Screening Levels		SH-12D									SH-12S								SH-13S							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/17/2002			11/3/2003			9/11/2001			5/17/2002			11/3/2003			9/11/2001			5/16/2002			11/3/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																													
Aluminum	NS	**3,600**	1,550			360			220	J	L	55.6	U		140			50.0	UJ	L	114	J	I	200			1,200	J	L
Antimony	NS	**1.5**	11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U	
Arsenic	NS	**0.045**	**0.52**			0.56	UJ	I	**0.25**	B	H	**5.5**			**5.4**	J	I	**11.0**	B	H	**3.3**			2.6	UJ	I	**5.6**	B	H
Barium	NS	**260**	15.6			13.0	U		10.0	B	H	190			210			250			188			91.0			140		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Calcium	NS	NS	25,500	J	H	21,000	U		23,000	B	H	64,200	J	H	76,000			110,000			94,400	J	H	72,000			98,000		
Chromium†	NS	**11**	4.4	J	I	1.6			1.0	U		5.0	J	I	2.0			1.0	U		**35.4**	J	I	2.2			2.6		
Cobalt	NS	**73**	2.5			1.0	U		1.0	U		5.4			7.8	U		12.0			1.7			0.96	U		1.9	B	H
Copper	NS	**150**	3.6	U		1.1	U		2.0	B	H	1.1	U		2.8	U		1.8	B	H	2.1	U		1.2	U		11.0	B	H
Iron	NS	**1,100**	**2,610**			760			570	B	H	**25,600**			**27,000**			**47,000**			**26,200**			**26,000**			**36,000**		
Lead‡	NS	***15***	1.6			0.60	U		1.1			2.1			9.9			4.6			8.4			15.0			***160***		
Magnesium	NS	NS	6,640			6,200	U		6,400	JB	I	8,170			8,600	U		9,600	JB	I	25,300			17,000			17,000	JB	I
Manganese	NS	**88**	**983**			**390**			**120**			**2,620**			**2,600**			**2,800**			**1,520**			**1,800**			**1,500**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L
Nickel	NS	**73**	4.2	J	I	2.4	U		10.0	U		5.7	J	I	6.1	U		10.0	U		4.1	J	I	2.7	U		10.0	U	
Potassium	NS	NS	2,130			1,200	U		1,200	JB	I	4,240			3,900	U		4,500	JB	I	4,230			3,700	U		4,200	JB	I
Selenium	NS	**18**	1.1	U		1.1	U		1.0	U		1.1	U		1.3			1.0	U		1.4			1.5			1.0	U	
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Sodium	NS	NS	15,400			16,000	U		19,000	B	H	47,100			37,000	U		30,000			14,400			14,000	U		17,000	B	H
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U		11.1	U		1.4			**4.3**		
Zinc	NS	**1,100**	22.4	UJ	I	11.0	U		10.0	JB	I	1,050	J	I	1,100			**1,800**	J	L	285	UJ	I	82.0	U		890	J	L
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U					5.0	U		5.0	U					5.0	U		5.0	U				
Natural Attenuation Parameters																													
Alkalinity (mg/l)	NS	NS	59.0			45.0	B	H	36.0	B	H	200			210			280			330			280			260		
Chloride (mg/l)	NS	NS	44.0			42.0	B	H	52.0	B	H	76.0			77.0	B	H	57.0	B	H	27.0			31.0	B	H	33.0	B	H
Nitrate (mg/l)	NS	**10**	0.69			0.73			1.4	B	H	0.10	U		0.10	U		0.050	U		0.10	U		0.31			0.20	B	H
Sulfate (mg/l)	NS	NS	12.0			10.0	B	H	10.0	B	H	13.0			15.0	B	H	10.0	B	H	1.0	U		4.1	B	H	3.9	B	H
Sulfide (mg/l)	NS	NS							0.20	UJ	L							0.20	U								0.20	U	
Total Dissolved Solids (mg/l)	NS	NS							200									430									370		
TKN (mg/l)	NS	NS	0.50	U		0.50	U		0.50	U		1.1			0.90			1.4	B	H	1.5			1.1			1.3	B	H
Total Organic Carbon (mg/l)	NS	NS							1.0	U								5.8									5.5		

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Analytes	Concentrations in µg/L (except as noted)																											
	COPC Screening Levels		SH-14D									SH-14S									SH-15D							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/10/2001			5/20/2002			11/4/2003			9/10/2001			5/20/2002			11/4/2003			9/10/2001			5/17/2002			11/4/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																												
Aluminum	NS	**3,600**	112			280			96.0	J	L	85.3			78.0			97.0	J	L	379			520			270	J	L
Antimony	NS	**1.5**	11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U	
Arsenic	NS	**0.045**	**0.46**	J	I	0.81	UJ	I	**1.7**			**1.4**			**4.9**			**4.6**			**0.50**			0.29	UJ	I	**0.18**	J	L
Barium	NS	**260**	9.1			10.0	U		5.7			31.7			23.0			30.0			13.9			15.0	U		13.0		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.0	U		1.1	U		1.1	U		1.0	U		1.1	U		0.56	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Calcium	NS	NS	12,100	J	H	11,000	U		14,000			45,800			49,000			50,000			11,900	J	H	11,000	U		13,000		
Chromium†	NS	**11**	1.1	UJ	I	1.1	U		1.0	U		1.8	J	I	2.0			1.0	U		4.7	J	I	1.2			1.0	U	
Cobalt	NS	**73**	1.1	U		0.16	U		1.0	U		3.1			1.3			1.3			1.2			1.4	U		1.3		
Copper	NS	**150**	1.1	U		0.88	U		1.2			2.0	U		4.0			3.0			1.1	U		1.2	U		1.9		
Iron	NS	**1,100**	148	U		220			280			**2,480**			**2,500**			**12,000**			616	U		730			590		
Lead‡	NS	***15***	1.1	U		0.21	U		1.0	U		1.1	U		0.36			1.0	U		1.1	U		0.55	U		1.0	U	
Magnesium	NS	NS	5,460			5,300	U		5,100	J	L	26,300			27,000			23,000	J	L	5,180			4,900	U		4,800	J	L
Manganese	NS	**88**	11.1	U		12.0	U		10.0	U		**1,670**			**1,800**			**2,000**			76.8			110	U		83.0		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	UJ	L
Nickel	NS	**73**	1.1	UJ	I	1.2	U		10.0	U		4.6	J	I	7.0			10.0	U		2.3	J	I	2.2	U		10.0	U	
Potassium	NS	NS	630	U		590	U		540	J	L	2,540			2,400			1,700	J	L	950	U		830	U		840	J	L
Selenium	NS	**18**	1.1	U		1.1	U		1.0	U		1.1	U		1.1			1.0	U		1.1	U		1.1	U		1.0	U	
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U	
Sodium	NS	NS	13,600			14,000	U		20,000			34,700			65,000			32,000			14,300			14,000	U		16,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.32	UJ	I	0.17	J	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	11.1	U		2.5			**5.9**			11.1	U		**7.2**			**6.1**			11.1	U		1.5			1.0	U	
Zinc	NS	**1,100**	29.2	UJ	I	11.0	U		10.0	UJ	L	11.1	UJ	I	11.0	U		10.0	UJ	L	84.8	UJ	I	11.0	U		10.0	UJ	L
Cyanide (weak acid dissociable)*	NS	**0.62**	**6.8**			5.0	U					5.0	U		5.0	U					5.0	U		5.0	U				
Natural Attenuation Parameters (mg/l)																												
Alkalinity (mg/l)	NS	NS	34.0			36.0	B	H	46.0			240			270			220			33.0			28.0	B	H	18.0		
Chloride (mg/l)	NS	NS	33.0			28.0	B	H	27.0			36.0			38.0			37.0			34.0			28.0	B	H	31.0		
Nitrate (mg/l)	NS	**10**	0.30			0.40			0.45			0.20			0.32			0.40			0.58			0.66			0.71		
Sulfate (mg/l)	NS	NS	8.5			8.2	B	H	10.0			31.0			33.0			27.0			11.0			10.0	B	H	9.7		
Sulfide (mg/l)	NS	NS							0.20	U								0.20	U								0.20	U	
Total Dissolved Solids (mg/l)	NS	NS							120									280									110		
TKN (mg/l)	NS	NS	0.50	U		0.50	U		0.50	U		0.50			0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Total Organic Carbon (mg/l)	NS	NS							1.0	U								4.0									1.0	U	

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Analytes	COPC Screening Levels		Concentrations in µg/L (except as noted)																						
			SH-15S									SH-16S									SH-17D			SH-17R		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/10/2001			5/20/2002			10/28/2003			9/11/2001			5/17/2002			11/19/2003			11/20/2003			11/20/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																									
Aluminum	NS	**3,600**	735			2,500			500	U		1,210			1,700			630	J	L	540			500	U	
Antimony	NS	**1.5**	11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		1.0	U		**3.6**			**1.6**		
Arsenic	NS	**0.045**	**16.5**			**19.0**			**13.0**			**17.4**			**4.7**	J	I	**4.0**			**69.0**			**48.0**		
Barium	NS	**260**	18.6			180			18.0			10.6			9.1	U		7.7			5.7			14.0		
Beryllium	NS	**7.3**	1.1	U		1.1	U		1.0	U		1.1	U		0.56	U		1.0	U		1.0	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.0	U		1.0	U	
Calcium	NS	NS	9,220			56,000			12,000			5,170	J	H	1,200	U		3,200			5,200			48,000		
Chromium†	NS	**11**	6.1	J	I	4.8			2.6			4.8	J	I	4.3			1.4			1.1			1.0	U	
Cobalt	NS	**73**	1.1	U		0.91			1.0	U		1.3			0.70	U		1.0	U		1.8			6.4		
Copper	NS	**150**	14.7	U		35.0			9.8			15.1			7.3	U		12.0			38.0			18.0		
Iron	NS	**1,100**	692			**1,300**			560			961	U		730			500			610			530		
Lead‡	NS	***15***	5.1			***34.0***			3.5			1.6			2.1	U		2.5			5.2			1.9		
Magnesium	NS	NS	224	U		560	U		500	U		1,250			290	U		440	J	L	1,000	U		14,000	J	H
Manganese	NS	**88**	28.5			36.0			22.0			**102**			16.0	U		24.0			61.0			**470**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U	
Nickel	NS	**73**	10.6	J	I	9.6			10.0	U		5.5	J	I	2.7	U		10.0	U		14.0			30.0		
Potassium	NS	NS	2,200			3,200			1,500	B	H	1,630			1,000	U		1,400	J	L	2,000			2,300		
Selenium	NS	**18**	1.8			1.3			1.3			2.0			1.2			1.0	U		2.1			3.0		
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.0	U		1.0	U		1.0	U	
Sodium	NS	NS	419,000			180,000			370,000			169,000			110,000	U		190,000			610,000			400,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.20	J	I	0.075	UJ	I	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	0.075	UJ	I	0.075	UJ	I
Vanadium	NS	**3.6**	**44.7**			**44.0**			**26.0**			**57.3**			**16.0**			**11.0**			**220**			**170**		
Zinc	NS	**1,100**	11.1	UJ	I	11.0	U		18.0	B	H	91.6	UJ	I	54.0	U		10.0	UJ	L	10.0	U		10.0	U	
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U					5.0	U		5.0	U					0.0050	U		0.0050	U	
Natural Attenuation Parameters (mg/l)																									
Alkalinity (mg/l)	NS	NS	840			400			790			310			180			310			1,200			600		
Chloride (mg/l)	NS	NS	38.0			21.0			41.0			34.0			31.0	B	H	9.5			27.0			81.0		
Nitrate (mg/l)	NS	**10**	0.10	U		0.10	U		0.050	U		0.10	U		1.1			0.28			0.050	U		0.050	U	
Sulfate (mg/l)	NS	NS	18.0			13.0			15.0			38.0			16.0	B	H	21.0			69.0			210		
Sulfide (mg/l)	NS	NS							0.36	J	L							0.20	U		0.20	UJ	L	0.20	UJ	L
Total Dissolved Solids (mg/l)	NS	NS							1,000									400			1,800			1,300		
TKN (mg/l)	NS	NS	2.6			1.2			1.7			0.90			0.70			0.50	U		1.8			0.90		
Total Organic Carbon (mg/l)	NS	NS							14.0									6.8			12.0			13.0		

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Analytes	COPC Screening Levels		Concentrations in µg/L (except as noted)																									
			SH-17S									SH-18D						SH-18S						SH-19D				
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/6/2001			5/20/2002			11/19/2003			9/4/2001			5/15/2002			9/4/2001			5/15/2002			9/5/2001			5/16/2002		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																												
Aluminum	NS	**3,600**	55.6	U		14.0			50.0	UJ	L	55.6	U		13.0			55.6	U		15.0			326			180		
Antimony	NS	**1.5**	11.1	U		1.1	U		1.0	U		11.1	U		1.1	U		11.1	U		1.1	U		11.1	U		1.1	U	
Arsenic	NS	**0.045**	**0.31**	J	I	0.32	U		**0.14**	J	L	**0.53**			**0.78**			**0.37**	J	I	**0.67**			**0.68**			**0.80**		
Barium	NS	**260**	23.8			43.0			27.0			16.2			17.0			56.7			77.0			23.1			20.0		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.0	U		1.1	U		0.56	U		1.1	U		0.56	U		1.1	U		0.56	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.1	U		0.17			1.1	U		0.11	U	
Calcium	NS	NS	20,100			29,000			36,000			26,500			25,000			23,900			33,000			23,700			20,000		
Chromium†	NS	**11**	1.1	U		1.2			1.0	U		1.1	U		1.1	U		1.1	U		1.1	U		1.8			1.2		
Cobalt	NS	**73**	1.1	U		0.26	UJ	I	1.0	U		1.1	U		0.13	UJ	I	2.2			1.9	J	I	1.7			0.61	UJ	I
Copper	NS	**150**	1.1	U		1.7	U		1.4			1.1	U		0.56	U		1.1	U		0.91	U		1.3	U		1.0	U	
Iron	NS	**1,100**	106			91.0			290			96.3			85.0			149			110			675			280		
Lead‡	NS	***15***	1.1	U		0.12	U		1.0	U		1.1	U		0.11	U		1.1	U		0.15	U		1.1	U		0.24	U	
Magnesium	NS	NS	3,120			6,800			3,500	J	L	10,700			9,600			6,550			8,300			8,480			7,400		
Manganese	NS	**88**	29.2	U		1.4	U		11.0			**130**			24.0			**456**			**420**			**485**			**190**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	1.2			1.4			10.0	U		1.4			1.4			3.0			2.8			3.5			2.3		
Potassium	NS	NS	1,290			1,300			860	J	L	1,320			1,200			3,350			3,700			1,780			1,300		
Selenium	NS	**18**	2.1			3.8			1.4			1.1	U		1.4			1.1	U		1.8			1.1	U		1.2		
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.1	U		0.11	U		1.1	U		0.11	U		1.1	U		0.11	U	
Sodium	NS	NS	3,680			64,000			23,000			29,300			28,000			34,700			39,000			36,100			31,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	0.075	UJ	I	**0.44**	J	I	0.17	J	I	**0.36**	J	I	0.20	J	I	0.32	UJ	I	0.21	J	I
Vanadium	NS	**3.6**	11.1	U		1.3			1.0	U		11.1	U		1.1	U		11.1	U		1.1			11.1	U		1.1	U	
Zinc	NS	**1,100**	11.1	U		32.0	U		10.0	UJ	L	81.5	U		11.0	U		11.1	U		170			90.0	U		11.0	U	
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U					5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Natural Attenuation Parameters (mg/l)																												
Alkalinity (mg/l)	NS	NS	51.0			190			99.0			25.0			23.0			52.0			41.0			24.0			13.0		
Chloride (mg/l)	NS	NS	3.6			5.9	B	H	3.1			76.0			91.0			60.0			110			83.0			83.0		
Nitrate (mg/l)	NS	**10**	0.61			0.10	U		0.23			1.7			1.6			0.41			0.77			1.6			1.4		
Sulfate (mg/l)	NS	NS	13.0			21.0			19.0			17.0			15.0			21.0			15.0			18.0			16.0		
Sulfide (mg/l)	NS	NS							0.20	U																			
Total Dissolved Solids (mg/l)	NS	NS							150																				
TKN (mg/l)	NS	NS	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Total Organic Carbon (mg/l)	NS	NS							1.5																				

TABLE 13D
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L (except as noted)																									
			SH-19R						SH-19S						SH-20S						SH-21S						SH-22S					
			9/5/2001			5/16/2002			9/5/2001			5/21/2002			9/5/2001			5/17/2002			9/6/2001			5/16/2002			9/5/2001			5/17/2002		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																																
Aluminum	NS	**3,600**	992			170			55.6	U		200	J	I	55.6	U		23.0			55.6	U		590			55.6	U		36.0		
Antimony	NS	**1.5**	11.1	U		1.1	U		11.1	U		1.1	U		11.1	U		1.1	U		11.1	U		1.1	U		11.1	U		1.1	U	
Arsenic	NS	**0.045**	**13.5**			**12.0**			**3.7**			**3.9**	J	I	**5.1**			**4.1**			**0.40**	J	I	**1.3**			**0.36**	J	I	0.57	U	
Barium	NS	**260**	9.2			5.6	U		45.3			46.0			77.5			85.0			52.6			61.0			35.7			34.0		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.1	U		0.56	U		1.1	U		0.56	U		1.1	U		0.56	U		1.1	U		0.56	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.1	U		0.25			1.1	U		0.11	U		1.1	U		0.11	U		1.1	U		0.11	U	
Calcium	NS	NS	12,000			12,000			31,800			40,000			27,400			30,000			19,500			21,000			21,200			16,000		
Chromium†	NS	**11**	1.3			1.1	U		**17.2**	J	I	1.6			1.1	U		1.1	U		1.1	U		1.8			1.1	U		1.1		
Cobalt	NS	**73**	1.1	U		0.21	UJ	I	2.9			6.0	J	I	1.1	U		1.6	J	I	1.1	U		1.1	J	I	1.1	U		0.35	UJ	I
Copper	NS	**150**	1.1	U		0.62	U		1.3	U		24.0			1.1	U		0.86	U		1.4	U		3.7	U		1.1	U		1.3	U	
Iron	NS	**1,100**	782			190			**12,700**			**11,000**			**6,070**			**5,100**			192			710			79.5			84.0		
Lead‡	NS	***15***	1.3			0.30	U		1.1	U		0.14	U		1.1	U		0.14	U		1.1	U		3.0	U		1.1	U		0.15	U	
Magnesium	NS	NS	2,940			2,600			11,500			14,000			6,730			7,400			6,700			7,200			6,840			5,200		
Manganese	NS	**88**	30.6	U		12.0	U		**414**			**420**			**209**			**210**			11.1	U		12.0	U		**270**			6.3	U	
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	1.3			0.70			6.7			17.0			3.0			1.9			2.1			2.9			2.7			1.1		
Potassium	NS	NS	658	U		420	U		4,550			5,200			3,680			4,000			1,640			1,600			2,620			1,900		
Selenium	NS	**18**	1.1	U		1.1	U		1.1	U		2.5			1.1	U		2.1			1.2			1.7			1.1	U		1.1	U	
Silver	NS	**18**	1.1	U		0.11	U		1.1	U		0.11	U		1.1	U		0.11	U		1.1	U		0.11	U		1.1	U		0.11	U	
Sodium	NS	NS	6,690			6,100			47,700			51,000			40,200			40,000			48,300			47,000			30,400			37,000		
Thallium	NS	**0.24**	0.32	UJ	I	0.17	UJ	I	**0.35**	J	I	0.24	J	I	0.32	UJ	I	0.19	J	I	0.32	UJ	I	0.19	J	I	0.32	UJ	I	0.21	J	I
Vanadium	NS	**3.6**	11.1	U		1.1	U		11.1	U		1.1	U		11.1	U		1.1	U		11.1	U		3.5			11.1	U		1.1	U	
Zinc	NS	**1,100**	64.2	U		41.0	U		71.3	U		170			11.5	U		11.0	U		49.7	U		31.0	U		11.1	U		45.0	U	
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Natural Attenuation Parameters (mg/l)																																
Alkalinity (mg/l)	NS	NS	43.0			54.0			64.0			40.0			48.0			42.0			13.0			26.0			25.0			14.0		
Chloride (mg/l)	NS	NS	2.9			2.4	B	H	58.0			110			52.0			97.0			87.0			86.0			66.0			78.0		
Nitrate (mg/l)	NS	**10**	0.28			0.29			0.53			1.0			0.10	U		0.10	U		1.6			3.7			1.6			1.5		
Sulfate (mg/l)	NS	NS	9.2			7.7			37.0			100			35.0			33.0			20.0			23.0			11.0			14.0		
Sulfide (mg/l)	NS	NS																														
Total Dissolved Solids (mg/l)	NS	NS																														
TKN (mg/l)	NS	NS	0.50	U		0.50	U		0.80			0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Total Organic Carbon (mg/l)	NS	NS																														

TABLE 13D
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Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L (except as noted)																									
			SH-23S									SH-24R			SH-24S			SH-25D			SH-25S			SH-26S			SH-27D		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/4/2001			5/15/2002			11/4/2003			11/6/2003			11/6/2003			11/5/2003			11/5/2003			10/28/2003			11/19/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																												
Aluminum	NS	**3,600**	519			130			690	J	L	410			100	U		100	U		650			**15,000**			560	J	I
Antimony	NS	**1.5**	11.1	U		1.1	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.2			**2.2**		
Arsenic	NS	**0.045**	**0.71**			**0.73**			**0.82**			**0.63**	J	L	**0.20**	J	L	**0.14**	JB	I	**0.48**	J	L	**49.0**			**1.6**	J	L
Barium	NS	**260**	25.0			18.0			32.0			3.0			10.0			14.0			25.0			66.0			7.5		
Beryllium	NS	**7.3**	1.1	U		0.56	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Cadmium	NS	**1.8**	1.1	U		0.11	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Calcium	NS	NS	34,800			21,000			35,000			9,000			13,000			24,000			12,000			5,200			30,000		
Chromium†	NS	**11**	1.8			1.1	U		1.6			1.0	U		1.0	U		1.0	U		3.3			**30.0**			1.0	U	
Cobalt	NS	**73**	1.1	U		0.23	UJ	I	1.4			1.0	U		1.0	U		1.0	U		2.2			10.0			1.5		
Copper	NS	**150**	1.9	U		1.5	U		2.8			1.6	U		1.2	U		1.0	U		11.0	U		110			2.4	U	
Iron	NS	**1,100**	681			160			1,100			400			110			140			520			**14,000**			730	J	I
Lead‡	NS	***15***	1.1	U		0.24	U		1.0	U		1.0	U		1.0	U		1.0	U		1.1			***31.0***			1.0	U	
Magnesium	NS	NS	14,800			9,400			13,000	J	L	3,200			4,300			11,000			3,900			2,800	J	H	15,000		
Manganese	NS	**88**	**102**			15.0	U		36.0			13.0			84.0			76.0	B	H	**360**			**620**			**170**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	UJ	L	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	2.8			1.6			10.0	U		10.0	U		10.0	U		10.0	U		10.0	U		24.0			10.0	U	
Potassium	NS	NS	1,760			1,200			1,500	J	L	730			1,100			1,100			1,500			1,500	B	H	1,600		
Selenium	NS	**18**	1.1	U		1.1	U		1.0	U		1.0	U		1.0	U		1.0	U		1.3			2.2			1.0	U	
Silver	NS	**18**	1.1	U		0.11	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Sodium	NS	NS	43,900			28,000			47,000			6,500			22,000			17,000			68,000			330,000			61,000		
Thallium	NS	**0.24**	**0.56**	J	I	0.20	J	I	0.075	UJ	I	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.13	J	I	0.080	UJ	I
Vanadium	NS	**3.6**	11.1	U		1.1	U		2.4			1.5			1.0	U		1.0	U		**4.8**			**150**			**4.6**		
Zinc	NS	**1,100**	11.1	U		130			10.0	UJ	L	10.0	U		10.0	U		10.0	U		10.0	U		63.0			10.0	U	
Cyanide (weak acid dissociable)*	NS	**0.62**	5.0	U		5.0	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U	
Natural Attenuation Parameters (mg/l)																												
Alkalinity (mg/l)	NS	NS	29.0			23.0			26.0			39.0			22.0			64.0			95.0			640			110		
Chloride (mg/l)	NS	NS	120			82.0			130			3.4			43.0			29.0			38.0			38.0			77.0		
Nitrate (mg/l)	NS	**10**	1.9			1.0			1.7			0.42			1.3			0.59			0.70			0.36	B	H	0.72		
Sulfate (mg/l)	NS	NS	26.0			18.0			23.0			3.2			9.5			39.0			35.0			39.0			43.0		
Sulfide (mg/l)	NS	NS							0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	UJ	L	0.20	U	
Total Dissolved Solids (mg/l)	NS	NS							380			77.0			140			180			230			1,000			290		
TKN (mg/l)	NS	NS	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.70			3.5			0.50	U	
Total Organic Carbon (mg/l)	NS	NS							1.0	U		1.0	U		1.0	U		1.0	U		8.4			16.0			1.5		

TABLE 13D
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Analytes	COPC Screening Levels		Concentrations in µg/L (except as noted)																									
			SH-27R			SH-27S			SH-28D			SH-28R			SH-28S			WP-01			WP-02			WP-03			WP-04		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	11/20/2003			11/21/2003			11/6/2003			11/7/2003			11/6/2003			11/4/2003			11/4/2003			11/5/2003			11/7/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																												
Aluminum	NS	**3,600**	170			100			820			510			100	U		100	U		100	U		220			**6,100**		
Antimony	NS	**1.5**	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		**1.9**			1.0	U		1.0	U		**5.4**		
Arsenic	NS	**0.045**	**0.40**	J	L	**0.55**	J	L	**0.40**	J	L	**0.92**	J	L	**0.36**	J	L	**3.1**	J	L	**0.92**	J	L	**0.15**	JB	I	**12.0**	J	L
Barium	NS	**260**	20.0			82.0			9.2			5.9			29.0			76.0			69.0			72.0			**270**		
Beryllium	NS	**7.3**	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		2.0		
Cadmium	NS	**1.8**	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Calcium	NS	NS	58,000			27,000			20,000			12,000			17,000			20,000			26,000			8,400	B	H	22,000		
Chromium†	NS	**11**	1.0	U		1.0	U		1.4			1.0	U		1.0	U		6.3			**21.0**			1.0	U		**130**		
Cobalt	NS	**73**	1.7			1.0	U		1.0	U		1.0	U		1.9			1.4			1.1			1.3	B	H	9.6		
Copper	NS	**150**	4.8	U		1.6	U		1.9	U		1.6	U		2.2	U		1.6	U		1.8	U		3.0	U		50.0		
Iron	NS	**1,100**	260			110			**1,200**			620			120			**7,600**			**2,300**			120			**35,000**		
Lead‡	NS	***15***	1.0	U		1.2			1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		***230***		
Magnesium	NS	NS	24,000			5,700			10,000			3,800			4,600			5,900			5,000			2,900	B	H	7,300		
Manganese	NS	**88**	**420**			**320**			**95.0**			19.0			**760**			**1,100**			**730**			**130**			**3,900**		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.33		
Nickel	NS	**73**	10.0	U		10.0	U		10.0	U		10.0	U		10.0	U		10.0	U		15.0			10.0	U		**81.0**		
Potassium	NS	NS	2,900			4,200			780			1,100			3,000			2,200			2,500			2,000	B	H	2,800		
Selenium	NS	**18**	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Silver	NS	**18**	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Sodium	NS	NS	26,000			72,000			10,000			7,800			40,000			43,000			92,000			12,000	B	H	31,000		
Thallium	NS	**0.24**	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.080	UJ	I	0.14	J	I
Vanadium	NS	**3.6**	1.2			1.3			1.9			1.2			1.0	U		1.7			1.7			1.0	U		**49.0**		
Zinc	NS	**1,100**	10.0	U		10.0	U		10.0	U		10.0	U		17.0			64.0			10.0	U		10.0	U		77.0		
Cyanide (weak acid dissociable)*	NS	**0.62**	0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U	
Natural Attenuation Parameters (mg/l)																												
Alkalinity (mg/l)	NS	NS	120			34.0			52.0			46.0			37.0			31.0			62.0			5.0	B	H	10.0		
Chloride (mg/l)	NS	NS	78.0			130			26.0			4.9			65.0			93.0			160			29.0	B	H	69.0		
Nitrate (mg/l)	NS	**10**	0.29			1.1			2.4			0.65			1.4			0.21			0.20			0.24			2.2		
Sulfate (mg/l)	NS	NS	67.0			24.0			16.0			6.8			13.0			16.0			6.8			15.0	B	H	20.0		
Sulfide (mg/l)	NS	NS	0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U		0.20	U	
Total Dissolved Solids (mg/l)	NS	NS	400			330			160			79.0			210			250			360			84.0	B	H	250		
TKN (mg/l)	NS	NS	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		1.4		
Total Organic Carbon (mg/l)	NS	NS	1.4			1.2			1.0	U		1.0	U		1.9			1.6			2.2			2.4			5.8		

TABLE 13D
Summary of Groundwater Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L (except as noted)										
	COPC Screening Levels		WP-05			WP-06			WP-07		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	11/7/2003			10/28/2003			10/27/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals											
Aluminum	NS	**3,600**	100	U		500	U		2,200		
Antimony	NS	**1.5**	1.0	U		1.0	U		1.4		
Arsenic	NS	**0.045**	**0.13**	J	L	**13.0**			**59.0**		
Barium	NS	**260**	67.0			1.0	U		13.0		
Beryllium	NS	**7.3**	1.0	U		1.0	U		1.0	U	
Cadmium	NS	**1.8**	1.0	U		1.0	U		1.0	U	
Calcium	NS	NS	14,000			2,600	B	H	3,800		
Chromium†	NS	**11**	1.0	U		1.1	B	H	**13.0**		
Cobalt	NS	**73**	1.0	U		1.0	U		2.4		
Copper	NS	**150**	1.4	U		7.8			120		
Iron	NS	**1,100**	680			140	B	H	**3,000**		
Lead‡	NS	***15***	1.0	U		1.1			***170***		
Magnesium	NS	NS	3,700			700	JB	H	580	J	H
Manganese	NS	**88**	86.0			23.0			81.0		
Mercury	0.068	**1.1**	0.20	U		0.20	U		0.20	U	
Nickel	NS	**73**	10.0	U		10.0	U		17.0		
Potassium	NS	NS	1,600			790	B	H	1,200		
Selenium	NS	**18**	1.0	U		1.0	U		1.8		
Silver	NS	**18**	1.0	U		1.0	U		1.0	U	
Sodium	NS	NS	23,000			100,000			340,000		
Thallium	NS	**0.24**	0.080	UJ	I	0.075	UJ	I	0.11	J	I
Vanadium	NS	**3.6**	1.0	U		**42.0**			**220**		
Zinc	NS	**1,100**	10.0	U		10.0	U		18.0		
Cyanide (weak acid dissociable)*	NS	**0.62**	0.0050	U		0.0050	U		0.0050	U	
Natural Attenuation Parameters (mg/l)											
Alkalinity (mg/l)	NS	NS	7.0			140			650		
Chloride (mg/l)	NS	NS	48.0			32.0	B	H	34.0		
Nitrate (mg/l)	NS	**10**	2.3			0.76			0.050	U	
Sulfate (mg/l)	NS	NS	18.0			14.0			20.0		
Sulfide (mg/l)	NS	NS	0.20	U		0.20	UJ	L	0.20	UJ	L
Total Dissolved Solids (mg/l)	NS	NS	6.0	U		250			870		
TKN (mg/l)	NS	NS	0.50	U		0.50	U		1.7		
Total Organic Carbon (mg/l)	NS	NS	1.0	U		1.8			19.0		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2A for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for metals (except mercury) by United States Environmental Protection Agency (USEPA) Method 6010B and Method 6020; mercury by USEPA Method 7471A; weak acid dissociable cyanide (WAD cyanide) by USEPA Method 4500-CN I; and natural attenuation parameters by USEPA Method 310.1 for alkalinity, USEPA Method 351.2 for total Kjeldahl nitrogen (TKN), USEPA Method 160.1 for total dissolved solids, USEPA Method 415.1 for total organic carbon, 376.2 for sulfide, and USEPA Method 300.0 for the remainder (chloride, nitrate and sulfate).

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002), the May 2002 Groundwater Sampling Report (SHA, 2003), and the Phase 1B RI Data Usability Report (SHA, 2004).

4. Metals and WAD Cyanide concentrations are presented in micrograms per liter (µg/l), which are equivalent to parts per billion (ppb). Natural attenuation parameter concentrations are presented in milligrams per liter (mg/l), which are equivalent to parts per million (ppm).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health risk assessment. Analyte detections from shallow wells which exceed the EPA Vapor Intrusion Screening Values (shaded value) are shaded. Analyte detections which exceed the EPA Region IX Tap Water PRG (**bold** value) are in **bold**. Analyte detections for lead which exceed the USEPA MCL of 15 µg/l (***bold italic*** value) are in ***bold italics*** **.**

"EPA Vapor Intrusion Screening" indicates values listed are from the USEPA Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Table 2C, November 29, 2002. These values apply to shallow groundwater (SH series wells with an S after the well number, and WP-series wells). Target groundwater concentrations based on non-carcinogenic effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999).

"EPA Region IX Tap Water PRG" indicates the values listed are from the USEPA Region IX Preliminary Remediation Goals (PRGs) Table, dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999).

6. "†" indicates the PRG presented is for chromium VI.
"‡" indicates no USEPA Region IX PRG or USEPA Vapor Intrusion Screening Values are available for lead. Therefore, as requested by the USEPA, the Maximum Contaminant Level (MCL) (from "2002 Edition of the Drinking Water Standards and Health Advisories") for lead (15 µg/l) is used as a benchmark for comparison for lead detects.
"*" indicates the PRG presented is for hydrogen cyanide.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in the Data Usability Report [SHA, 2002], and the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" - The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
"U" - The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
"UJ" - The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
"R" - Indicates data rejected during validation.

Bias:

"L" - Low
"I" - Indeterminate
"H" - High

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																				
	COPC Screening Levels		SH-01D									SH-01R									SH-01S								SH-02D								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/22/2002			10/29/2003			9/13/2001			5/22/2002			10/30/2003			9/12/2001			5/21/2002			10/28/2003			9/13/2001			5/23/2002			10/30/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	NS	**37**	5.3			15			35			**99**			**80**			**50**			3.9			5.6			20			27			4.0			1.0		
Acenaphthylene	NS	NS	11			34			33			98			73			65			4.3			2.9			7.3			17			7.8			0.43		
Anthracene	NS	**180**	1.7			2.5	U		21	U		27			13			21	U		0.55			1.3			5.2			2.6			1.4			0.73		
Benzo(a)anthracene	NS	**0.092**	1.3	U		2.5	U		21	U		5.2	U		2.6	U		21	U		0.21	U		0.10	U		0.53	U		0.51	U		1.0	U		0.060	U	
Benzo(a)pyrene	NS	**0.0092**	0.23	UJ		0.12	UJ		1.2	UJ		**2.7**	J	I	**0.91**			1.2	UJ		0.054	UJ		**0.048**	J		**0.27**	J	I	**0.17**	J	I	0.20	UJ		0.0036	UJ	
Benzo(b)fluoranthene	NS	**0.092**	1.3	U		2.5	U		21	U		5.2	U		2.6	U		21	U		0.21	U		0.10	U		0.53	U		0.51	U		1.0	U		0.060	U	
Benzo(g,h,i)perylene	NS	NS	1.3	U		2.5	U		21	U		5.2	U		2.6	U		21	U		0.21	U		0.10	U		0.53	U		0.51	U		1.0	U		0.060	U	
Benzo(k)fluoranthene	NS	**0.92**	1.3	U		2.5	U		21	U		5.2	U		2.6	U		21	U		0.21	U		0.10	U		0.53	U		0.51	U		1.0	U		0.060	U	
Chrysene	NS	**9.2**	1.3	U		2.5	U		21	U		5.2	U		2.6	U		21	U		0.21	U		0.10	U		0.53	U		0.51	U		1.0	U		0.060	U	
Dibenz(a,h)anthracene	NS	**0.0092**	**0.20**	J		0.12	UJ		0.88	UJ		**0.85**	J		0.13	UJ		0.90	UJ		**0.029**	J		0.0081	J		0.022	UJ		**0.074**	J	I	0.052	UJ		0.0026	UJ	
Fluoranthene	NS	**150**	1.3	U		2.5	U		21	U		18			7.6			21	U		0.50			0.60			2.1			1.1			1.0	U		0.11		
Fluorene	NS	**24**	3.1			5.6			21	U		**65**			**47**			**34**			3.2			4.6			16			15			1.7			0.59		
Indeno(1,2,3-cd)pyrene	NS	**0.092**	1.3	U		2.5	U		21	U		5.2	U		2.6	U		21	U		0.21	U		0.10	U		0.53	U		0.51	U		1.0	U		0.060	U	
Methylnaphthalene (2-)	330	NS	51			220			270			620			480			410			25			19			58			140			60			0.23		
Naphthalene	15	**0.62**	**1,100**			**3,100**			**2,400**			**3,200**			**3,300**			**2,900**			**110**			**46**			**150**			**650**			**670**			**2.7**		
Phenanthrene	NS	NS	6.2			5.8			21	U		120			60			39			4.3			6.3			27			16			3.6			1.2		
Pyrene	NS	**18**	1.3	U		2.5	U		21	U		**26**			11			21	U		0.46			0.66			3.4			1.3			1.6			0.23		
Total PAHs	NS	NS	1,178.5			3,380.4			2,738			4,276.55			4,072.51			3,498			152.239			87.0161			289.27			870.244			750.1			7.2		
Other SVOCs																																					
Benzoic acid	NS	**15,000**	79	J	L		R						R			R						R			R						R			6.5	J	L			
Benzyl Alcohol	NS	**1,100**	100	U			R					210	U			R					11	U		5.0	UJ	L				20	U		26	U				
bis(2-Chloroethoxy)methane	NS	NS	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
bis(2-Chloroethyl)ether	10	**0.01**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
bis(2-Chloroisopropyl)ether	51	**0.27**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
bis(2-Ethylhexyl)phthalate	NS	**4.8**	30	UJ		19	UJ		210	U		61	UJ		20	UJ		210	U		3.1	UJ		1.8	UJ		5.3	U		6.0	UJ		4.8	UJ		1.5		
Bromophenyl-phenylether (4-)	NS	NS	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Butylbenzylphthalate	NS	**730**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Carbazole	NS	**3.4**	30	UJ		19	UJ		210	U		61	UJ		**22**	J		210	U		3.1	UJ		0.93	UJ		5.3	U		6.0	UJ		**7.6**	J		1.2		
Chloro-3-methylphenol (4-)	NS	NS	100	U			R					210	U			R					11	U		2.0	U					20	U		10	U				
Chloroaniline (4-)	NS	**15**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Chloronaphthalene (2-)	NS	**49**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Chlorophenol (2-)	110	**3.0**	100	U			R					210	U			R					11	U		2.0	U					20	U		10	U				
Chlorophenyl-phenylether (4-)	NS	NS	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Dibenzofuran	NS	**1.2**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Dichlorobenzene (1,2-)	260	**37**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Dichlorobenzene (1,3-)	83	**18**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Dichlorobenzene (1,4-)	820	**0.50**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Dichlorobenzidine (3,3'-)	NS	**0.15**	30	UJ		79	UJ					61	UJ		83	UJ					3.1	UJ		4.0	UJ					6.0	UJ		21	UJ				
Dichlorophenol (2,4-)	NS	**11**	100	U			R					210	U			R					11	U		2.0	U					20	U		10	U				
Diethylphthalate	NS	**2,900**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Dimethylphenol (2,4-)	NS	**73**	32	J			R					65	J			R					11	U		5.0	U					6.2	J		21	J				
Dimethylphthalate	NS	**36,000**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Di-n-butylphthalate	NS	**360**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	260	U			R					520	U			R					26	U		5.0	U					51	U		26	U				
Dinitrophenol (2,4-)	NS	**7.3**	100	UJ	I		R					210	UJ	I		R					11	UJ	I	5.0	UJ	I				20	UJ	I	26	UJ	I			
Dinitrotoluene (2,4-)	NS	**7.3**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Dinitrotoluene (2,6-)	NS	**3.6**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Di-n-octylphthalate	NS	**150**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Hexachlorobenzene	1	**0.042**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Hexachlorobutadiene	0.33	**0.86**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Hexachlorocyclopentadiene	50	**22**	260	UJ	L	40	U					520	UJ	L	42	U					26	UJ	L	2.0	U					51	UJ	L	10	U				
Hexachloroethane	3.8	**3.6**	100	UJ	L	40	U					210	UJ	L	42	U					11	UJ	L	2.0	U					20	UJ	L	10	U				
Isophorone	NS	**71**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Methylphenol (2-)	NS	**180**	100	U			R					210	U			R					11	U		2.0	U					20	U		14					
Methylphenol (4-)	NS	**18**	**43**	J			R					**92**	J			R					11	U		2.0	U					9.2	J		**33**					
Nitroaniline (2-)	NS	**11**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Nitroaniline (3-)	NS	**1.1**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Nitroaniline (4-)	NS	**3.2**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Nitrobenzene	200	**0.34**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Nitrophenol (2-)	NS	NS	100	U			R					210	U			R					11	U		2.0	U					20	U		10	U				
Nitrophenol (4-)	NS	NS	100	U			R					210	U			R					11	U		2.0	U					20	U		10	U				
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	30	UJ		19	UJ					61	UJ		20	UJ					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Nitrosodiphenylamine (N-)	NS	**14**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Pentachlorophenol	NS	**0.56**	30	UJ			R					61	UJ			R					3.1	UJ		0.93	UJ					6.0	UJ		4.8	UJ				
Phenol	NS	**1,100**	100	U			R					210	U			R					11	U		2.0	U					20	U		14					
Trichlorobenzene (1,2,4-)	340	**0.72**	100	U		40	U					210	U		42	U					11	U		2.0	U					20	U		10	U				
Trichlorophenol (2,4,5-)	NS	**360**	100	U			R					210	U			R					11	U		2.0	U					20	U		10	U				
Trichlorophenol (2,4,6-)	NS	**0.36**	100	U			R					210	U			R					11	U		2.0	U					20	U		10	U				
Total Other SVOCs	NS	NS	154			-			-			157			22			-			-			-			-			15.4			96.1			2.7		
Total SVOCs	NS	NS	1,332.5			3,380.4			2,738			4,433.55			4,094.51			3,498			152.239			87.0161			289.27			885.644			846.2			9.9		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																					
	COPC Screening Levels		SH-02R									SH-02S									SH-03D								SH-03S									
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/16/2002			11/4/2003			9/12/2001			5/24/2002			10/29/2003			9/12/2001			5/23/2002			11/3/2003			9/11/2001			5/16/2002			11/3/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																						
Acenaphthene	NS	**37**	0.15			0.48			0.45			1.0			0.13			0.46			0.051	U		0.052	U		0.052	U		0.17			0.21			0.23		
Acenaphthylene	NS	NS	0.051	U		0.053	U		0.057	U		0.47			0.051			0.051			0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Anthracene	NS	**180**	0.051	U		0.053	U		0.057	U		0.12			0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Benzo(a)anthracene	NS	**0.092**	0.051	U		0.053	U		0.057	U		0.053	U		0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Benzo(a)pyrene	NS	**0.0092**	0.0029	UJ		0.0018	UJ		0.0034	UJ		0.0030	UJ		0.0019	J		0.0062	J	I	0.0029	UJ		0.0018	UJ		0.0030	UJ		0.0029	UJ		0.0017	UJ		0.0030	UJ	
Benzo(b)fluoranthene	NS	**0.092**	0.051	U		0.053	U		0.057	U		0.053	U		0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Benzo(g,h,i)perylene	NS	NS	0.051	U		0.053	U		0.057	U		0.053	U		0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Benzo(k)fluoranthene	NS	**0.92**	0.051	U		0.053	U		0.057	U		0.053	U		0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Chrysene	NS	**9.2**	0.051	U		0.053	U		0.057	U		0.053	U		0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0044	UJ		0.0027	UJ		0.0024	UJ		0.0045	UJ		0.0025	UJ		0.0021	UJ		0.0044	UJ		0.0026	UJ		0.0022	UJ		0.0045	UJ		0.0026	UJ		0.0022	UJ	
Fluoranthene	NS	**150**	0.051	U		0.053	U		0.057	U		0.088			0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Fluorene	NS	**24**	0.051	U		0.15			0.057	U		0.54			0.050	U		0.094			0.051	U		0.052	U		0.052	U		0.097			0.10			0.20		
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.051	U		0.053	U		0.057	U		0.053	U		0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Methylnaphthalene (2-)	330	NS	1.4			3.8			0.11			1.7			0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.069		
Naphthalene	15	**0.62**	**8.3**			**83**			**15**			**5.2**			0.085			0.055			0.24			0.052	U		0.064			0.13			0.051	U		0.40		
Phenanthrene	NS	NS	0.051	U		0.12			0.16			0.64			0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.16		
Pyrene	NS	**18**	0.051	U		0.053	U		0.057	U		0.075			0.050	U		0.050	U		0.051	U		0.052	U		0.052	U		0.052	U		0.051	U		0.052	U	
Total PAHs	NS	NS	9.9			87.55			15.72			9.8			0.27			0.67			0.24			-			0.064			0.40			0.31			1.06		
Other SVOCs																																						
Benzoic acid	NS	**15,000**		R		5.3	UJ	L					R			R	L					R			R				60	J	L	3.3	J	L				
Benzyl Alcohol	NS	**1,100**	2.0	U		5.3	UJ	L				2.1	U		5.0	UJ	L				2.0	U		5.2	UJ	L				10	U		5.1	UJ	L			
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
bis(2-Chloroethyl)ether	10	**0.01**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
bis(2-Chloroisopropyl)ether	51	**0.27**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.60	UJ		0.99	UJ		0.57	U		0.62	UJ		1.9	UJ		0.50	U		0.60	UJ		0.96	UJ		0.89	U		3.1	UJ		0.95	UJ		0.59	U	
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Butylbenzylphthalate	NS	**730**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Carbazole	NS	**3.4**	0.60	UJ		0.99	UJ		0.57	U		0.62	UJ		0.93	UJ		0.50	U		0.60	UJ		0.96	UJ		0.52	U		3.1	UJ		0.95	UJ		0.52	U	
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Chloroaniline (4-)	NS	**15**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Chlorophenol (2-)	110	**3.0**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Dibenzofuran	NS	**1.2**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Dichlorobenzene (1,3-)	83	**18**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Dichlorobenzene (1,4-)	820	**0.50**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.60	UJ		4.2	UJ					0.62	UJ		4.0	UJ					0.60	UJ		4.1	UJ					3.1	UJ		4.0	UJ				
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Diethylphthalate	NS	**2,900**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Dimethylphenol (2,4-)	NS	**73**	2.0	U		5.3	U					2.1	U		5.0	U					2.0	U		5.2	U					10	U		5.1	U				
Dimethylphthalate	NS	**36,000**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Di-n-butylphthalate	NS	**360**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.1	U		5.3	U					5.3	U		5.0	U					5.1	U		5.2	U					26	U		5.1	U				
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.3	UJ	I				2.1	UJ	I	5.0	UJ	I				2.0	UJ	I	5.2	UJ	I				10	UJ	I	5.1	UJ	I			
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Di-n-octylphthalate	NS	**150**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Hexachlorobenzene	1	**0.042**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Hexachlorobutadiene	0.33	**0.86**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Hexachlorocyclopentadiene	50	**22**	5.1	UJ	L	2.1	U					5.3	UJ	L	2.0	U					5.1	UJ	L	2.1	U					26	UJ	L	2.0	U				
Hexachloroethane	3.8	**3.6**	2.0	UJ	L	2.1	U					2.1	UJ	L	2.0	U					2.0	UJ	L	2.1	U					10	UJ	L	2.0	U				
Isophorone	NS	**71**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Methylphenol (2-)	NS	**180**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Methylphenol (4-)	NS	**18**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					**94**			**21**					
Nitroaniline (2-)	NS	**11**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Nitrobenzene	200	**0.34**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Nitrophenol (2-)	NS	NS	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Nitrophenol (4-)	NS	NS	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Pentachlorophenol	NS	**0.56**	0.60	UJ		0.99	UJ					0.62	UJ		0.93	UJ					0.60	UJ		0.96	UJ					3.1	UJ		0.95	UJ				
Phenol	NS	**1,100**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					3.8	J		2.0	J				
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.1	U					2.1	U		2.0	U					2.0	U		2.1	U					10	U		2.0	U				
Total Other SVOCs	NS	NS	-			-			-			-			-			-			-			-			-			157.8			26.3			-		
Total SVOCs	NS	NS	9.9			87.55			15.72			9.8			0.27			0.67			0.24			-			0.064			158.197			26.61			1.06		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																
	COPC Screening Levels		SH-04D									SH-04S									SH-05D								SH-05R-A			SH-05R-B		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/11/2001			5/21/2002			11/5/2003			9/11/2001			5/20/2002			10/28/2003			9/11/2001			5/21/2002			11/4/2003			11/10/2003			11/11/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																			
Acenaphthene	NS	**37**	0.050	U		0.050	U		0.052	U		20			7.0			14			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Acenaphthylene	NS	NS	0.050	U		0.050	U		0.052	U		9.2			3.7			5.8			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Anthracene	NS	**180**	0.050	U		0.050	U		0.052	U		4.6			1.4			2.4			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Benzo(a)anthracene	NS	**0.092**	0.050	U		0.050	U		0.052	U		**0.75**			**0.40**			1.0	U		0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Benzo(a)pyrene	NS	**0.0092**	0.0028	UJ		0.0017	UJ		0.0030	UJ		**0.49**	J	I	**0.24**	J		**0.18**	J	I	0.0030	UJ		0.0019	UJ		0.0031	UJ		0.0030	UJ		0.0032	UJ	
Benzo(b)fluoranthene	NS	**0.092**	0.050	U		0.050	U		0.052	U		0.51	U		0.26	U		1.0	U		0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Benzo(g,h,i)perylene	NS	NS	0.050	U		0.050	U		0.052	U		0.51	U		0.26	U		1.0	U		0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Benzo(k)fluoranthene	NS	**0.92**	0.050	U		0.050	U		0.052	U		0.51	U		0.26	U		1.0	U		0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Chrysene	NS	**9.2**	0.050	U		0.050	U		0.052	U		0.75			0.31			1.0	U		0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0043	UJ		0.0025	UJ		0.0022	UJ		**0.11**	J	I	**0.021**	J		0.044	UJ		0.0046	UJ		0.0038	J		0.0022	UJ		0.0021	UJ		0.0023	UJ	
Fluoranthene	NS	**150**	0.050	U		0.050	U		0.052	U		3.0			1.2			1.3			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Fluorene	NS	**24**	0.050	U		0.050	U		0.052	U		12			4.2			8.8			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.050	U		0.050	U		0.052	U		0.51	U		0.26	U		1.0	U		0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Methylnaphthalene (2-)	330	NS	0.050	U		0.050	U		0.052	U		96			35			59			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Naphthalene	15	**0.62**	0.050	U		0.050	U		0.052	U		**310**			**140**			**200**			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Phenanthrene	NS	NS	0.050	U		0.050	U		0.052	U		24			6.5			14			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Pyrene	NS	**18**	0.050	U		0.050	U		0.052	U		4.0			1.9			2.1			0.053	U		0.057	U		0.053	U		0.050	U		0.054	U	
Total PAHs	NS	NS	-			-			-			484.9			201.871			307.58			-			0.0038			-			-			-		
Other SVOCs																																			
Benzoic acid	NS	**15,000**		R			R						R		3.7	J	L					R			R					1.0	U		1.1	U	
Benzyl Alcohol	NS	**1,100**	2.0	U		5.0	UJ	L				20	U		5.2	UJ	L				2.1	U		5.7	UJ	L				0.25	U		0.27	U	
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
bis(2-Chloroethyl)ether	10	**0.01**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
bis(2-Chloroisopropyl)ether	51	**0.27**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.59	UJ		0.93	UJ		2.4	U		6.0	UJ		0.96	UJ		10	U		0.63	UJ		1.1	UJ		0.71	U		0.43	U		0.59	U	
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Butylbenzylphthalate	NS	**730**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Carbazole	NS	**3.4**	0.59	UJ		0.93	UJ		0.52	U		6.0	UJ		1.4	J		10	U		0.63	UJ		1.1	UJ		0.53	U		0.25	U		0.27	U	
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Chloroaniline (4-)	NS	**15**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Chlorophenol (2-)	110	**3.0**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Dibenzofuran	NS	**1.2**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Dichlorobenzene (1,3-)	83	**18**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
Dichlorobenzene (1,4-)	820	**0.50**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.59	UJ		4.0	UJ					6.0	UJ		4.1	UJ					0.63	UJ		4.5	UJ					0.25	U		0.27	U	
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Diethylphthalate	NS	**2,900**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Dimethylphenol (2,4-)	NS	**73**	2.0	U		5.0	U					9.2	J		4.3	J					2.1	U		5.7	U					0.25	U		0.27	U	
Dimethylphthalate	NS	**36,000**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Di-n-butylphthalate	NS	**360**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.0	U		5.0	U					51	U		5.2	U					5.3	U		5.7	U					0.50	UJ	I	0.54	UJ	I
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.0	UJ	I				20	UJ	I	5.2	UJ	I				2.1	UJ	I	5.7	UJ	I				1.0	UJ	I	1.1	UJ	I
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Di-n-octylphthalate	NS	**150**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Hexachlorobenzene	1	**0.042**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
Hexachlorobutadiene	0.33	**0.86**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
Hexachlorocyclopentadiene	50	**22**	5.0	U		2.0	U					51	UJ	L	2.1	U					5.3	U		2.3	U					0.25	U		0.27	U	
Hexachloroethane	3.8	**3.6**	2.0	U		2.0	U					20	UJ	L	2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Isophorone	NS	**71**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Methylphenol (2-)	NS	**180**	2.0	U		2.0	U					20	U		1.4	J					2.1	U		2.3	U					0.25	U		0.27	U	
Methylphenol (4-)	NS	**18**	2.0	U		2.0	U					8.5	J		5.2						2.1	U		2.3	U					0.25	U		0.27	U	
Nitroaniline (2-)	NS	**11**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.50	U		0.54	U	
Nitrobenzene	200	**0.34**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
Nitrophenol (2-)	NS	NS	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Nitrophenol (4-)	NS	NS	2.0	U		2.0	U					20	U		2.1	U					2.1	UJ	L	2.3	U					1.0	U		1.1	U	
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					0.25	U		0.27	U	
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Pentachlorophenol	NS	**0.56**	0.59	UJ		0.93	UJ					6.0	UJ		0.96	UJ					0.63	UJ		1.1	UJ					1.0	U		1.1	U	
Phenol	NS	**1,100**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.0	U					20	U		2.1	U					2.1	U		2.3	U					0.25	U		0.27	U	
Total Other SVOCs	NS	NS	-			-			-			17.7			16			-			-			-			-			-			-		
Total SVOCs	NS	NS	-			-			-			502.6			217.871			307.58			-			0.0038			-			-			-		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																		
	COPC Screening Levels		SH-05S									SH-06D									SH-06R-A			SH-06R-B			SH-06S								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/11/2001			5/21/2002			10/29/2003			9/6/2001			5/22/2002			10/29/2003			11/5/2003			11/6/2003			9/6/2001			5/22/2002			10/29/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																			
Acenaphthene	NS	**37**	11			9.1			5.6			5.1			6.1			8.2			0.053	U		0.053	U		1.7			2.0			3.4		
Acenaphthylene	NS	NS	3.2			2.6			1.2			4.4			4.0			6.4			0.053	U		0.053	U		0.33			0.41			0.43		
Anthracene	NS	**180**	3.0			2.9			1.7			1.4			2.4			4.1			0.053	U		0.053	U		0.30			0.22			0.24		
Benzo(a)anthracene	NS	**0.092**	**0.43**			**0.51**			0.52	U		**0.44**			**0.83**			**1.1**			0.053	U		0.053	U		**0.18**			**0.14**			0.23	U	
Benzo(a)pyrene	NS	**0.0092**	**0.29**			**0.26**			**0.081**	J	I	**0.32**			**0.45**			**0.72**			0.012	UJ		0.0031	UJ		**0.19**			**0.12**			**0.10**	J	I
Benzo(b)fluoranthene	NS	**0.092**	0.21	U		**0.11**			0.52	U		**0.26**			**0.23**			0.54	U		0.053	U		0.053	U		**0.14**			0.084			0.23	U	
Benzo(g,h,i)perylene	NS	NS	0.21	U		0.10	U		0.52	U		0.075			0.15			0.54	U		0.053	U		0.053	U		0.12			0.076			0.23	U	
Benzo(k)fluoranthene	NS	**0.92**	0.21	U		0.12			0.52	U		0.12			0.24			0.54	U		0.053	U		0.053	U		0.10			0.052			0.23	U	
Chrysene	NS	**9.2**	0.40			0.40			0.52	U		0.43			0.67			1.2			0.053	U		0.053	U		0.18			0.13			0.23	U	
Dibenz(a,h)anthracene	NS	**0.0092**	**0.051**	J	I	**0.026**	J		0.022	UJ		**0.020**	J		**0.048**	J		**0.074**	J	I	0.0022	UJ		0.0023	UJ		**0.029**	J		**0.023**	J		0.0098	UJ	
Fluoranthene	NS	**150**	2.5			2.2			1.1			2.3			3.1			4.8			0.053	U		0.053	U		0.68			0.29			0.36		
Fluorene	NS	**24**	9.1			8.4			4.7			4.9			6.4			9.8			0.053	U		0.053	U		1.1			1.2			1.8		
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.21	U		0.10	U		0.52	U		0.058			**0.12**			0.54	U		0.053	U		0.053	U		0.087			0.057			0.23	U	
Methylnaphthalene (2-)	330	NS	33			20			12			26			21			42			0.053	U		0.053	U		7.2			8.3			8.1		
Naphthalene	15	**0.62**	**72**			**52**			**27**			**140**			**100**			**150**			0.053	U		0.053	U		**34**			**28**			**36**		
Phenanthrene	NS	NS	23			18			12			12			16			33			0.053	U		0.053	U		2.2			1.3			2.2		
Pyrene	NS	**18**	2.4			2.9			1.4			2.5			4.2			8.2			0.061			0.053	U		0.60			0.35			0.58		
Total PAHs	NS	NS	160.371			119.526			66.781			200.323			165.938			269.594			0.061			-			49.136			42.752			53.21		
Other SVOCs																																			
Benzoic acid	NS	**15,000**		R			R					13	J	L	5.4	J	L				1.0	UJ	L	1.1	UJ	L	1.0	J	L	1.1	J	L			
Benzyl Alcohol	NS	**1,100**	8.4	U		5.2	UJ	L				10	U		5.0	UJ	L				0.26	U		0.27	U		2.0	U		5.2	UJ	L			
bis(2-Chloroethoxy)methane	NS	NS	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
bis(2-Chloroethyl)ether	10	**0.01**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
bis(2-Chloroisopropyl)ether	51	**0.27**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
bis(2-Ethylhexyl)phthalate	NS	**4.8**	2.5	UJ		0.97	UJ		5.2	U		3.0	UJ	I	1.1	J		5.4	U		0.37	U		1.2	U		**12**			0.96	UJ		2.3	U	
Bromophenyl-phenylether (4-)	NS	NS	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Butylbenzylphthalate	NS	**730**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Carbazole	NS	**3.4**	2.5	UJ		1.1	J		5.2	U		3.0	UJ		1.0	J		5.4	U		0.26	U		0.27	U		0.68	J		0.96	UJ		2.3	U	
Chloro-3-methylphenol (4-)	NS	NS	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Chloroaniline (4-)	NS	**15**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Chloronaphthalene (2-)	NS	**49**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Chlorophenol (2-)	110	**3.0**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Chlorophenyl-phenylether (4-)	NS	NS	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Dibenzofuran	NS	**1.2**	8.4	U		1.1	J					10	U		1.1	J					0.26	U		0.27	U		2.0	U		2.1	U				
Dichlorobenzene (1,2-)	260	**37**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Dichlorobenzene (1,3-)	83	**18**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
Dichlorobenzene (1,4-)	820	**0.50**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
Dichlorobenzidine (3,3'-)	NS	**0.15**	2.5	UJ		4.1	UJ					3.0	UJ		4.0	UJ					0.26	U		0.27	U		0.60	UJ		4.1	UJ				
Dichlorophenol (2,4-)	NS	**11**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Diethylphthalate	NS	**2,900**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Dimethylphenol (2,4-)	NS	**73**	8.4	U		1.1	J					7.4	J		3.0	J					0.26	U		0.27	U		2.0	U		5.2	U				
Dimethylphthalate	NS	**36,000**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Di-n-butylphthalate	NS	**360**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	21	U		5.2	U					25	U		5.0	U					0.53	UJ	I	0.53	UJ	I	5.0	U		5.2	U				
Dinitrophenol (2,4-)	NS	**7.3**	8.4	UJ	I	5.2	UJ	I				10	UJ	I	5.0	UJ	I				1.0	UJ	I	1.1	UJ	I	2.0	UJ	I	5.2	UJ	I			
Dinitrotoluene (2,4-)	NS	**7.3**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Dinitrotoluene (2,6-)	NS	**3.6**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Di-n-octylphthalate	NS	**150**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Hexachlorobenzene	1	**0.042**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
Hexachlorobutadiene	0.33	**0.86**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
Hexachlorocyclopentadiene	50	**22**	21	UJ	L	2.1	U					25	U		2.0	U					0.26	UJ	L	0.27	UJ	L	5.0	U		2.1	U				
Hexachloroethane	3.8	**3.6**	8.4	UJ	L	2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Isophorone	NS	**71**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Methylphenol (2-)	NS	**180**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Methylphenol (4-)	NS	**18**	8.4	U		1.3	J					7.7	J		5.3						0.26	U		0.27	U		1.1	J		2.1	U				
Nitroaniline (2-)	NS	**11**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
Nitroaniline (3-)	NS	**1.1**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Nitroaniline (4-)	NS	**3.2**	8.4	U		2.1	U					10	U		2.0	U					0.53	U		0.53	U		2.0	U		2.1	U				
Nitrobenzene	200	**0.34**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
Nitrophenol (2-)	NS	NS	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Nitrophenol (4-)	NS	NS	8.4	U		2.1	U					10	U		2.0	U					1.0	U		1.1	U		2.0	U		2.1	U				
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					0.26	U		0.27	U		0.60	UJ		0.96	UJ				
Nitrosodiphenylamine (N-)	NS	**14**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Pentachlorophenol	NS	**0.56**	2.5	UJ		0.97	UJ					3.0	UJ		0.93	UJ					1.0	U		1.1	U		0.60	UJ		0.96	UJ				
Phenol	NS	**1,100**	8.4	U		2.1	U					3.8	J		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Trichlorobenzene (1,2,4-)	340	**0.72**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Trichlorophenol (2,4,5-)	NS	**360**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Trichlorophenol (2,4,6-)	NS	**0.36**	8.4	U		2.1	U					10	U		2.0	U					0.26	U		0.27	U		2.0	U		2.1	U				
Total Other SVOCs	NS	NS	-			4.6			-			31.9			16.9			-			-			-			14.78			1.1			-		
Total SVOCs	NS	NS	160.371			124.126			66.781			232.223			182.838			269.594			0.061			-			63.916			43.852			53.21		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																				
	COPC Screening Levels		SH-07D									SH-07S									SH-08D								SH-08S								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/7/2001			5/22/2002			10/30/2003			9/7/2001			5/22/2002			10/29/2003			9/7/2001			5/20/2002			10/29/2003			9/6/2001			5/21/2002			10/28/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	NS	**37**	0.78			1.3			1.2			0.40			0.12			0.23			1.3			1.1			1.5			0.084			0.050	U		0.055	U	
Acenaphthylene	NS	NS	0.051	U		0.078			0.10	U		0.085			0.054	U		0.12			0.27			0.26			0.41	U		0.051	U		0.050	U		0.055	U	
Anthracene	NS	**180**	0.25			0.47			0.34			0.072			0.054	U		0.10	U		0.17			0.18			0.41	U		0.053			0.050	U		0.055	U	
Benzo(a)anthracene	NS	**0.092**	0.053			0.075			0.10	U		0.050	U		0.054	U		0.10	U		0.051	U		0.050	U		0.41	U		0.051	U		0.050	U		0.055	U	
Benzo(a)pyrene	NS	**0.0092**	**0.031**	J		0.043	UJ		**0.036**	J	I	0.0056	J		0.0039	UJ		0.0061	UJ		**0.010**	J		0.0040	UJ		0.024	UJ		0.0033	J		0.0017	UJ		0.0032	UJ	
Benzo(b)fluoranthene	NS	**0.092**	0.051	U		0.050	U		0.10	U		0.050	U		0.054	U		0.10	U		0.051	U		0.050	U		0.41	U		0.051	U		0.050	U		0.055	U	
Benzo(g,h,i)perylene	NS	NS	0.051	U		0.050	U		0.10	U		0.050	U		0.054	U		0.10	U		0.051	U		0.050	U		0.41	U		0.051	U		0.050	U		0.055	U	
Benzo(k)fluoranthene	NS	**0.92**	0.051	U		0.050	U		0.10	U		0.050	U		0.054	U		0.10	U		0.051	U		0.050	U		0.41	U		0.051	U		0.050	U		0.055	U	
Chrysene	NS	**9.2**	0.053			0.067			0.10	U		0.050	U		0.054	U		0.10	U		0.051	U		0.050	U		0.41	U		0.051	U		0.050	U		0.055	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0051	J		0.0077	UJ		0.0044	UJ		0.0043	UJ		0.0027	UJ		0.0044	UJ		0.0044	UJ		0.0025	UJ		0.018	UJ		0.0043	UJ		0.0025	UJ		0.0024	UJ	
Fluoranthene	NS	**150**	0.20			0.26			0.20			0.050	U		0.054	U		0.10	U		0.059			0.050	U		0.41	U		0.074			0.050	U		0.055	U	
Fluorene	NS	**24**	0.74			1.1			0.93			0.62			0.16			0.46			1.0			1.2			1.5			0.15			0.050	U		0.055	U	
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.051	U		0.050	U		0.10	U		0.050	U		0.054	U		0.10	U		0.051	U		0.050	U		0.41	U		0.051	U		0.050	U		0.055	U	
Methylnaphthalene (2-)	330	NS	8.7			11			10			23			2.7			12			62			62			62			0.11			0.050	U		0.055	U	
Naphthalene	15	**0.62**	**9.1**			**14**			**15**			**22**			**5.7**			**16**			**70**			**73**			**73**			0.094			0.050	U		0.055	U	
Phenanthrene	NS	NS	1.8			2.3			2.2			1.2			0.083			0.57			2.7			2.2			3.3			0.20			0.050	U		0.055	U	
Pyrene	NS	**18**	0.16			0.28			0.28			0.050	U		0.054	U		0.10	U		0.064			0.069			0.41	U		0.084			0.050	U		0.055	U	
Total PAHs	NS	NS	21.8721			30.93			30.186			47.3826			8.8			29.38			137.573			140.009			141.3			0.85			-			-		
Other SVOCs																																					
Benzoic acid	NS	**15,000**	1.2	J	L	13	J	L				2.0	UJ	L		R					8.2	UJ	L	5.0	UJ	L					R		5.0	UJ	L			
Benzyl Alcohol	NS	**1,100**	2.0	U		5.0	UJ	L				2.0	U		5.4	UJ	L				8.2	U		5.0	UJ	L				2.0	U		5.0	U				
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
bis(2-Chloroethyl)ether	10	**0.01**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
bis(2-Chloroisopropyl)ether	51	**0.27**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.60	UJ		0.93	UJ		1.9			0.99	J		1.0	UJ		1.0	U		2.4	UJ		0.93	UJ		4.1	U		0.61	UJ		0.93	UJ		0.55	U	
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Butylbenzylphthalate	NS	**730**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Carbazole	NS	**3.4**	0.87	J		0.99	J		1.0	U		2.3			1.0	UJ		3.0			**3.9**	J		**4.1**			**5.3**			0.60	UJ		0.93	UJ		0.55	U	
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Chloroaniline (4-)	NS	**15**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Chlorophenol (2-)	110	**3.0**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Dibenzofuran	NS	**1.2**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Dichlorobenzene (1,3-)	83	**18**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Dichlorobenzene (1,4-)	820	**0.50**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.60	UJ		4.0	UJ						R		4.3	UJ					2.4	UJ		4.0	UJ					0.60	UJ		4.0	UJ				
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Diethylphthalate	NS	**2,900**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Dimethylphenol (2,4-)	NS	**73**	0.86	J		5.0	U					2.0	U		5.4	U					8.2	U		1.8	J					2.0	U		5.0	U				
Dimethylphthalate	NS	**36,000**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Di-n-butylphthalate	NS	**360**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.0	U		5.0	U					5.0	U		5.4	U					20	U		5.0	U					5.0	U		5.0	U				
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.0	UJ	I				3.0	J	I	5.4	UJ	I				8.2	UJ	I	5.0	UJ	I				2.0	UJ	I	5.0	UJ	I			
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Di-n-octylphthalate	NS	**150**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Hexachlorobenzene	1	**0.042**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Hexachlorobutadiene	0.33	**0.86**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Hexachlorocyclopentadiene	50	**22**	5.0	U		2.0	U					5.0	U		2.2	U					20	U		2.0	U					5.0	U		2.0	U				
Hexachloroethane	3.8	**3.6**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Isophorone	NS	**71**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Methylphenol (2-)	NS	**180**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Methylphenol (4-)	NS	**18**	1.0	J		1.6	J					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Nitroaniline (2-)	NS	**11**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Nitrobenzene	200	**0.34**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Nitrophenol (2-)	NS	NS	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Nitrophenol (4-)	NS	NS	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Pentachlorophenol	NS	**0.56**	0.60	UJ		0.93	UJ					0.59	UJ		1.0	UJ					2.4	UJ		0.93	UJ					0.60	UJ		0.93	UJ				
Phenol	NS	**1,100**	1.5	J		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.0	U					2.0	U		2.2	U					8.2	U		2.0	U					2.0	U		2.0	U				
Total Other SVOCs	NS	NS	5.4			15.59			1.9			6.3			-			3.0			3.9			5.9			5.3			-			-			-		
Total SVOCs	NS	NS	27.3021			46.52			32.086			53.6726			8.8			32.38			141.473			145.909			146.6			0.85			-			-		

TABLE 13E
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Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																				
	COPC Screening Levels		SH-09D									SH-09S									SH-10S								SH-11S								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/7/2001			5/23/2002			10/28/2003			9/7/2001			5/17/2002			10/31/2003			9/10/2001			5/23/2002			10/31/2003			9/7/2001			5/16/2002			11/3/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																					
Acenaphthene	NS	**37**	0.11			0.057			0.078			0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Acenaphthylene	NS	NS	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Anthracene	NS	**180**	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Benzo(a)anthracene	NS	**0.092**	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Benzo(a)pyrene	NS	**0.0092**	0.0068	J		0.0029	J		**0.017**	J	I	0.0029	UJ		0.0018	UJ		0.0030	UJ		0.0032	J		0.0018	UJ		0.0031	UJ		0.0028	UJ		0.0017	UJ		0.0030	UJ	
Benzo(b)fluoranthene	NS	**0.092**	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Benzo(g,h,i)perylene	NS	NS	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Benzo(k)fluoranthene	NS	**0.92**	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Chrysene	NS	**9.2**	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0043	UJ		0.0027	UJ		0.0022	UJ		0.0044	UJ		0.0026	UJ		0.0022	UJ		0.0045	UJ		0.0027	UJ		0.0022	UJ		0.0043	UJ		0.0025	UJ		0.0022	UJ	
Fluoranthene	NS	**150**	0.063			0.053	U		0.062			0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Fluorene	NS	**24**	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.050	U		0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Methylnaphthalene (2-)	330	NS	0.084			0.053	U		0.052	U		0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Naphthalene	15	**0.62**	0.26			0.14			0.23			0.051	U		0.052	U		0.073			0.052	U		0.054	U		0.29			0.051	U		0.050	U		0.051	U	
Phenanthrene	NS	NS	0.14			0.10			0.13			0.051	U		0.052	U		0.051	U		0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Pyrene	NS	**18**	0.12			0.082			0.17			0.10			0.060			0.088			0.052	U		0.054	U		0.053	U		0.051	U		0.050	U		0.051	U	
Total PAHs	NS	NS	0.78			0.38			0.69			0.10			0.060			0.16			0.0032			-			0.29			-			-			-		
Other SVOCs																																					
Benzoic acid	NS	**15,000**	2.0	UJ	L		R					2.0	UJ	L	5.2	UJ	L					R			R					2.0	UJ	L		R				
Benzyl Alcohol	NS	**1,100**	2.0	U		5.3	UJ	L				2.0	U		5.2	UJ	L				2.1	U		5.4	UJ	L				2.0	U		5.0	UJ	L			
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
bis(2-Chloroethyl)ether	10	**0.01**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
bis(2-Chloroisopropyl)ether	51	**0.27**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.59	UJ		0.99	UJ		0.52	U		0.60	UJ		0.97	UJ		0.51	U		0.61	UJ		1.0	UJ		0.83	U		0.68	J		0.93	UJ		0.51	U	
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Butylbenzylphthalate	NS	**730**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Carbazole	NS	**3.4**	0.59	UJ		0.99	UJ		0.52	U		0.60	UJ		0.97	UJ		0.51	U		0.61	UJ		1.0	UJ		0.53	U		0.60	UJ		0.93	UJ		0.51	U	
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Chloroaniline (4-)	NS	**15**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Chlorophenol (2-)	110	**3.0**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Dibenzofuran	NS	**1.2**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Dichlorobenzene (1,3-)	83	**18**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Dichlorobenzene (1,4-)	820	**0.50**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.59	UJ		4.2	UJ					0.60	UJ		4.1	UJ					0.61	UJ		4.3	UJ					0.60	UJ		4.0	UJ				
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Diethylphthalate	NS	**2,900**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Dimethylphenol (2,4-)	NS	**73**	2.0	U		5.3	U					2.0	U		5.2	U					2.1	U		5.4	U					2.0	U		5.0	U				
Dimethylphthalate	NS	**36,000**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Di-n-butylphthalate	NS	**360**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.0	U		5.3	U					5.0	U		5.2	U					5.2	U		5.4	U					5.0	U		5.0	U				
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.3	UJ	I				2.0	UJ	I	5.2	UJ	I				2.1	UJ	I	5.4	UJ	I				2.0	UJ	I	5.0	UJ	I			
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Di-n-octylphthalate	NS	**150**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Hexachlorobenzene	1	**0.042**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Hexachlorobutadiene	0.33	**0.86**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Hexachlorocyclopentadiene	50	**22**	5.0	U		2.1	U					5.0	U		2.1	U					5.2	U		2.2	U					5.0	U		2.0	U				
Hexachloroethane	3.8	**3.6**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Isophorone	NS	**71**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Methylphenol (2-)	NS	**180**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Methylphenol (4-)	NS	**18**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Nitroaniline (2-)	NS	**11**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Nitrobenzene	200	**0.34**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Nitrophenol (2-)	NS	NS	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Nitrophenol (4-)	NS	NS	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Pentachlorophenol	NS	**0.56**	0.59	UJ		0.99	UJ					0.60	UJ		0.97	UJ					0.61	UJ		1.0	UJ					0.60	UJ		0.93	UJ				
Phenol	NS	**1,100**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.1	U					2.0	U		2.1	U					2.1	U		2.2	U					2.0	U		2.0	U				
Total Other SVOCs	NS	NS	-			-			-			-			-			-			-			-			-			0.68			-			-		
Total SVOCs	NS	NS	0.78			0.38			0.69			0.10			0.060			0.16			0.0032			-			0.29			0.68			-			-		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																			
	COPC Screening Levels		SH-12D										SH-12S										SH-13S								SH-14D							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/17/2002			11/3/2003				9/11/2001			5/17/2002			11/3/2003				9/11/2001			5/16/2002			11/3/2003			9/10/2001			5/20/2002			11/4/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																						
Acenaphthene	NS	**37**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.052	U		0.053	U		0.051	U		0.053	U	
Acenaphthylene	NS	NS	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.052	U		0.053	U		0.051	U		0.053	U	
Anthracene	NS	**180**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.052	U		0.053	U		0.051	U		0.053	U	
Benzo(a)anthracene	NS	**0.092**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.052	U		0.053	U		0.051	U		0.053	U	
Benzo(a)pyrene	NS	**0.0092**	0.0029	UJ		0.0017	UJ		0.0033	UJ			0.0029	UJ		0.0046	UJ		0.0030	UJ			0.0029	UJ		0.0027	UJ		**0.11**			0.0030	UJ		0.0017	UJ		0.0031	UJ	
Benzo(b)fluoranthene	NS	**0.092**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		**0.14**			0.053	U		0.051	U		0.053	U	
Benzo(g,h,i)perylene	NS	NS	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.20			0.053	U		0.051	U		0.053	U	
Benzo(k)fluoranthene	NS	**0.92**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.062			0.053	U		0.051	U		0.053	U	
Chrysene	NS	**9.2**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.077			0.053	U		0.051	U		0.053	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0044	UJ		0.0025	UJ		0.0024	UJ			0.0045	UJ		0.0030	J		0.0022	UJ			0.0044	UJ		0.0025	UJ		**0.033**			0.0046	UJ		0.0026	UJ		0.0023	UJ	
Fluoranthene	NS	**150**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.086			0.053	U		0.051	U		0.053	U	
Fluorene	NS	**24**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.052	U		0.053	U		0.051	U		0.053	U	
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		**0.17**			0.053	U		0.051	U		0.053	U	
Methylnaphthalene (2-)	330	NS	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.052	U		0.053	U		0.051	U		0.053	U	
Naphthalene	15	**0.62**	0.051	U		0.050	U		0.10				0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.052	U		0.053	U		0.051	U		0.053	U	
Phenanthrene	NS	NS	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.055			0.053	U		0.051	U		0.053	U	
Pyrene	NS	**18**	0.051	U		0.050	U		0.056	U			0.052	U		0.050	U		0.051	U			0.051	U		0.050	U		0.11			0.053	U		0.051	U		0.053	U	
Total PAHs	NS	NS	-			-			0.10				-			0.0030			-				-			-			1.04			-			-			-		
Other SVOCs																																						
Benzoic acid	NS	**15,000**		R			R							R			R							R			R							R		5.1	UJ	L			
Benzyl Alcohol	NS	**1,100**	2.0	U		5.0	UJ	L					2.1	U		5.0	UJ	L					2.0	U		5.0	UJ	L				2.1	U		5.1	UJ	L			
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
bis(2-Chloroethyl)ether	10	**0.01**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
bis(2-Chloroisopropyl)ether	51	**0.27**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.60	UJ		0.93	UJ		0.56	U			0.61	UJ		0.93	UJ		2.4	U			0.60	UJ		0.93	UJ		0.52	U		0.76	J		0.95	UJ		1.1	U	
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Butylbenzylphthalate	NS	**730**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Carbazole	NS	**3.4**	0.60	UJ		0.93	UJ		0.56	U			0.61	UJ		0.93	UJ		0.51	U			0.60	UJ		0.93	UJ		0.52	U		0.63	UJ		0.95	UJ		0.53	U	
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Chloroaniline (4-)	NS	**15**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Chlorophenol (2-)	110	**3.0**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Dibenzofuran	NS	**1.2**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Dichlorobenzene (1,3-)	83	**18**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Dichlorobenzene (1,4-)	820	**0.50**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.60	UJ		4.0	UJ						0.61	UJ		4.0	UJ						0.60	UJ		4.0	UJ					0.63	UJ		4.0	UJ				
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Diethylphthalate	NS	**2,900**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Dimethylphenol (2,4-)	NS	**73**	2.0	U		5.0	U						2.1	U		5.0	U						2.0	U		5.0	U					2.1	U		5.1	U				
Dimethylphthalate	NS	**36,000**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Di-n-butylphthalate	NS	**360**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.1	U		5.0	U						5.2	U		5.0	U						5.1	U		5.0	U					5.3	U		5.1	U				
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.0	UJ	I					2.1	UJ	I	5.0	UJ	I					2.0	UJ	I	5.0	UJ	I				2.1	UJ	I	5.1	UJ	I			
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Di-n-octylphthalate	NS	**150**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Hexachlorobenzene	1	**0.042**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Hexachlorobutadiene	0.33	**0.86**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Hexachlorocyclopentadiene	50	**22**	5.1	U		2.0	U						5.2	U		2.0	U						5.1	U		2.0	U					5.3	U		2.0	U				
Hexachloroethane	3.8	**3.6**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Isophorone	NS	**71**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Methylphenol (2-)	NS	**180**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Methylphenol (4-)	NS	**18**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Nitroaniline (2-)	NS	**11**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Nitrobenzene	200	**0.34**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Nitrophenol (2-)	NS	NS	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Nitrophenol (4-)	NS	NS	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Pentachlorophenol	NS	**0.56**	0.60	UJ		0.93	UJ						0.61	UJ		0.93	UJ						0.60	UJ		0.93	UJ					0.63	UJ		0.95	UJ				
Phenol	NS	**1,100**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.0	U						2.1	U		2.0	U						2.0	U		2.0	U					2.1	U		2.0	U				
Total Other SVOCs	NS	NS	-			-			-				-			-			-				-			-			-			0.76			-			-		
Total SVOCs	NS	NS	-			-			0.10				-			0.0030			-				-			-			1.04			0.76			-			-		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L																											
			SH-14S									SH-15D								SH-15S										
			9/10/2001			5/20/2002			11/4/2003			9/10/2001			5/17/2002			11/4/2003			9/10/2001			5/20/2002			10/28/2003		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	
PAHs																														
Acenaphthene	NS	**37**	0.14			0.53			0.057	U		0.053	U		0.053	U		0.052	U		5.3			0.75			6.2			
Acenaphthylene	NS	NS	0.051	U		0.35			0.057	U		0.053	U		0.053	U		0.052	U		2.0			0.20			1.7			
Anthracene	NS	**180**	0.077			0.050	U		0.057	U		0.053	U		0.053	U		0.052	U		0.84			0.20			0.75			
Benzo(a)anthracene	NS	**0.092**	0.051	U		0.050	U		0.057	U		0.053	U		0.053	U		0.052	U		0.071			0.067			0.21	U		
Benzo(a)pyrene	NS	**0.0092**	0.0036	J		**0.021**	J		0.010	UJ		0.0042	J		0.0018	UJ		0.0030	UJ		**0.043**	J		**0.034**	J		**0.048**	J		I
Benzo(b)fluoranthene	NS	**0.092**	0.051	U		0.050	U		0.057	U		0.053	U		0.053	U		0.052	U		0.050	U		0.056	U		0.21	U		
Benzo(g,h,i)perylene	NS	NS	0.051	U		0.050	U		0.057	U		0.053	U		0.053	U		0.052	U		0.050	U		0.056	U		0.21	U		
Benzo(k)fluoranthene	NS	**0.92**	0.051	U		0.050	U		0.057	U		0.053	U		0.053	U		0.052	U		0.050	U		0.056	U		0.21	U		
Chrysene	NS	**9.2**	0.051	U		0.050	U		0.057	U		0.053	U		0.053	U		0.052	U		0.065			0.057			0.21	U		
Dibenz(a,h)anthracene	NS	**0.0092**	0.0044	UJ		0.0071	J		0.0024	UJ		0.0053	J		0.0037	J		0.0022	UJ		0.0061	J		0.0033	J		0.0091	UJ		
Fluoranthene	NS	**150**	0.051	U		0.081			0.057	U		0.053	U		0.053	U		0.052	U		0.50			0.30			0.28			
Fluorene	NS	**24**	0.10			0.27			0.057	U		0.053	U		0.053	U		0.052	U		3.2			0.46			3.9			
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.051	U		0.050	U		0.057	U		0.053	U		0.053	U		0.052	U		0.050	U		0.056	U		0.21	U		
Methylnaphthalene (2-)	330	NS	0.43			3.3			0.057	U		0.053	U		0.053	U		0.052	U		21			3.3			17			
Naphthalene	15	**0.62**	**0.72**			**14**			**0.86**			0.053	U		0.053	U		0.052	U		**59**			**10**			**55**			
Phenanthrene	NS	NS	0.31			0.070			0.057	U		0.053	U		0.053	U		0.052	U		5.5			1.1			5.2			
Pyrene	NS	**18**	0.055			0.16			0.14			0.053	U		0.053	U		0.052	U		0.66			0.45			0.46			
Total PAHs	NS	NS	1.8			18.7891			1.0			0.0095			0.0037			-			98.1851			16.9213			90.538			
Other SVOCs																														
Benzoic acid	NS	**15,000**	2.0	UJ	L	5.0	UJ	L					R			R					2.0	UJ	L	5.6	UJ	L				
Benzyl Alcohol	NS	**1,100**	2.0	U		5.0	UJ	L				2.1	U		5.3	UJ	L				2.0	U		5.6	UJ	L				
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
bis(2-Chloroethyl)ether	10	**0.01**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
bis(2-Chloroisopropyl)ether	51	**0.27**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.60	UJ		0.94	J		**110**	J	H	3.8			0.99	UJ		0.52	U		0.59	UJ		1.0	UJ		2.1	U		
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Butylbenzylphthalate	NS	**730**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Carbazole	NS	**3.4**	0.60	UJ		0.93	UJ		0.57	U		0.62	UJ		0.99	UJ		0.52	U		0.70	J		1.0	UJ		2.1	U		
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Chloroaniline (4-)	NS	**15**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Chlorophenol (2-)	110	**3.0**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Dibenzofuran	NS	**1.2**	2.0	U		2.0	U					2.1	U		2.1	U					0.72	J		2.2	U					
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Dichlorobenzene (1,3-)	83	**18**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Dichlorobenzene (1,4-)	820	**0.50**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.60	UJ	L	4.0	UJ					0.62	UJ		4.2	UJ					0.59	UJ	L	4.4	UJ					
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Diethylphthalate	NS	**2,900**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Dimethylphenol (2,4-)	NS	**73**	2.0	U		5.0	U					2.1	U		5.3	U					1.1	J		5.6	U					
Dimethylphthalate	NS	**36,000**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Di-n-butylphthalate	NS	**360**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.0	U		5.0	U					5.3	U		5.3	U					5.0	U		5.6	U					
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.0	UJ	I				2.1	UJ	I	5.3	UJ	I				2.0	UJ	I	5.6	UJ	I				
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Di-n-octylphthalate	NS	**150**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Hexachlorobenzene	1	**0.042**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Hexachlorobutadiene	0.33	**0.86**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Hexachlorocyclopentadiene	50	**22**	5.0	U		2.0	U					5.3	U		2.1	U					5.0	U		2.2	U					
Hexachloroethane	3.8	**3.6**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Isophorone	NS	**71**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Methylphenol (2-)	NS	**180**	2.0	U		2.0	U					2.1	U		2.1	U					0.60	J		2.2	U					
Methylphenol (4-)	NS	**18**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Nitroaniline (2-)	NS	**11**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Nitrobenzene	200	**0.34**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Nitrophenol (2-)	NS	NS	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Nitrophenol (4-)	NS	NS	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Pentachlorophenol	NS	**0.56**	0.60	UJ		0.93	UJ					0.62	UJ		0.99	UJ					0.59	UJ		1.0	UJ					
Phenol	NS	**1,100**	2.0	U		2.0	U					2.1	U		2.1	U					0.67	J		2.2	U					
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.0	U					2.1	U		2.1	U					2.0	U		2.2	U					
Total Other SVOCs	NS	NS	-			0.94			110			3.8			-			-			3.8			-			-			
Total SVOCs	NS	NS	1.8			19.7291			111			3.8			0.0037			-			101.9751			16.9213			90.538			

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																							
	COPC Screening Levels		SH-16S									SH-17D			SH-17R			SH-17S									SH-18D						SH-18S							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/11/2001			5/17/2002			11/19/2003			11/20/2003			11/20/2003			9/6/2001			5/20/2002			11/19/2003			9/4/2001			5/15/2002			9/4/2001			5/15/2002				
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias		
PAHs																																								
Acenaphthene	NS	**37**	0.051	U		0.052	U		0.053	U		0.11			0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Acenaphthylene	NS	NS	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Anthracene	NS	**180**	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.15			0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Benzo(a)anthracene	NS	**0.092**	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Benzo(a)pyrene	NS	**0.0092**	0.0029	UJ		0.0018	UJ		0.0031	UJ		0.0057	J	I	0.0037	J	I	**0.021**			0.0020	J		0.0030	UJ		0.0028	UJ		0.0045	UJ		0.0029	UJ	L	0.0019	UJ			
Benzo(b)fluoranthene	NS	**0.092**	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Benzo(g,h,i)perylene	NS	NS	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Benzo(k)fluoranthene	NS	**0.92**	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Chrysene	NS	**9.2**	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Dibenz(a,h)anthracene	NS	**0.0092**	0.0044	UJ		0.0026	UJ		0.0022	UJ		0.0022	UJ		0.0032	J	I	0.0043	UJ		0.0025	UJ		0.0024	J		0.0043	UJ		0.0026	UJ		0.0044	UJ	L	0.0076	J			
Fluoranthene	NS	**150**	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Fluorene	NS	**24**	0.051	U		0.052	U		0.053	U		0.13			0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.051	U		0.052	U		0.053	U		0.051	U		0.053	U		0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Methylnaphthalene (2-)	330	NS	0.051	U		0.052	U		0.053	U		3.8			1.5			0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Naphthalene	15	**0.62**	0.051	U		0.052	U		0.053	U		**3.2**			**1.5**			0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Phenanthrene	NS	NS	0.051	U		0.052	U		0.053	U		0.33			0.12			0.074			0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Pyrene	NS	**18**	0.051	U		0.052	U		0.053	U		0.083			0.090			0.050	U		0.050	U		0.052	U		0.051	U		0.052	U		0.052	UJ	L	0.052	U			
Total PAHs	NS	NS	-			-			-			7.7			3.2			0.25			0.0020			0.0024			-			-			-			0.0076				
Other SVOCs																																								
Benzoic acid	NS	**15,000**		R			R					1.0	UJ	L	1.1	UJ	L		R		5.0	UJ	L					R			R			R			R			
Benzyl Alcohol	NS	**1,100**	2.0	U		5.2	UJ	L				0.26	U		0.27	U		2.0	U		5.0	U					2.0	U		5.2	U		2.1	UJ	L	5.2	U			
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
bis(2-Chloroethyl)ether	10	**0.01**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
bis(2-Chloroisopropyl)ether	51	**0.27**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.60	UJ		0.97	UJ		0.53	U		1.1	U		0.66	U		0.86	UJ		0.93	UJ		0.52	U		0.80	UJ		0.96	UJ		1.3	UJ	L	0.96	UJ			
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Butylbenzylphthalate	NS	**730**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Carbazole	NS	**3.4**	0.60	UJ		0.97	UJ		0.53	U		0.68			0.30			0.59	UJ		0.93	UJ		0.52	U		0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Chloroaniline (4-)	NS	**15**	2.0	U		2.1	U					0.26	U		0.27	UJ	L	2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Chlorophenol (2-)	110	**3.0**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Dibenzofuran	NS	**1.2**	2.0	U		2.1	U					0.19	J	I	0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Dichlorobenzene (1,3-)	83	**18**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Dichlorobenzene (1,4-)	820	**0.50**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.60	UJ		4.1	UJ					0.26	U			R		0.59	UJ		4.0	UJ					0.60	UJ		4.1	UJ		0.61	UJ	L	4.1	UJ			
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Diethylphthalate	NS	**2,900**	2.0	U		2.1	U					0.13	J	I	0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Dimethylphenol (2,4-)	NS	**73**	2.0	U		5.2	U					0.26	U		0.27	U		2.0	U		5.0	U					2.0	U		5.2	U		2.1	UJ	L	5.2	U			
Dimethylphthalate	NS	**36,000**	2.0	U		2.1	U					0.26	U		0.27	UJ	L	2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Di-n-butylphthalate	NS	**360**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.1	U		5.2	U					0.51	UJ	I	0.53	UJ	I	5.0	U		5.0	U					5.0	U		5.2	U		5.2	UJ	L	5.2	U			
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.2	UJ	I				1.0	UJ	I	1.1	UJ	I	2.0	UJ	I	5.0	UJ	I				2.0	UJ	I	5.2	UJ	I	2.1	UJ	I	5.2	UJ	I		
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Di-n-octylphthalate	NS	**150**	2.0	U		2.1	U					0.16	J	I	0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Hexachlorobenzene	1	**0.042**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Hexachlorobutadiene	0.33	**0.86**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Hexachlorocyclopentadiene	50	**22**	5.1	U		2.1	U					0.26	U		0.27	U		5.0	U		2.0	U					5.0	U		2.1	U		5.2	UJ	L	2.1	U			
Hexachloroethane	3.8	**3.6**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Isophorone	NS	**71**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Methylphenol (2-)	NS	**180**	2.0	U		2.1	U					0.15	J	I	0.12	J	I	2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Methylphenol (4-)	NS	**18**	2.0	U		2.1	U					0.15	J	I	0.11	J	I	2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Nitroaniline (2-)	NS	**11**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.1	U					0.51	U		0.53	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Nitrobenzene	200	**0.34**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Nitrophenol (2-)	NS	NS	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Nitrophenol (4-)	NS	NS	2.0	U		2.1	U					1.0	U		1.1	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.60	UJ		0.97	UJ					0.26	U		0.27	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Pentachlorophenol	NS	**0.56**	0.60	UJ		0.97	UJ					1.0	U		1.1	U		0.59	UJ		0.93	UJ					0.60	UJ		0.96	UJ		0.61	UJ	L	0.96	UJ			
Phenol	NS	**1,100**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.1	U					0.26	U		0.27	U		2.0	U		2.0	U					2.0	U		2.1	U		2.1	UJ	L	2.1	U			
Total Other SVOCs	NS	NS	-			-			-			1.5			0.53			-			-			-			-			-			-			-				
Total SVOCs	NS	NS	-			-			-			9.1			3.7			0.25			0.0020			0.0024			-			-			-			0.0076				

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																							
	COPC Screening Levels		SH-19D						SH-19R						SH-19S						SH-20S						SH-21S						SH-22S					
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/5/2001			5/16/2002			9/5/2001			5/16/2002			9/5/2001			5/21/2002			9/5/2001			5/17/2002			9/6/2001			5/16/2002			9/5/2001			5/17/2002		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																								
Acenaphthene	NS	**37**	0.051	U		0.054	U		0.051	U		0.054	U		0.24			0.097			0.053	U		0.052	U		2.8			1.9			0.053	U		0.052	U	
Acenaphthylene	NS	NS	0.051	U		0.054	U		0.051	U		0.054	U		0.064			0.051	U		0.053	U		0.052	U		0.14			0.30			0.053	U		0.052	U	
Anthracene	NS	**180**	0.051	U		0.054	U		0.051	U		0.054	U		0.057			0.051	U		0.053	U		0.052	U		0.57			0.61			0.053	U		0.052	U	
Benzo(a)anthracene	NS	**0.092**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		**0.30**			**0.83**			0.053	U		0.052	U	
Benzo(a)pyrene	NS	**0.0092**	0.0029	UJ		0.0024	UJ		0.0045	J		0.0024	UJ		0.0028	UJ		0.0017	UJ		0.0030	UJ		0.0018	UJ		**0.25**			**0.87**			0.0030	UJ		0.0021	UJ	
Benzo(b)fluoranthene	NS	**0.092**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		**0.22**			**0.59**			0.053	U		0.052	U	
Benzo(g,h,i)perylene	NS	NS	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		0.13			0.45			0.053	U		0.052	U	
Benzo(k)fluoranthene	NS	**0.92**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		0.15			0.57			0.053	U		0.052	U	
Chrysene	NS	**9.2**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		0.25			0.64			0.053	U		0.052	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0044	UJ		0.0027	UJ		0.0043	UJ		0.0027	UJ		0.0043	UJ		0.0026	UJ		0.0045	UJ		0.0026	UJ		**0.032**			**0.15**			0.0045	UJ		0.0026	UJ	
Fluoranthene	NS	**150**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		0.88			1.5			0.053	U		0.052	U	
Fluorene	NS	**24**	0.051	U		0.054	U		0.051	U		0.054	U		0.21			0.089			0.053	U		0.052	U		2.1			0.91			0.053	U		0.052	U	
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		**0.12**			**0.45**			0.053	U		0.052	U	
Methylnaphthalene (2-)	330	NS	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		0.40			0.17			0.053	U		0.052	U	
Naphthalene	15	**0.62**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		**1.1**			0.47			0.053	U		0.052	U	
Phenanthrene	NS	NS	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.052	U		2.9			1.5			0.053	U		0.052	U	
Pyrene	NS	**18**	0.051	U		0.054	U		0.051	U		0.054	U		0.050	U		0.051	U		0.053	U		0.16			0.68			1.4			0.053	U		0.052	U	
Total PAHs	NS	NS	-			-			0.0045			-			0.57			0.19			-			0.16			13.022			13.31			-			-		
Other SVOCs																																								
Benzoic acid	NS	**15,000**		R			R			R			R			R		5.1	UJ	L		R			R			R			R			R			R		
Benzyl Alcohol	NS	**1,100**	2.0	U		5.4	U		2.0	U		5.4	U		2.0	U		5.1	U		2.1	U		5.2	U		2.1	U		5.4	U		2.1	U		5.2	U	
bis(2-Chloroethoxy)methane	NS	NS	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
bis(2-Chloroethyl)ether	10	**0.01**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
bis(2-Chloroisopropyl)ether	51	**0.27**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
bis(2-Ethylhexyl)phthalate	NS	**4.8**	3.4	U		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		1.1	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Bromophenyl-phenylether (4-)	NS	NS	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Butylbenzylphthalate	NS	**730**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Carbazole	NS	**3.4**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Chloro-3-methylphenol (4-)	NS	NS	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Chloroaniline (4-)	NS	**15**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Chloronaphthalene (2-)	NS	**49**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Chlorophenol (2-)	110	**3.0**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Chlorophenyl-phenylether (4-)	NS	NS	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Dibenzofuran	NS	**1.2**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		0.76	J		2.2	U		2.1	U		2.1	U	
Dichlorobenzene (1,2-)	260	**37**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Dichlorobenzene (1,3-)	83	**18**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Dichlorobenzene (1,4-)	820	**0.50**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.60	UJ		4.3	UJ		0.60	UJ		4.3	UJ		0.59	UJ		4.0	UJ		0.62	UJ		4.1	UJ		0.61	UJ		4.3	UJ		0.62	UJ		4.1	UJ	
Dichlorophenol (2,4-)	NS	**11**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Diethylphthalate	NS	**2,900**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Dimethylphenol (2,4-)	NS	**73**	2.0	U		5.4	U		2.0	U		5.4	U		2.0	U		5.1	U		2.1	U		5.2	U		2.1	U		5.4	U		2.1	U		5.2	U	
Dimethylphthalate	NS	**36,000**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Di-n-butylphthalate	NS	**360**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.1	U		5.4	U		5.0	U		5.4	U		5.0	U		5.1	U		5.3	U		5.2	U		5.2	U		5.4	U		5.1	U		5.2	U	
Dinitrophenol (2,4-)	NS	**7.3**	2.0	UJ	I	5.4	UJ	I	2.0	UJ	I	5.4	UJ	I	2.0	UJ	I	5.1	UJ	I	2.1	UJ	I	5.2	UJ	I	2.1	UJ	I	5.4	UJ	I	2.1	UJ	I	5.2	UJ	I
Dinitrotoluene (2,4-)	NS	**7.3**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Dinitrotoluene (2,6-)	NS	**3.6**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Di-n-octylphthalate	NS	**150**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Hexachlorobenzene	1	**0.042**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Hexachlorobutadiene	0.33	**0.86**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Hexachlorocyclopentadiene	50	**22**	5.1	U		2.2	U		5.0	U		2.2	U		5.0	U		2.0	U		5.3	U		2.1	U		5.2	U		2.2	U		5.1	U		2.1	U	
Hexachloroethane	3.8	**3.6**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Isophorone	NS	**71**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Methylphenol (2-)	NS	**180**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Methylphenol (4-)	NS	**18**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Nitroaniline (2-)	NS	**11**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Nitroaniline (3-)	NS	**1.1**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Nitroaniline (4-)	NS	**3.2**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Nitrobenzene	200	**0.34**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Nitrophenol (2-)	NS	NS	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Nitrophenol (4-)	NS	NS	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Nitrosodiphenylamine (N-)	NS	**14**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Pentachlorophenol	NS	**0.56**	0.60	UJ		1.0	UJ		0.60	UJ		1.0	UJ		0.59	UJ		0.95	UJ		0.62	UJ		0.97	UJ		0.61	UJ		1.0	UJ		0.62	UJ		0.96	UJ	
Phenol	NS	**1,100**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Trichlorobenzene (1,2,4-)	340	**0.72**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Trichlorophenol (2,4,5-)	NS	**360**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Trichlorophenol (2,4,6-)	NS	**0.36**	2.0	U		2.2	U		2.0	U		2.2	U		2.0	U		2.0	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.1	U	
Total Other SVOCs	NS	NS	-			-			-			-			-			-			-			-			0.76			-			-			-		
Total SVOCs	NS	NS	-			-			0.0045			-			0.57			0.19			-			0.16			13.782			13.31			-			-		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																							
	COPC Screening Levels		SH-23S										SH-24R			SH-24S			SH-25D			SH-25S			SH-26S			SH-27D			SH-27R			SH-27S			SH-28D		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/4/2001			5/15/2002			11/4/2003				11/6/2003			11/6/2003			11/5/2003			11/5/2003			10/28/2003			11/19/2003			11/20/2003			11/21/2003			11/6/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																								
Acenaphthene	NS	**37**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		3.5			0.050	U		0.050	U		0.053	U		0.054	U	
Acenaphthylene	NS	NS	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.55			0.050	U		0.050	U		0.053	U		0.054	U	
Anthracene	NS	**180**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.82			0.050	U		0.050	U		0.053	U		0.054	U	
Benzo(a)anthracene	NS	**0.092**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.21	U		0.050	U		0.050	U		0.053	U		0.054	U	
Benzo(a)pyrene	NS	**0.0092**	0.0030	UJ		0.013	UJ		0.0031	UJ		0.0030	UJ		0.0098	UJ		0.0031	UJ		0.0049	UJ		**0.069**	J	I	**0.0096**	J	I	0.0030	UJ		**0.014**	J	I	0.0032	UJ	
Benzo(b)fluoranthene	NS	**0.092**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.21	U		0.050	U		0.050	U		0.053	U		0.054	U	
Benzo(g,h,i)perylene	NS	NS	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.21	U		0.050	U		0.050	U		0.053	U		0.054	U	
Benzo(k)fluoranthene	NS	**0.92**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.21	U		0.050	U		0.050	U		0.053	U		0.054	U	
Chrysene	NS	**9.2**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.21	U		0.050	U		0.050	U		0.053	U		0.054	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0047	UJ		**0.053**			0.0023	UJ		0.0022	UJ		0.0027	UJ		0.0022	UJ		0.0024	UJ		0.0090	UJ		0.0081	J	I	0.0021	UJ		0.0047	J	I	0.0023	UJ	
Fluoranthene	NS	**150**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		1.1			0.050	U		0.050	U		0.053	U		0.054	U	
Fluorene	NS	**24**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		2.2			0.050	U		0.050	U		0.053	U		0.054	U	
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		0.21	U		0.050	U		0.050	U		0.053	U		0.054	U	
Methylnaphthalene (2-)	330	NS	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		11			0.050	U		0.060			0.053	U		0.054	U	
Naphthalene	15	**0.62**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		**29**			0.050	U		0.053			0.053	U		0.054	U	
Phenanthrene	NS	NS	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		6.8			0.050	U		0.050	U		0.053	U		0.054	U	
Pyrene	NS	**18**	0.054	U		0.052	U		0.053	U		0.052	U		0.054	U		0.052	U		0.053	U		1.9			0.050	U		0.050	U		0.053	U		0.054	U	
Total PAHs	NS	NS	-			0.053			-			-			-			-			-			56.939			0.018			0.11			0.019			-		
Other SVOCs																																								
Benzoic acid	NS	**15,000**		R			R					1.0	UJ	L	1.1	UJ	L	1.0	UJ	L	1.1	UJ	L	2.1	J	I	1.0	UJ	L	0.35	J	I	0.37	J	I	1.1	UJ	L
Benzyl Alcohol	NS	**1,100**	2.2	U		5.2	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
bis(2-Chloroethoxy)methane	NS	NS	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
bis(2-Chloroethyl)ether	10	**0.01**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
bis(2-Chloroisopropyl)ether	51	**0.27**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.64	UJ		0.99	UJ		0.53	U		1.9	U		0.85	U		2.5	U		1.9	U		3.8	U		0.59	U		0.80	U		0.87	U		0.27	U	
Bromophenyl-phenylether (4-)	NS	NS	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Butylbenzylphthalate	NS	**730**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Carbazole	NS	**3.4**	0.64	UJ		0.97	UJ		0.53	U		0.26	U		0.27	U		0.26	U		0.27	U		0.67	J	I	0.25	U		0.25	U		0.26	U		0.27	U	
Chloro-3-methylphenol (4-)	NS	NS	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Chloroaniline (4-)	NS	**15**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Chloronaphthalene (2-)	NS	**49**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Chlorophenol (2-)	110	**3.0**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Chlorophenyl-phenylether (4-)	NS	NS	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dibenzofuran	NS	**1.2**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		0.55	J	I	0.25	U		0.25	U		0.26	U		0.27	U	
Dichlorobenzene (1,2-)	260	**37**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dichlorobenzene (1,3-)	83	**18**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dichlorobenzene (1,4-)	820	**0.50**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.64	UJ		4.1	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dichlorophenol (2,4-)	NS	**11**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Diethylphthalate	NS	**2,900**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dimethylphenol (2,4-)	NS	**73**	2.2	U		5.2	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dimethylphthalate	NS	**36,000**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.19	J	I	0.26	U		0.42		
Di-n-butylphthalate	NS	**360**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		1.4	U		0.26	U		0.30	U	
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	5.4	U		5.2	U					0.52	UJ	I	0.54	UJ	I	0.52	UJ	I	0.53	UJ	I	2.1	UJ	I	0.50	UJ	I	0.50	UJ	I	0.53	UJ	I	0.54	UJ	I
Dinitrophenol (2,4-)	NS	**7.3**	2.2	UJ	I	5.2	UJ	I				1.0	UJ	I	1.1	UJ	I	1.0	UJ	I	1.1	UJ	I	4.2	UJ	I	1.0	UJ	I	1.0	UJ	I	1.0	UJ	I	1.1	UJ	I
Dinitrotoluene (2,4-)	NS	**7.3**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Dinitrotoluene (2,6-)	NS	**3.6**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.18	J	I	0.26	U		0.27	U	
Di-n-octylphthalate	NS	**150**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Hexachlorobenzene	1	**0.042**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Hexachlorobutadiene	0.33	**0.86**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Hexachlorocyclopentadiene	50	**22**	5.4	U		2.1	U					0.26	UJ	L	0.27	UJ	L	0.26	UJ	L	0.27	UJ	L	1.0	U		0.25	U		0.25	U		0.26	U		0.27	UJ	L
Hexachloroethane	3.8	**3.6**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Isophorone	NS	**71**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Methylphenol (2-)	NS	**180**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Methylphenol (4-)	NS	**18**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		0.59	J	I	0.25	U		0.25	U		0.26	U		0.27	U	
Nitroaniline (2-)	NS	**11**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Nitroaniline (3-)	NS	**1.1**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Nitroaniline (4-)	NS	**3.2**	2.2	U		2.1	U					0.52	U		0.54	U		0.52	U		0.53	U		2.1	U		0.50	U		0.50	U		0.53	U		0.54	U	
Nitrobenzene	200	**0.34**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Nitrophenol (2-)	NS	NS	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Nitrophenol (4-)	NS	NS	2.2	U		2.1	U					1.0	U		1.1	U		1.0	U		1.1	U		4.2	U		1.0	U		0.10	J	I	1.0	U		1.1	U	
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.64	UJ		0.97	UJ					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Nitrosodiphenylamine (N-)	NS	**14**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Pentachlorophenol	NS	**0.56**	0.64	UJ		0.97	UJ					1.0	U		1.1	U		1.0	U		1.1	U		4.2	U		1.0	U		1.0	U		1.0	U		1.1	U	
Phenol	NS	**1,100**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Trichlorobenzene (1,2,4-)	340	**0.72**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Trichlorophenol (2,4,5-)	NS	**360**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Trichlorophenol (2,4,6-)	NS	**0.36**	2.2	U		2.1	U					0.26	U		0.27	U		0.26	U		0.27	U		1.0	U		0.25	U		0.25	U		0.26	U		0.27	U	
Total Other SVOCs	NS	NS	-			-			-			-			-			-			-			3.9			-			0.82			0.37			0.42		
Total SVOCs	NS	NS	-			0.053			-			-			-			-			-			60.849			0.018			0.93			0.39			0.42		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																														
	COPC Screening Levels		SH-28R			SH-28S			WP-01			WP-02			WP-03			WP-04			WP-05			WP-06			WP-07		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	11/7/2003			11/6/2003			11/4/2003			11/4/2003			11/5/2003			11/7/2003			11/7/2003			10/28/2003			10/27/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																															
Acenaphthene	NS	**37**	0.054	U		0.054	U		2.2			0.052	U		0.054	U		0.052	U		0.053	U		0.46			2.6		
Acenaphthylene	NS	NS	0.054	U		0.054	U		0.14			0.052	U		0.054	U		0.052	U		0.053	U		0.070			0.38		
Anthracene	NS	**180**	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.052	U		0.053	U		0.057	U		0.30		
Benzo(a)anthracene	NS	**0.092**	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		**0.093**			0.053	U		0.057	U		0.11	U	
Benzo(a)pyrene	NS	**0.0092**	0.0032	UJ		0.0032	UJ		0.0031	UJ		0.0030	UJ		0.0032	UJ		**0.088**			0.0031	UJ		0.0054	J	I	**0.077**	J	I
Benzo(b)fluoranthene	NS	**0.092**	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		**0.095**			0.053	U		0.057	U		0.11	U	
Benzo(g,h,i)perylene	NS	NS	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.056			0.053	U		0.057	U		0.11	U	
Benzo(k)fluoranthene	NS	**0.92**	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.052	U		0.053	U		0.057	U		0.11	U	
Chrysene	NS	**9.2**	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.10			0.053	U		0.057	U		0.11	U	
Dibenz(a,h)anthracene	NS	**0.0092**	0.0023	UJ		0.0023	UJ		0.0022	UJ		0.0022	UJ		0.0023	UJ		**0.017**	J	I	0.0023	UJ		0.0024	UJ		**0.025**	J	I
Fluoranthene	NS	**150**	0.054	U		0.054	U		1.3			0.052	U		0.054	U		0.18			0.053	U		0.057	U		0.41		
Fluorene	NS	**24**	0.054	U		0.054	U		1.4			0.052	U		0.054	U		0.052	U		0.053	U		0.27			1.4		
Indeno(1,2,3-cd)pyrene	NS	**0.092**	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.052	U		0.053	U		0.057	U		0.11	U	
Methylnaphthalene (2-)	330	NS	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.052	U		0.053	U		1.2			7.7		
Naphthalene	15	**0.62**	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.052	U		0.053	U		**3.1**			**18**		
Phenanthrene	NS	NS	0.054	U		0.054	U		0.052	U		0.052	U		0.054	U		0.11			0.053	U		0.47			2.8		
Pyrene	NS	**18**	0.054	U		0.054	U		1.7			0.052	U		0.054	U		0.23			0.053	U		0.057	U		0.93		
Total PAHs	NS	NS	-			-			6.7			-			-			0.97			-			5.6			34.622		
Other SVOCs																															
Benzoic acid	NS	**15,000**	1.1	U		1.1	UJ	L	1.0	UJ	L	1.0	UJ	L	1.1	UJ	L	0.25	J	I	1.1	U		1.1	UJ	L	1.1	J	I
Benzyl Alcohol	NS	**1,100**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
bis(2-Chloroethoxy)methane	NS	NS	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
bis(2-Chloroethyl)ether	10	**0.01**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
bis(2-Chloroisopropyl)ether	51	**0.27**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
bis(2-Ethylhexyl)phthalate	NS	**4.8**	0.27	U		0.38	U		0.61	U		0.45	U		0.40	U		0.76	U		0.27	U		0.28	U		0.75	U	
Bromophenyl-phenylether (4-)	NS	NS	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Butylbenzylphthalate	NS	**730**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Carbazole	NS	**3.4**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.64		
Chloro-3-methylphenol (4-)	NS	NS	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Chloroaniline (4-)	NS	**15**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Chloronaphthalene (2-)	NS	**49**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Chlorophenol (2-)	110	**3.0**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Chlorophenyl-phenylether (4-)	NS	NS	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dibenzofuran	NS	**1.2**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.36	J	I
Dichlorobenzene (1,2-)	260	**37**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dichlorobenzene (1,3-)	83	**18**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dichlorobenzene (1,4-)	820	**0.50**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dichlorobenzidine (3,3'-)	NS	**0.15**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dichlorophenol (2,4-)	NS	**11**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Diethylphthalate	NS	**2,900**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dimethylphenol (2,4-)	NS	**73**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.50	J	I
Dimethylphthalate	NS	**36,000**	0.27	U		0.17	J	I	0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Di-n-butylphthalate	NS	**360**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dinitro-2-methylphenol (4,6-)	NS	**0.36**	0.54	UJ	I	0.54	UJ	I	0.52	UJ	I	0.52	UJ	I	0.54	UJ	I	0.52	UJ	I	0.53	UJ	I	0.57	UJ	I	1.1	UJ	I
Dinitrophenol (2,4-)	NS	**7.3**	1.1	UJ	I	1.1	UJ	I	1.0	UJ	I	1.0	UJ	I	1.1	UJ	I	1.0	UJ	I	1.1	UJ	I	1.1	UJ	I	2.3	UJ	I
Dinitrotoluene (2,4-)	NS	**7.3**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Dinitrotoluene (2,6-)	NS	**3.6**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Di-n-octylphthalate	NS	**150**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.34	J	H	0.27	U		0.28	U		0.30	J	I
Hexachlorobenzene	1	**0.042**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Hexachlorobutadiene	0.33	**0.86**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Hexachlorocyclopentadiene	50	**22**	0.27	U		0.27	UJ	L	0.26	UJ	L	0.26	UJ	L	0.27	UJ	L	0.26	U		0.27	U		0.28	U		0.57	U	
Hexachloroethane	3.8	**3.6**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Isophorone	NS	**71**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Methylphenol (2-)	NS	**180**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.43	J	I
Methylphenol (4-)	NS	**18**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.61		
Nitroaniline (2-)	NS	**11**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Nitroaniline (3-)	NS	**1.1**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Nitroaniline (4-)	NS	**3.2**	0.54	U		0.54	U		0.52	U		0.52	U		0.54	U		0.52	U		0.53	U		0.57	U		1.1	U	
Nitrobenzene	200	**0.34**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Nitrophenol (2-)	NS	NS	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Nitrophenol (4-)	NS	NS	1.1	U		1.1	U		1.0	U		1.0	U		1.1	U		1.0	U		1.1	U		1.1	U		2.3	U	
Nitroso-di-n-propylamine (N-)	NS	**0.0096**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Nitrosodiphenylamine (N-)	NS	**14**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Pentachlorophenol	NS	**0.56**	1.1	U		1.1	U		1.0	U		1.0	U		1.1	U		1.0	U		1.1	U		1.1	U		2.3	U	
Phenol	NS	**1,100**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Trichlorobenzene (1,2,4-)	340	**0.72**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Trichlorophenol (2,4,5-)	NS	**360**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Trichlorophenol (2,4,6-)	NS	**0.36**	0.27	U		0.27	U		0.26	U		0.26	U		0.27	U		0.26	U		0.27	U		0.28	U		0.57	U	
Total Other SVOCs	NS	NS	-			0.17			-			-			-			0.59			-			-			3.9		
Total SVOCs	NS	NS	-			0.17			6.7			-			-			1.6			-			5.6			38.562		

TABLE 13E
Summary of Groundwater Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2A for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels).

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002), the May 2002 Groundwater Sampling Report (SHA, 2003), and the Phase 1B RI Data Usability Report (SHA, 2004).

4. All concentrations are presented in micrograms per liter (µg/l), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health risk assessment. Analyte detections from shallow wells which exceed the EPA Vapor Intrusion Screening Values (shaded value) are shaded. Analyte detections which exceed EPA Region IX Tap Water PRG (**bold** value) are in **bold**.

"EPA Vapor Intrusion Screening" indicates values listed are from the USEPA Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Table 2C, November 29, 2002. These values apply to shallow groundwater (SH-series wells with an S after the well number, and WP-series wells). Target groundwater concentrations based on non-carcinogenic effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999).

"EPA Region IX Tap Water PRG" indicates the values listed are from the USEPA Region IX Preliminary Remediation Goals (PRGs) Table, dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999).

6. Total concentrations listed (e.g. Total PAHs) are the sum of detected concentrations of the relevant suite of compounds. "PAHs" are polycyclic aromatic hydrocarbons. "Other SVOCs" are non-PAH semi-volatile organic compounds.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in the Data Usability Report [SHA, 2002], and the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
- "R" Indicates data rejected during validation.

Bias:

- "L" Low
- "I" Indeterminate

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L																															
			SH-01D									SH-01R									SH-01S									SH-02D					
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/22/2002			10/29/03			9/13/2001			5/22/2002			10/30/03			9/12/2001			5/21/2002			10/28/03			9/13/2001			5/23/2002			10/30/03		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																				
Benzene $	5	**0.35**	**810**	J	L	**340**	J	L	**130**	J	L	**660**			**690**	J	L	**390**			**16**			**1.3**	J		**2.2**	J	I	**83**			**180**			**3.8**	J	I
Toluene	150	**72**	**1,200**	J	L	**670**	J	L	**420**	J	L	**920**			**1,000**	J	L	**770**			24			4.5			19			**130**			**270**			40	U	
Ethylbenzene	700	**130**	**350**	J	L	**400**	J	L	**310**	J	L	**280**			**380**	J	L	**260**			7.0			1.7	J		10	U		47			58	J		40	U	
Xylene (m,p-) †	2,200	**21**	**420**	J	L	**420**	J	L	**330**	J	L	**390**			**560**	J	L	**430**			**22**			3.2			8.0	J	I	**74**			**98**	J		40	U	
Xylene (o-) †	3,300	**21**	**230**	J	L	**200**	J	L	**160**	J	L	**190**			**260**	J	L	**200**			11			1.7	J		10	U		**35**	J		100	U		40	U	
Styrene	890	**160**	**280**	J	L	130	J	L	82	J	L	**240**			**320**	J	L	**240**			9.3			2.0	U		10	U		38	J		69	J		40	U	
Total AVOCs	NS	NS	3,290			2,160			1,432			2,680			3,210			2,290			89.3			12.4			29.2			407			675			3.8		
CVOCs																																				
Carbon tetrachloride $	5	**0.17**	9.0	UJ	L	26	UJ	L		R		22	UJ		26	UJ	L	36	UJ		0.45	UJ		0.53	UJ		3.6	UJ		9.0	UJ		26	UJ		15	UJ	
Chlorobenzene	39	**11**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Chloroethane	2,800	**4.6**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Chloroform $	80	**0.17**	150	UJ	I	14	UJ	L		R		310	U		14	UJ	L	7.0	UJ		0.37	UJ		0.27	UJ		0.70	UJ		120	U		14	UJ		2.8	UJ	
Chloromethane	6.7	**16**	11	UJ	L	14	UJ	L		R		28	UJ		14	UJ	L	40	UJ		0.57	UJ		0.29	UJ		4.0	UJ		11	UJ		14	UJ		16	UJ	
Dichloroethane (1,1-)	220	**81**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Dichloroethane (1,2-) $	5	**0.12**	3.6	UJ	L	14	UJ	L		R		9.0	UJ		14	UJ	L	5.0	UJ		0.18	UJ		0.29	UJ		0.50	UJ		3.6	UJ		14	UJ		2.0	UJ	
Dichloroethene (1,1-)	19	**34**	8.6	UJ	L	9.5	UJ	L		R		22	UJ		9.5	UJ	L	11	UJ		0.43	UJ		0.19	UJ		1.1	UJ		8.6	UJ		9.5	UJ		4.4	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Dichloroethene (trans-1,2-)	18	**12**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Dichloropropane (1,2-)	3.5	**0.16**	3.0	UJ	L	12	UJ	L		R		7.5	UJ		12	UJ	L	8.5	UJ		0.15	UJ		0.24	UJ		0.85	UJ		3.0	UJ		12	UJ		3.4	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	4.6	UJ	L	11	UJ	L		R		12	UJ		11	UJ	L	10	UJ		0.23	UJ		0.22	UJ		1.0	UJ		4.6	UJ		11	UJ		4.2	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	4.2	UJ	L	12	UJ	L		R		10	UJ		12	UJ	L	5.5	UJ		0.21	UJ		0.23	UJ		0.55	UJ		4.2	UJ		12	UJ		2.2	UJ	
Methylene chloride	58	**4.3**	7.0	UJ	L	26	UJ	L		R		**14**	J		20	UJ	L	78	UJ		0.20	UJ		0.21	UJ		7.8	UJ		4.0	UJ		10	UJ		31	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	3.2	UJ	L	6.0	UJ	L		R		8.0	UJ		6.0	UJ	L	16	UJ		0.16	UJ		0.12	UJ		1.6	UJ		3.2	UJ		6.0	UJ		6.2	UJ	
Tetrachloroethene $	5	**0.1**	6.4	UJ	L	10	UJ	L		R		16	UJ		10	UJ	L	7.5	UJ		0.32	UJ		0.21	UJ		0.75	UJ		6.4	UJ		10	UJ		3.0	UJ	
Trichloroethane (1,1,1-)	310	**320**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Trichloroethane (1,1,2-) $	5	**0.20**	5.2	UJ	L	12	UJ	L		R		13	UJ		12	UJ	L	6.0	UJ		0.26	UJ		0.24	UJ		0.60	UJ		5.2	UJ		12	UJ		2.4	UJ	
Trichloroethene $	5	**0.028**	5.2	UJ	L	13	UJ	L		R		13	UJ		13	UJ	L	9.0	UJ		0.26	UJ		0.26	UJ		0.90	UJ		5.2	UJ		13	UJ		3.6	UJ	
Vinyl chloride $	2	**0.020**	15	UJ	L	29	UJ	L		R		38	UJ		29	UJ	L	16	UJ		0.75	UJ		0.58	UJ		1.6	UJ		15	UJ		29	UJ		6.4	UJ	
Total CVOCs	NS	NS	-			-			-			14			-			-			-			-			-			-			-			-		
Other VOCs																																				
Acetone	22,000	**550**	400	UJ	L	200	J	L		R		1,000	UJ	L	150	J	L	250	U		20	UJ	L	6.9			23	J	I	400	UJ	L	250	U		100	U	
Bromochloromethane	NS	NS	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Bromodichloromethane	2.1	**0.18**	43	UJ	I	11	UJ	L		R		110	U		11	UJ	L	12	UJ		0.23	UJ		0.22	UJ		1.2	UJ		47	UJ		11	UJ		4.8	UJ	
Bromoform	0.0083	**8.5**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Bromomethane	2.0	**0.87**	21	UJ	I	8.0	UJ	L		R		54	UJ	I	8.0	UJ	L	77	UJ	I	1.1	UJ	I	0.16	UJ		7.7	UJ	I	21	UJ	I	30	UJ	I	31	UJ	I
Butanone (2-)	44,000	**700**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.9			26			40	U		100	U		40	U	
Carbon disulfide	56	**100**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Chloroethylvinyl ether (2-)	NS	NS		R		100	UJ	L		R			R		100	UJ	L	100	U		2.0	U		2.0	U		10	U			R		100	U		40	U	
Dibromochloromethane	3.2	**0.13**	15	UJ	L	10	UJ	L		R		32	UJ		10	UJ	L	7.5	UJ		0.15	UJ		0.20	UJ		0.75	UJ		15	UJ		10	UJ		3.0	UJ	
Hexanone (2-)	NS	NS	180	J	L	250	UJ	L	72	J	L	330			140	J	L	99	J	I	3.3			1.5	J		25	U		40	U		60	J		100	U	
Methyl-2-pentanone (4-)	1,400	**200**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Methyl-tert Butyl Ether	12,000	**6.2**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Trichlorofluoromethane	18	**130**	40	UJ	L	100	UJ	L		R		100	U		100	UJ	L	100	U		2.0	U		2.0	U		10	U		40	U		100	U		40	U	
Vinyl acetate	960	**41**	100	UJ	L	100	UJ	L		R		250	UJ	L	100	UJ	L	100	U		5.0	UJ	L	2.0	U		10	U		100	UJ	L	100	U		40	U	
Total Other VOCs	NS	NS	180			200			72			330			290			99			3.3			11.3			49			-			60			-		
Total VOCs	NS	NS	3,470			2,360			1,504			3,024			3,500			2,389			92.6			23.7			78.2			407			735			3.8		
Ratio: BT/BTEX	*NS*	*NS*	*0.67*			*0.50*			*0.41*			*0.65*			*0.58*			*0.57*			*0.50*			*0.47*			*0.73*			*0.58*			*0.74*			*1.0*		
Ratio: BT/AVOCs	*NS*	*NS*	*0.61*			*0.47*			*0.38*			*0.59*			*0.53*			*0.51*			*0.45*			*0.47*			*0.73*			*0.52*			*0.67*			*1.0*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*0.91*			*0.94*			*0.94*			*0.91*			*0.90*			*0.90*			*0.90*			*1.0*			*1.0*			*0.91*			*0.90*			*1.0*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*0.87*			*0.86*			*0.90*			*0.81*			*0.83*			*0.86*			*0.86*			*0.52*			*0.37*			*0.91*			*0.82*			*1.0*		
VPH																																				
C5-C8 Aliphatic	NS	NS																																		
C9-C12 Aliphatic	NS	NS																																		
C9-C10 Aromatic	NS	NS																																		
Total VPH	NS	NS																																		
EPH																																				
C9-C18 Aliphatic	NS	NS																																		
C19-C36 Aliphatic	NS	NS																																		
C11-C22 Aromatic	NS	NS																																		
Total EPH	NS	NS																																		

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																				
	COPC Screening Levels		SH-02R									SH-02S									SH-03D									SH-03S								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/16/2002			11/04/03			9/12/2001			5/24/2002			10/29/03			9/12/2001			5/23/2002			11/03/03			9/11/2001			5/16/2002			11/03/03		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																					
Benzene $	5	**0.35**	**8.4**			**6.9**			**2.1**	J	L	**0.96**	J		**0.84**	J		0.75	UJ		0.25	UJ		0.22	UJ		0.15	UJ		0.25	UJ		0.22	UJ		0.15	UJ	
Toluene	150	**72**	12			2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		8.8			28			4.6		
Ethylbenzene	700	**130**	2.7			2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	3.2			4.1			2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	1.8	J		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	28.1			11			2.1			0.96			0.84			-			-			-			-			8.8			28			4.6		
CVOCs																																					
Carbon tetrachloride $	5	**0.17**	0.45	UJ		0.53	UJ		0.33	UJ		0.45	UJ		0.53	UJ		3.6	UJ		0.45	UJ		0.53	UJ		0.33	UJ		0.45	UJ		0.53	UJ		0.33	UJ	
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	0.31	UJ		0.27	UJ		0.11	UJ		0.24	UJ		0.27	UJ		0.70	UJ		0.29	UJ		0.27	UJ		0.11	UJ		0.22	UJ		0.27	UJ		0.11	UJ	
Chloromethane	6.7	**16**	0.57	UJ		0.29	UJ		0.20	UJ		0.57	UJ		0.29	UJ		4.0	UJ		0.57	UJ		0.29	UJ		0.20	UJ		0.57	UJ		0.29	UJ		0.20	UJ	
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.18	UJ		0.29	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.50	UJ		0.18	UJ		0.29	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.17	UJ	
Dichloroethene (1,1-)	19	**34**	0.43	UJ		0.19	UJ		0.30	UJ		0.43	UJ		0.19	UJ		1.1	UJ		0.43	UJ		0.19	UJ		0.30	UJ		0.43	UJ		0.19	UJ		0.30	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.15	UJ		0.24	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.85	UJ		0.15	UJ		0.24	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.14	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.23	UJ		0.22	UJ		0.14	UJ		0.23	UJ		0.22	UJ		1.0	UJ		0.23	UJ		0.22	UJ		0.14	UJ		0.23	UJ		0.22	UJ		0.14	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.21	UJ		0.23	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.55	UJ		0.21	UJ		0.23	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.10	UJ	
Methylene chloride	58	**4.3**	0.20	UJ		0.21	UJ		0.25	UJ		0.20	UJ		0.21	UJ		7.8	UJ		0.20	UJ		0.21	UJ		0.25	UJ		0.20	UJ		0.21	UJ		0.25	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.16	UJ		0.12	UJ		0.090	UJ		0.16	UJ		0.12	UJ		1.6	UJ		0.16	UJ		0.12	UJ		0.090	UJ		0.16	UJ		0.12	UJ		0.090	UJ	
Tetrachloroethene $	5	**0.1**	0.32	UJ		0.21	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.75	UJ		0.32	UJ		0.21	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.23	UJ	
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	0.26	UJ		0.24	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.60	UJ		0.26	UJ		0.24	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.10	UJ	
Trichloroethene $	5	**0.028**	**1.0**	J		**0.99**	J		**0.81**	J	I	0.26	UJ		0.26	UJ		0.90	UJ		**0.41**	J		**0.45**	J		**0.38**	J	I	0.26	UJ		0.26	UJ		0.18	UJ	
Vinyl chloride $	2	**0.020**	0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		1.6	UJ		0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ	
Total CVOCs	NS	NS	1.0			0.99			0.81			-			-			-			0.41			0.45			0.38			-			-			-		
Other VOCs																																					
Acetone	22,000	**550**	20	UJ	L	5.0	U		2.0	U		20	UJ	L	3.4	J		25	U		20	UJ	L	5.0	U		2.0	U		20	UJ	L	5.0	J		2.0	U	
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	0.23	UJ		0.22	UJ		0.060	UJ		0.23	UJ		0.22	UJ		1.2	UJ		0.23	UJ		0.22	UJ		0.060	UJ		0.23	UJ		0.22	UJ		0.060	UJ	
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	1.1	UJ	I	0.32	UJ	I	0.78	UJ	I	1.1	UJ	I	0.47	UJ	I	7.7	UJ	I	1.1	UJ	I	0.43	UJ	I	0.78	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		16			6.8			2.0	U	
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U			R		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U			R	
Dibromochloromethane	3.2	**0.13**	0.15	UJ		0.20	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.75	UJ		0.15	UJ		0.20	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.090	UJ	
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		25	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	5.0	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		10	U		5.0	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		2.0	U	
Total Other VOCs	NS	NS	-			-			-			-			3.4			-			-			-			-			16			11.8			-		
Total VOCs	NS	NS	29.1			11.99			2.9			0.96			4.2			-			0.41			0.45			0.38			24.8			39.8			4.6		
Ratio: BT/BTEX	*NS*	*NS*	*0.73*			*0.63*			*1.0*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*1.0*		
Ratio: BT/AVOCs	*NS*	*NS*	*0.73*			*0.63*			*1.0*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*1.0*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*1.0*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*0.97*			*0.92*			*0.72*			*1.0*			*0.20*			*N/A*			*N/A*			*N/A*			*N/A*			*0.35*			*0.70*			*1.0*		
VPH																																					
C5-C8 Aliphatic	NS	NS																																			
C9-C12 Aliphatic	NS	NS																																			
C9-C10 Aromatic	NS	NS																																			
Total VPH	NS	NS																																			
EPH																																					
C9-C18 Aliphatic	NS	NS																																			
C19-C36 Aliphatic	NS	NS																																			
C11-C22 Aromatic	NS	NS																																			
Total EPH	NS	NS																																			

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Walpole, Massachusetts

Analytes	Concentrations in µg/L																																		
	COPC Screening Levels		SH-04D									SH-04S									SH-05D									SH-05R-A			SH-05R-B		
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/11/2001			5/21/2002			11/05/03			9/11/2001			5/20/2002			10/28/03			9/11/2001			5/21/2002			11/04/03			11/10/03			11/11/03		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																			
Benzene $	5	**0.35**	0.25	UJ		0.22	UJ		0.15	UJ	L	**43**			**17**	J		**17**			0.25	UJ		0.22	UJ		0.15	UJ	L	0.15	UJ		0.15	UJ	
Toluene	150	**72**	2.0	U		2.0	U		2.0	U		57			22			23			2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	2.0	U		2.0	U		2.0	U		23			20	U		9.2	J	I	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	2.0	U		2.0	U		2.0	U		**33**			11	J		13			2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	2.0	U		2.0	U		2.0	U		17			20	U		7.0	J	I	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		13			20	U		6.2	J	I	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	-			-			-			186			50			75.4			-			-			-			-			-		
CVOCs																																			
Carbon tetrachloride $	5	**0.17**	0.45	UJ		0.53	UJ		0.33	UJ		2.2	UJ		5.3	UJ		3.6	UJ		0.45	UJ		0.53	UJ		0.33	UJ		0.33	UJ		0.33	UJ	
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	0.25	UJ		0.27	UJ		0.11	UJ		28	U		2.7	UJ		0.70	UJ		0.33	UJ		0.27	UJ		0.11	UJ		0.11	UJ		0.11	UJ	
Chloromethane	6.7	**16**	0.57	UJ		0.29	UJ		0.20	UJ		2.8	UJ		2.9	UJ		4.0	UJ		0.57	UJ		0.29	UJ		0.20	UJ		0.20	UJ		0.20	UJ	
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.18	UJ		0.29	UJ		0.17	UJ		0.90	UJ		2.9	UJ		0.50	UJ		0.18	UJ		0.29	UJ		0.17	UJ		0.17	UJ		0.17	UJ	
Dichloroethene (1,1-)	19	**34**	0.43	UJ		0.19	UJ		0.30	UJ		2.2	UJ		1.9	UJ		1.1	UJ		0.43	UJ		0.19	UJ		0.30	UJ		0.30	UJ		0.30	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.15	UJ		0.24	UJ		0.14	UJ		0.75	UJ		2.4	UJ		0.85	UJ		0.15	UJ		0.24	UJ		0.14	UJ		0.14	UJ		0.14	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.23	UJ		0.22	UJ		0.14	UJ		1.2	UJ		2.2	UJ		1.0	UJ		0.23	UJ		0.22	UJ		0.14	UJ		0.14	UJ		0.14	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.21	UJ		0.23	UJ		0.10	UJ		1.0	UJ		2.3	UJ		0.55	UJ		0.21	UJ		0.23	UJ		0.10	UJ		0.10	UJ		0.10	UJ	
Methylene chloride	58	**4.3**	0.20	UJ		0.21	UJ		0.25	UJ		1.4	UJ		6.6	UJ		7.8	UJ		0.20	UJ		0.21	UJ		0.25	UJ		0.25	UJ		0.25	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.16	UJ		0.12	UJ		0.090	UJ		0.80	UJ			R		1.6	UJ		0.16	UJ		0.12	UJ		0.090	UJ		0.090	UJ		0.090	UJ	
Tetrachloroethene $	5	**0.1**	0.32	UJ		0.21	UJ		0.23	UJ		1.6	UJ		2.1	UJ		0.75	UJ		0.32	UJ		0.21	UJ		0.23	UJ		0.23	UJ		0.23	UJ	
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	0.26	UJ		0.24	UJ		0.10	UJ		1.3	UJ		2.4	UJ		0.60	UJ		0.26	UJ		0.24	UJ		0.10	UJ		0.10	UJ		0.10	UJ	
Trichloroethene $	5	**0.028**	0.26	UJ		0.26	UJ		0.18	UJ		1.3	UJ		2.6	UJ		0.90	UJ		**2.2**			**2.2**			**3.2**			0.18	UJ		0.18	UJ	
Vinyl chloride $	2	**0.020**	0.75	UJ		0.58	UJ		0.32	UJ		3.8	UJ		5.8	UJ		1.6	UJ		0.75	UJ		0.58	UJ		0.32	UJ		0.32	UJ		0.32	UJ	
Total CVOCs	NS	NS	-			-			-			-			-			-			2.2			2.2			-			-			-		
Other VOCs																																			
Acetone	22,000	**550**	20	UJ	L	5.0	U		2.0	U		100	UJ	L	50	U		25	U		20	UJ	L	5.0	U		2.0	U		5.0	U		5.0	U	
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	0.23	UJ		0.22	UJ		0.060	UJ		9.2	UJ		2.2	UJ		1.2	UJ		0.23	UJ		0.22	UJ		0.060	UJ		0.060	UJ		0.060	UJ	
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	1.1	UJ	I	0.45	UJ	I	0.78	UJ	I	5.4	UJ	I	2.1	UJ	I	7.7	UJ	I	1.1	UJ	I	0.51	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U		2.0	U			R		20	U		10	U		2.0	U			R		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	0.15	UJ		0.20	UJ		0.090	UJ		2.7	UJ		2.0	UJ		0.75	UJ		0.15	UJ		0.20	UJ		0.090	UJ		0.090	UJ		0.090	UJ	
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		18			20	U		8.0	J	I	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		10	U		20	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	5.0	UJ	L	2.0	U		2.0	U		25	UJ	L		R		10	U		5.0	UJ	L	2.0	U		2.0	U		2.0	U		2.0	U	
Total Other VOCs	NS	NS	-			-			-			18			-			8.0			-			-			-			-			-		
Total VOCs	NS	NS	-			-			-			204			50			83.4			2.2			2.2			-			-			-		
Ratio: BT/BTEX	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*0.58*			*0.78*			*0.58*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*0.54*			*0.78*			*0.53*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*0.93*			*1.0*			*0.92*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*0.85*			*1.0*			*0.83*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
VPH																																			
C5-C8 Aliphatic	NS	NS																																	
C9-C12 Aliphatic	NS	NS																																	
C9-C10 Aromatic	NS	NS																																	
Total VPH	NS	NS																																	
EPH																																			
C9-C18 Aliphatic	NS	NS																																	
C19-C36 Aliphatic	NS	NS																																	
C11-C22 Aromatic	NS	NS																																	
Total EPH	NS	NS																																	

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																	
	COPC Screening Levels		SH-05S									SH-06D									SH-06R-A			SH-06R-B			SH-06S							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/11/2001			5/21/2002			10/29/03			9/6/2001			5/22/2002			10/29/03			11-05-03			11-06-03			9/6/2001			5/22/2002			10/29/03		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																		
Benzene $	5	**0.35**	**7.4**	J		**12**			**2.0**	J	I	**3.7**	J		**3.0**	J		**5.1**	J	L	0.15	UJ	L	0.15	UJ	L	**3.8**	J		**4.6**	J		**2.6**	J	I
Toluene	150	**72**	7.0	J		6.6	J		10	U		20	U		7.4	J		10	J	L	2.0	U		2.0	U		6.6	J		5.3	J		5.2	J	I
Ethylbenzene	700	**130**	5.0	J		10	U		10	U		11	J		12			12	J	L	2.0	U		2.0	U		10	U		10	U		10	U	
Xylene (m,p-) †	2,200	**21**	11			12			10	U		**48**			**49**	J	I	**50**	J	L	2.0	U		2.0	U		5.2	J		10	U		8.2	J	I
Xylene (o-) †	3,300	**21**	7.2	J		7.4	J		10	U		**45**			**48**	J	I	**48**	J	L	2.0	U		2.0	U		10	U		10	U		5.9	J	I
Styrene	890	**160**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Total AVOCs	NS	NS	37.6			38			2.0			107.7			119.4			125.1			-			-			15.6			9.9			21.9		
CVOCs																																		
Carbon tetrachloride $	5	**0.17**	2.2	UJ		2.6	UJ		3.6	UJ		4.5	UJ		2.6	UJ		3.6	UJ	L	0.33	UJ		0.33	UJ		2.2	UJ		2.6	UJ		3.6	UJ	
Chlorobenzene	39	**11**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Chloroethane	2,800	**4.6**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Chloroform $	80	**0.17**	27	U		1.4	UJ		0.70	UJ		4.1	UJ		1.4	UJ		0.70	UJ	L	0.11	UJ		0.11	UJ		1.9	UJ		1.4	UJ		0.70	UJ	
Chloromethane	6.7	**16**	2.8	UJ		1.4	UJ		4.0	UJ		5.7	UJ		1.4	UJ		4.0	UJ	L	0.20	UJ		0.20	UJ		2.8	UJ		1.4	UJ		4.0	UJ	
Dichloroethane (1,1-)	220	**81**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Dichloroethane (1,2-) $	5	**0.12**	0.90	UJ		1.4	UJ		0.50	UJ		1.8	UJ		1.4	UJ		0.50	UJ	L	0.17	UJ		0.17	UJ		0.90	UJ		1.4	UJ		0.50	UJ	
Dichloroethene (1,1-)	19	**34**	2.2	UJ		0.95	UJ		1.1	UJ		4.3	UJ		0.95	UJ		1.1	UJ	L	0.30	UJ		0.30	UJ		2.2	UJ		0.95	UJ		1.1	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Dichloroethene (trans-1,2-)	18	**12**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	UJ	I	2.0	UJ	I	10	U		10	U		10	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.75	UJ		1.2	UJ		0.85	UJ		1.5	UJ		1.2	UJ		0.85	UJ	L	0.14	UJ		0.14	UJ		0.75	UJ		1.2	UJ		0.85	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	1.2	UJ		1.1	UJ		1.0	UJ		2.3	UJ		1.1	UJ		1.0	UJ	L	0.14	UJ		0.14	UJ		1.2	UJ		1.1	UJ		1.0	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	1.0	UJ		1.2	UJ		0.55	UJ		2.1	UJ		1.2	UJ		0.55	UJ	L	0.10	UJ		0.10	UJ		1.0	UJ		1.2	UJ		0.55	UJ	
Methylene chloride	58	**4.3**	1.4	UJ		1.0	UJ		7.8	UJ		2.3	UJ		3.5	UJ		7.8	UJ	L	0.25	UJ		0.25	UJ		1.2	UJ		1.0	UJ		7.8	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.80	UJ		0.60	UJ		1.6	UJ		1.6	UJ		0.60	UJ		1.6	UJ	L	0.090	UJ		0.090	UJ		0.80	UJ		0.60	UJ		1.6	UJ	
Tetrachloroethene $	5	**0.1**	1.6	UJ		1.0	UJ		0.75	UJ		3.2	UJ		1.0	UJ		0.75	UJ	L	0.23	UJ		0.23	UJ		1.6	UJ		1.0	UJ		0.75	UJ	
Trichloroethane (1,1,1-)	310	**320**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Trichloroethane (1,1,2-) $	5	**0.20**	1.3	UJ		1.2	UJ		0.60	UJ		2.6	UJ		1.2	UJ		0.60	UJ	L	0.10	UJ		0.10	UJ		1.3	UJ		1.2	UJ		0.60	UJ	
Trichloroethene $	5	**0.028**	1.3	UJ		1.3	UJ		0.90	UJ		2.6	UJ		1.3	UJ		0.90	UJ	L	**1.9**	J	I	**1.5**	J	I	1.3	UJ		1.3	UJ		0.90	UJ	
Vinyl chloride $	2	**0.020**	3.8	UJ		2.9	UJ		1.6	UJ		7.5	UJ		2.9	UJ		1.6	UJ	L	0.32	UJ		0.32	UJ		3.8	UJ		2.9	UJ		1.6	UJ	
Total CVOCs	NS	NS	-			-			-			-			-			-			1.9			1.5			-			-			-		
Other VOCs																																		
Acetone	22,000	**550**	100	UJ	L	25	J		25	U		50	J	I	69			84	J	L	2.0	U		2.0	U		25	UJ	I	14	J		25	U	
Bromochloromethane	NS	NS	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Bromodichloromethane	2.1	**0.18**	9.0	UJ		1.1	UJ		1.2	UJ		2.3	UJ		1.1	UJ		1.2	UJ	L	0.060	UJ		0.060	UJ		1.2	UJ		1.1	UJ		1.2	UJ	
Bromoform	0.0083	**8.5**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Bromomethane	2.0	**0.87**	5.4	UJ	I	0.80	UJ		7.7	UJ	I	11	UJ	I	0.80	UJ		7.7	UJ	I	0.78	UJ	I	0.78	UJ	I	5.4	UJ	I	3.2	UJ	I	7.7	UJ	I
Butanone (2-)	44,000	**700**	10	U		10	U		10	U		20	U		10	U		9.2	J	L	2.0	U		2.0	U		10	U		6.4	J		10	U	
Carbon disulfide	56	**100**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Chloroethylvinyl ether (2-)	NS	NS		R		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Dibromochloromethane	3.2	**0.13**	2.8	UJ		1.0	UJ		0.75	UJ		1.5	UJ		1.0	UJ		0.75	UJ	L	0.090	UJ		0.090	UJ		0.75	UJ		1.0	UJ		0.75	UJ	
Hexanone (2-)	NS	NS	10	U		25	U		25	U		20	U		25	U		25	UJ	L	2.0	U		2.0	U		10	U		10	U		25	U	
Methyl-2-pentanone (4-)	1,400	**200**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Methyl-tert Butyl Ether	12,000	**6.2**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Trichlorofluoromethane	18	**130**	10	U		10	U		10	U		20	U		10	U		10	UJ	L	2.0	U		2.0	U		10	U		10	U		10	U	
Vinyl acetate	960	**41**	25	UJ	L	10	U		10	U		50	UJ	L	10	U		10	UJ	L	2.0	U		2.0	U		25	UJ	L	10	U		10	U	
Total Other VOCs	NS	NS	-			25			-			50			69			93.2			-			-			-			20.4			-		
Total VOCs	NS	NS	37.6			63			2.0			157.7			188.4			218.3			1.9			1.5			15.6			30.3			21.9		
Ratio: BT/BTEX	*NS*	*NS*	*0.38*			*0.49*			*1.0*			*0.034*			*0.087*			*0.12*			*N/A*			*N/A*			*0.67*			*1.0*			*0.36*		
Ratio: BT/AVOCs	*NS*	*NS*	*0.38*			*0.49*			*1.0*			*0.034*			*0.087*			*0.12*			*N/A*			*N/A*			*0.67*			*1.0*			*0.36*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*N/A*			*N/A*			*1.0*			*1.0*			*1.0*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*1.0*			*0.60*			*1.0*			*0.68*			*0.63*			*0.57*			*N/A*			*N/A*			*1.0*			*0.33*			*1.0*		
VPH																																		
C5-C8 Aliphatic	NS	NS																																
C9-C12 Aliphatic	NS	NS																																
C9-C10 Aromatic	NS	NS																																
Total VPH	NS	NS																																
EPH																																		
C9-C18 Aliphatic	NS	NS																																
C19-C36 Aliphatic	NS	NS																																
C11-C22 Aromatic	NS	NS																																
Total EPH	NS	NS																																

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Analytes	Concentrations in µg/L																																						
	COPC Screening Levels		SH-07D									SH-07S									SH-08D									SH-08S								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/7/2001			5/22/2002			10/30/03			9/7/2001			5/22/2002			10/29/03			9/7/2001			5/20/2002			10/29/03			9/6/2001			5/21/2002			10/28/03		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																							
Benzene $	5	**0.35**	**13**	J	L	**9.2**	J		**8.2**	J	L	**3.6**	J		**0.43**	J		**3.2**	J	I	**77**			**49**			**46**			0.25	UJ		0.22	UJ		0.15	UJ	
Toluene	150	**72**	12	J	L	40	U		40	UJ	L	10	U		2.0	U		10	U		**99**			57			55			2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	10	J	L	40	U		40	UJ	L	13			2.0	U		11			47			34			30			2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	**27**	J	L	40	U		40	UJ	L	21			1.4	J		20			**160**			**100**			**95**			2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	16	J	L	40	U		40	UJ	L	12			2.0	U		9.5	J	I	**87**			**67**			**55**			2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	78			9.2			8.2			49.6			1.8			43.7			470			307			281			-			-			-		
CVOCs																																							
Carbon tetrachloride $	5	**0.17**	4.5	UJ	L	11	UJ		15	UJ	L	2.2	UJ		0.53	UJ		3.6	UJ		2.2	UJ		0.53	UJ		3.6	UJ		0.45	UJ		0.53	UJ		0.73	UJ	
Chlorobenzene	39	**11**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	3.3	UJ	L	5.4	UJ		2.8	UJ	L	1.6	UJ		0.27	UJ		0.70	UJ		2.0	UJ		0.27	UJ		0.70	UJ		0.22	UJ		0.27	UJ		0.14	UJ	
Chloromethane	6.7	**16**	5.7	UJ	L	5.8	UJ		16	UJ	L	2.8	UJ		0.29	UJ		4.0	UJ		2.8	UJ		0.93	J		4.0	UJ		0.57	UJ		0.29	UJ		0.79	UJ	
Dichloroethane (1,1-)	220	**81**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	1.8	UJ	L	5.8	UJ		2.0	UJ	L	0.90	UJ		0.29	UJ		0.50	UJ		0.90	UJ		0.29	UJ		0.50	UJ		0.18	UJ		0.29	UJ		0.10	UJ	
Dichloroethene (1,1-)	19	**34**	4.3	UJ	L	3.8	UJ		4.4	UJ	L	2.2	UJ		0.19	UJ		1.1	UJ		2.2	UJ		0.19	UJ		1.1	UJ		0.43	UJ		0.19	UJ		0.22	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		1.2	J		10	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	1.5	UJ	L	4.8	UJ		3.4	UJ	L	0.75	UJ		0.24	UJ		0.85	UJ		0.75	UJ		0.24	UJ		0.85	UJ		0.15	UJ		0.24	UJ		0.17	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	2.3	UJ	L	4.4	UJ		4.2	UJ	L	1.2	UJ		0.22	UJ		1.0	UJ		1.2	UJ		0.22	UJ		1.0	UJ		0.23	UJ		0.22	UJ		0.21	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	2.1	UJ	L	4.6	UJ		2.2	UJ	L	1.0	UJ		0.23	UJ		0.55	UJ		1.0	UJ		0.23	UJ		0.55	UJ		0.21	UJ		0.23	UJ		0.11	UJ	
Methylene chloride	58	**4.3**	2.0	UJ	L	4.2	UJ		31	UJ	L	1.0	UJ		0.21	UJ		7.8	UJ		1.2	UJ		0.21	UJ		7.8	UJ		0.30	UJ		0.21	UJ		1.6	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	1.6	UJ	L	2.4	UJ		6.2	UJ	L	0.80	UJ		0.12	UJ		1.6	UJ		0.80	UJ		0.12	UJ		1.6	UJ		0.16	UJ		0.12	UJ		0.31	UJ	
Tetrachloroethene $	5	**0.1**	3.2	UJ	L	4.2	UJ		3.0	UJ	L	1.6	UJ		0.21	UJ		0.75	UJ		1.6	UJ		0.21	UJ		0.75	UJ		0.32	UJ		0.21	UJ		0.15	UJ	
Trichloroethane (1,1,1-)	310	**320**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	2.6	UJ	L	4.8	UJ		2.4	UJ	L	1.3	UJ		0.24	UJ		0.60	UJ		1.3	UJ		0.24	UJ		0.60	UJ		0.26	UJ		0.24	UJ		0.12	UJ	
Trichloroethene $	5	**0.028**	2.6	UJ	L	5.2	UJ		3.6	UJ	L	1.3	UJ		0.26	UJ		0.90	UJ		1.3	UJ		0.26	UJ		0.90	UJ		0.26	UJ		0.26	UJ		0.18	UJ	
Vinyl chloride $	2	**0.020**	7.5	UJ	L	12	UJ		6.4	UJ	L	3.8	UJ		0.58	UJ		1.6	UJ		3.8	UJ		0.58	UJ		1.6	UJ		0.75	UJ		0.58	UJ		0.32	UJ	
Total CVOCs	NS	NS	-			-			-			-			-			-			-			2.1			-			-			-			-		
Other VOCs																																							
Acetone	22,000	**550**	86	J	I	110			87	J	L	25	UJ	I	5.0	U		25	U		25	UJ	I	5.0	U		25	U		20	UJ	L	5.0	U		5.0	U	
Bromochloromethane	NS	NS	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	UJ		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	2.3	UJ	L	4.4	UJ		4.8	UJ	L	1.2	UJ		0.22	UJ		1.2	UJ		1.2	UJ		0.22	UJ		1.2	UJ		0.23	UJ		0.22	UJ		0.24	UJ	
Bromoform	0.0083	**8.5**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	11	UJ	I	8.2	UJ	I	31	UJ	I	5.4	UJ	I	0.16	UJ		7.7	UJ	I	5.4	UJ	I	0.30	UJ	I	7.7	UJ	I	1.1	UJ	I	0.22	UJ	I	1.5	UJ	I
Butanone (2-)	44,000	**700**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	20	UJ	L	40	U		40	UJ	L	10	U			R		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	1.5	UJ	L	4.0	UJ		3.0	UJ	L	0.75	UJ		0.20	UJ		0.75	UJ		0.75	UJ		0.20	UJ		0.75	UJ		0.15	UJ		0.20	UJ		0.15	UJ	
Hexanone (2-)	NS	NS	20	UJ	L	40	U		100	UJ	L	10	U		5.0	U		25	U		10	U		2.0	U		25	U		2.0	U		2.0	U		5.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	20	UJ	L	**22**	J		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	20	UJ	L	40	U		40	UJ	L	10	U		2.0	U		10	U		10	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	50	UJ	L	40	U		40	UJ	L	25	UJ	L	2.0	U		10	U		25	UJ	L	2.0	U		10	U		5.0	UJ	L	2.0	U		2.0	U	
Total Other VOCs	NS	NS	86			132			87			-			-			-			-			-			-			-			-			-		
Total VOCs	NS	NS	164			141.2			95.2			49.6			1.8			43.7			470			309.13			281			-			-			-		
Ratio: BT/BTEX	*NS*	*NS*	*0.32*			*1.0*			*1.0*			*0.073*			*0.23*			*0.073*			*0.37*			*0.35*			*0.36*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*0.32*			*1.0*			*1.0*			*0.073*			*0.23*			*0.073*			*0.37*			*0.35*			*0.36*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*0.48*			*0.065*			*0.090*			*1.0*			*1.0*			*1.0*			*1.0*			*0.99*			*1.0*			*N/A*			*N/A*			*N/A*		
VPH																																							
C5-C8 Aliphatic	NS	NS										240	U		240	U														240	U		240	U						
C9-C12 Aliphatic	NS	NS										350	J	L	110	J	L													100	U		100	U						
C9-C10 Aromatic	NS	NS										200	J	L	70	U														70	U		70	U						
Total VPH	NS	NS										550			110															-			410							
EPH																																							
C9-C18 Aliphatic	NS	NS										31	UJ	L	33	UJ	L													31	U		30	U						
C19-C36 Aliphatic	NS	NS										42	U		43	UJ	L													41	U		40	U						
C11-C22 Aromatic	NS	NS										94			92	UJ	L													87	U		85	U						
Total EPH	NS	NS										94			-															-			-							

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L																																
			SH-09D									SH-09S									SH-10S									SH-11S							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/7/2001			5/23/2002			10/28/03			9/7/2001			5/17/2002			10/31/03			9/10/2001			5/23/2002			10/31/03			9/7/2001			5/16/2002			11/03/03		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																					
Benzene $	5	**0.35**	1.2	UJ		0.22	UJ		0.15	UJ		0.25	UJ		0.22	UJ		0.15	UJ		0.25	UJ		0.22	UJ		0.15	UJ		0.25	UJ		0.22	UJ		0.15	UJ	
Toluene	150	**72**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-			-		
CVOCs																																					
Carbon tetrachloride $	5	**0.17**	2.2	UJ		0.53	UJ		0.73	UJ		0.45	UJ		0.53	UJ		0.73	UJ		0.45	UJ		0.53	UJ		0.73	UJ		0.45	UJ		0.53	UJ		0.33	UJ	
Chlorobenzene	39	**11**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	2.0	UJ		0.27	UJ		0.14	UJ		0.22	UJ		0.27	UJ		0.14	UJ		0.36	UJ		0.27	UJ		0.14	UJ		0.22	UJ		0.27	UJ		0.11	UJ	
Chloromethane	6.7	**16**	2.8	UJ		0.29	UJ		0.79	UJ		0.57	UJ		0.29	UJ		0.79	UJ		0.57	UJ		0.29	UJ		0.79	UJ		0.57	UJ		0.29	UJ		0.20	UJ	
Dichloroethane (1,1-)	220	**81**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.90	UJ		0.29	UJ		0.10	UJ		0.18	UJ		0.29	UJ		0.10	UJ		0.18	UJ		0.29	UJ		0.10	UJ		0.18	UJ		0.29	UJ		0.17	UJ	
Dichloroethene (1,1-)	19	**34**	2.2	UJ		0.19	UJ		0.22	UJ		0.43	UJ		0.19	UJ		0.22	UJ		0.43	UJ		0.19	UJ		0.22	UJ		0.43	UJ		0.19	UJ		0.30	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.75	UJ		0.24	UJ		0.17	UJ		0.15	UJ		0.24	UJ		0.17	UJ		0.15	UJ		0.24	UJ		0.17	UJ		0.15	UJ		0.24	UJ		0.14	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	1.2	UJ		0.22	UJ		0.21	UJ		0.23	UJ		0.22	UJ		0.21	UJ		0.23	UJ		0.22	UJ		0.21	UJ		0.23	UJ		0.22	UJ		0.14	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	1.0	UJ		0.23	UJ		0.11	UJ		0.21	UJ		0.23	UJ		0.11	UJ		0.21	UJ		0.23	UJ		0.11	UJ		0.21	UJ		0.23	UJ		0.10	UJ	
Methylene chloride	58	**4.3**	1.0	UJ		0.21	UJ		1.6	UJ		0.20	UJ		0.21	UJ		1.6	UJ		0.20	UJ		0.21	UJ		1.6	UJ		0.20	UJ		0.21	UJ		0.25	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.80	UJ		0.12	UJ		0.31	UJ		0.16	UJ		0.12	UJ		0.31	UJ		0.16	UJ		0.12	UJ		0.31	UJ		0.16	UJ		0.12	UJ		0.090	UJ	
Tetrachloroethene $	5	**0.1**	1.6	UJ		0.21	UJ		0.15	UJ		0.32	UJ		0.21	UJ		0.15	UJ		0.32	UJ		0.21	UJ		0.15	UJ		0.32	UJ		0.21	UJ		0.23	UJ	
Trichloroethane (1,1,1-)	310	**320**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	1.3	UJ		0.24	UJ		0.12	UJ		0.26	UJ		0.24	UJ		0.12	UJ		0.26	UJ		0.24	UJ		0.12	UJ		0.26	UJ		0.24	UJ		0.10	UJ	
Trichloroethene $	5	**0.028**	1.3	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ	
Vinyl chloride $	2	**0.020**	3.8	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ	
Total CVOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-			-		
Other VOCs																																					
Acetone	22,000	**550**	25	UJ	I	5.3			7.4			5.0	UJ	I	5.0	U		5.0	U		20	UJ	L	3.5	J		5.0	U		5.0	UJ	I	5.0	U		2.0	U	
Bromochloromethane	NS	NS	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	1.2	UJ		0.22	UJ		0.24	UJ		0.23	UJ		0.22	UJ		0.24	UJ		0.23	UJ		0.22	UJ		0.24	UJ		0.23	UJ		0.22	UJ		0.060	UJ	
Bromoform	0.0083	**8.5**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	5.4	UJ	I	0.46	UJ	I	1.5	UJ	I	1.1	UJ	I	0.16	UJ	I	1.5	UJ	I	1.1	UJ	I	0.82	UJ	I	1.5	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I
Butanone (2-)	44,000	**700**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	10	U		2.0	U		2.0	U		2.0	U			R		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	0.75	UJ		0.20	UJ		0.15	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.15	UJ		0.20	UJ		0.090	UJ	
Hexanone (2-)	NS	NS	10	U		2.0	U		5.0	U		2.0	U		2.0	U		5.0	U		2.0	U		2.0	U		5.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	10	U		2.0	U		2.0	U		**40**			**31**			2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	25	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		2.0	U	
Total Other VOCs	NS	NS	-			5.3			7.4			40			31			-			-			3.5			-			-			-			-		
Total VOCs	NS	NS	-			5.3			7.4			40			31			-			-			3.5			-			-			-			-		
Ratio: BT/BTEX	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
VPH																																					
C5-C8 Aliphatic	NS	NS																																			
C9-C12 Aliphatic	NS	NS																																			
C9-C10 Aromatic	NS	NS																																			
Total VPH	NS	NS																																			
EPH																																					
C9-C18 Aliphatic	NS	NS																																			
C19-C36 Aliphatic	NS	NS																																			
C11-C22 Aromatic	NS	NS																																			
Total EPH	NS	NS																																			

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																																						
	COPC Screening Levels		SH-12D									SH-12S									SH-13S									SH-14D								
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/12/2001			5/17/2002			11/03/03			9/11/2001			5/17/2002			11/03/03			9/11/2001			5/16/2002			11/3/2003			9/10/2001			5/20/2002			11/4/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																							
Benzene $	5	**0.35**	0.25	UJ		0.22	UJ		0.15	UJ		0.25	UJ		**0.39**	J		**0.53**	J	I	0.25	UJ		0.22	UJ		0.15	UJ		0.25	UJ		0.22	UJ		0.15	UJ	L
Toluene	150	**72**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	-			-			-			-			0.39			0.53			-			-			-			-			-			-		
CVOCs																																							
Carbon tetrachloride $	5	**0.17**	0.45	UJ		0.53	UJ		0.33	UJ		0.45	UJ		0.53	UJ		0.33	UJ		0.45	UJ		0.53	UJ		0.33	UJ		0.45	UJ		0.53	UJ		0.33	UJ	
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	0.22	UJ		0.27	UJ		0.11	UJ		0.22	UJ		0.27	UJ		0.11	UJ		0.22	UJ		0.27	UJ		0.11	UJ		0.63	UJ		0.27	UJ		0.11	UJ	
Chloromethane	6.7	**16**	0.57	UJ		0.29	UJ		0.20	UJ		0.57	UJ		0.29	UJ		0.20	UJ		0.57	UJ		0.29	UJ		0.20	UJ		0.57	UJ		0.29	UJ		0.20	UJ	
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.18	UJ		0.29	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.17	UJ	
Dichloroethene (1,1-)	19	**34**	0.43	UJ		0.19	UJ		0.30	UJ		0.43	UJ		0.19	UJ		0.30	UJ		0.43	UJ		0.19	UJ		0.30	UJ		0.43	UJ		0.19	UJ		0.30	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.15	UJ		0.24	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.14	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.23	UJ		0.22	UJ		0.14	UJ		0.23	UJ		0.22	UJ		0.14	UJ		0.23	UJ		0.22	UJ		0.14	UJ		0.23	UJ		0.22	UJ		0.14	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.21	UJ		0.23	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.10	UJ	
Methylene chloride	58	**4.3**	0.20	UJ		0.21	UJ		0.25	UJ		0.20	UJ		0.21	UJ		0.25	UJ		0.20	UJ		0.21	UJ		0.25	UJ		0.20	UJ		0.21	UJ		0.25	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.16	UJ		0.12	UJ		0.090	UJ		0.16	UJ		0.12	UJ		0.090	UJ		0.16	UJ		0.12	UJ		0.090	UJ		0.16	UJ		0.12	UJ		0.090	UJ	
Tetrachloroethene $	5	**0.1**	0.32	UJ		0.21	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.23	UJ	
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	0.26	UJ		0.24	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.10	UJ	
Trichloroethene $	5	**0.028**	0.26	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ	
Vinyl chloride $	2	**0.020**	0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ	
Total CVOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-			-		
Other VOCs																																							
Acetone	22,000	**550**	20	UJ	L	5.0	U		2.0	U		20	UJ	L	4.5	J		2.0	U		20	UJ	L	5.0	U		2.0	U		20	UJ	L	5.0	U		2.0	U	
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	0.23	UJ		0.22	UJ		0.060	UJ		0.23	UJ		0.22	UJ		0.060	UJ		0.23	UJ		0.22	UJ		0.060	UJ		0.23	UJ		0.22	UJ		0.060	UJ	
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	0.15	UJ		0.20	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.090	UJ	
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	2.0	UJ	L	2.0	U		2.0	U		2.0	UJ	L	2.0	U		2.0	U		2.0	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		2.0	U	
Total Other VOCs	NS	NS	-			-			-			-			4.5			-			-			-			-			-			-			-		
Total VOCs	NS	NS	-			-			-			-			4.9			0.53			-			-			-			-			-			-		
Ratio: BT/BTEX	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*0.080*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
VPH																																							
C5-C8 Aliphatic	NS	NS																																						
C9-C12 Aliphatic	NS	NS																																						
C9-C10 Aromatic	NS	NS																																						
Total VPH	NS	NS																																						
EPH																																							
C9-C18 Aliphatic	NS	NS																																						
C19-C36 Aliphatic	NS	NS																																						
C11-C22 Aromatic	NS	NS																																						
Total EPH	NS	NS																																						

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Analytes	COPC Screening Levels		Concentrations in µg/L																																				
			SH-14S									SH-15D									SH-15S									SH-16S										
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/10/2001			5/20/2002			11/4/2003			9/10/2001			5/17/2002			11/4/2003			9/10/2001			5/20/2002			10/28/2003			9/11/2001			5/17/2002			11/19/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																							
Benzene $	5	**0.35**	0.25	UJ		**1.5**	J		0.15	UJ	L	0.25	UJ		0.22	UJ		0.15	UJ	L	**7.6**	J		**1.7**	J		**4.4**	J	I	0.25	UJ		0.22	UJ		0.15	UJ	
Toluene	150	**72**	2.0	U		1.7	J		2.0	U		2.0	U		2.0	U		2.0	U		7.8	J		10	U		10	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		5.4	J		10	U		10	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	-			3.2			-			-			-			-			20.8			1.7			4.4			-			-			-		
CVOCs																																							
Carbon tetrachloride $	5	**0.17**	0.45	UJ		0.53	UJ		0.33	UJ		0.45	UJ		0.53	UJ		0.33	UJ		2.2	UJ		2.6	UJ		3.6	UJ		0.45	UJ		0.53	UJ		0.33	UJ	
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	0.22	UJ		0.27	UJ		0.11	UJ		0.29	UJ		0.27	UJ		0.11	UJ		1.6	UJ		1.4	UJ		0.70	UJ		0.28	UJ		0.27	UJ		0.11	UJ	
Chloromethane	6.7	**16**	0.57	UJ		0.29	UJ		0.20	UJ		0.57	UJ		0.29	UJ		0.20	UJ		2.8	UJ		1.4	UJ		4.0	UJ		0.57	UJ		0.29	UJ		0.20	UJ	
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.18	UJ		0.29	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.17	UJ		0.90	UJ		1.4	UJ		0.50	UJ		0.18	UJ		0.29	UJ		0.17	UJ	
Dichloroethene (1,1-)	19	**34**	0.43	UJ		0.19	UJ		0.30	UJ		0.43	UJ		0.19	UJ		0.30	UJ		2.2	UJ		0.95	UJ		1.1	UJ		0.43	UJ		0.19	UJ		0.30	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.15	UJ		0.24	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.14	UJ		0.75	UJ		1.2	UJ		0.85	UJ		0.15	UJ		0.24	UJ		0.14	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.23	UJ		0.22	UJ		0.14	UJ		0.23	UJ		0.22	UJ		0.14	UJ		1.2	UJ		1.1	UJ		1.0	UJ		0.23	UJ		0.22	UJ		0.14	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.21	UJ		0.23	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.10	UJ		1.0	UJ		1.2	UJ		0.55	UJ		0.21	UJ		0.23	UJ		0.10	UJ	
Methylene chloride	58	**4.3**	0.20	UJ		0.21	UJ		0.25	UJ		0.20	UJ		0.21	UJ		0.25	UJ		1.0	UJ		1.0	UJ		7.8	UJ		0.20	UJ		0.21	UJ		0.25	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.16	UJ		0.12	UJ		0.090	UJ		0.16	UJ		0.12	UJ		0.090	UJ		0.80	UJ		0.60	UJ		1.6	UJ		0.16	UJ		0.12	UJ		0.090	UJ	
Tetrachloroethene $	5	**0.1**	0.32	UJ		0.21	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.23	UJ		1.6	UJ		1.0	UJ		0.75	UJ		0.32	UJ		0.21	UJ		0.23	UJ	
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	0.26	UJ		0.24	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.10	UJ		1.3	UJ		1.2	UJ		0.60	UJ		0.26	UJ		0.24	UJ		0.10	UJ	
Trichloroethene $	5	**0.028**	0.26	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ		1.3	UJ		1.3	UJ		0.90	UJ		0.26	UJ		0.26	UJ		0.18	UJ	
Vinyl chloride $	2	**0.020**	0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ		3.8	UJ		2.9	UJ		1.6	UJ		0.75	UJ		0.58	UJ		0.32	UJ	
Total CVOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-			-		
Other VOCs																																							
Acetone	22,000	**550**	5.0	UJ	I	5.0	U		2.2	U		20	UJ	L	5.0	U		2.0	U		25	UJ	I	25	U		25	U		20	UJ	L	5.0	U		5.0	U	
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	0.23	UJ		0.22	UJ		0.060	UJ		0.23	UJ		0.22	UJ		0.060	UJ		1.2	UJ		1.1	UJ		1.2	UJ		0.23	UJ		0.22	UJ		0.060	UJ	
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I	5.4	UJ	I	1.0	UJ	I	7.7	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	0.15	UJ		0.20	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.090	UJ		0.75	UJ		1.0	UJ		0.75	UJ		0.15	UJ		0.20	UJ		0.090	UJ	
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		25	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		10	U		10	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	5.0	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		2.0	U		25	UJ	L	10	U		10	U		5.0	UJ	L	2.0	U		2.0	U	
Total Other VOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-			-		
Total VOCs	NS	NS	-			3.2			-			-			-			-			20.8			1.7			4.4			-			-			-		
Ratio: BT/BTEX	*NS*	*NS*	*N/A*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*0.74*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*N/A*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*0.74*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*N/A*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*N/A*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*			*1.0*			*N/A*			*N/A*			*N/A*		
VPH																																							
C5-C8 Aliphatic	NS	NS																																					
C9-C12 Aliphatic	NS	NS																																					
C9-C10 Aromatic	NS	NS																																					
Total VPH	NS	NS																																					
EPH																																							
C9-C18 Aliphatic	NS	NS																																					
C19-C36 Aliphatic	NS	NS																																					
C11-C22 Aromatic	NS	NS																																					
Total EPH	NS	NS																																					

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L																															
			SH-17D			SH-17R			SH-17S									SH-18D						SH-18S						SH-19D					
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	11/20/2003			11/20/2003			9/6/2001			5/20/2002			11/19/2003			9/4/2001			5/15/2002			9/4/2001			5/15/2002			9/5/2001			5/16/2002		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																		
Benzene $	5	**0.35**	**2.9**			**2.0**			0.25	UJ		0.22	UJ		0.15	UJ		0.25	UJ		0.22	UJ		0.25	UJ		0.22	UJ		0.25	UJ		0.22	UJ	
Toluene	150	**72**	1.6	J	I	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	2.9			1.1	J	I	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	2.4			1.3	J	I	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	9.8			4.4			-			-			-			-			-			-			-			-			-		
CVOCs																																		
Carbon tetrachloride $	5	**0.17**	0.33	UJ		0.33	UJ		0.45	UJ		0.53	UJ		0.33	UJ		0.45	UJ		0.53	UJ		0.45	UJ		0.53	UJ		0.45	UJ		0.53	UJ	
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	0.11	UJ		0.11	UJ		0.22	UJ		0.27	UJ		0.11	UJ		0.22	UJ		0.27	UJ		0.22	UJ		0.27	UJ		0.36	UJ		0.27	UJ	
Chloromethane	6.7	**16**	0.20	UJ		0.20	UJ		0.57	UJ		0.29	UJ		0.20	UJ		0.57	UJ		0.29	UJ		0.57	UJ		0.29	UJ		0.57	UJ		0.29	UJ	
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.17	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.17	UJ		0.18	UJ		0.29	UJ		0.18	UJ		0.29	UJ		0.18	UJ		0.29	UJ	
Dichloroethene (1,1-)	19	**34**	0.30	UJ		0.30	UJ		0.43	UJ		0.19	UJ		0.30	UJ		0.43	UJ		0.19	UJ		0.43	UJ		0.19	UJ		0.43	UJ		0.19	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.14	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.14	UJ		0.15	UJ		0.24	UJ		0.15	UJ		0.24	UJ		0.15	UJ		0.24	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.14	UJ		0.14	UJ		0.23	UJ		0.22	UJ		0.14	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.10	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.10	UJ		0.21	UJ		0.23	UJ		0.21	UJ		0.23	UJ		0.21	UJ		0.23	UJ	
Methylene chloride	58	**4.3**	0.25	UJ		0.25	UJ		0.28	UJ		0.21	UJ		0.25	UJ		0.20	UJ		0.21	UJ		0.20	UJ		0.21	UJ		0.20	UJ		0.21	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.090	UJ		0.090	UJ	L	0.16	UJ		0.12	UJ		0.090	UJ		0.16	UJ		0.12	UJ		0.16	UJ		0.12	UJ		0.16	UJ		0.12	UJ	
Tetrachloroethene $	5	**0.1**	0.23	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.23	UJ		0.32	UJ		0.21	UJ		0.32	UJ		0.21	UJ		0.32	UJ		0.21	UJ	
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	0.10	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.10	UJ		0.26	UJ		0.24	UJ		0.26	UJ		0.24	UJ		0.26	UJ		0.24	UJ	
Trichloroethene $	5	**0.028**	0.18	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.18	UJ		0.26	UJ		0.26	UJ		0.26	UJ		0.26	UJ		0.26	UJ		0.26	UJ	
Vinyl chloride $	2	**0.020**	0.32	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.32	UJ		0.75	UJ		0.58	UJ		0.75	UJ		0.58	UJ		0.75	UJ		0.58	UJ	
Total CVOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-		
Other VOCs																																		
Acetone	22,000	**550**	5.0	U		5.0	U		20	UJ	L	5.0	U		5.0	U		20	UJ	L	5.0	U		20	UJ	L	5.0	U		20	UJ	L	5.0	U	
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	0.060	UJ		0.060	UJ		0.23	UJ		0.22	UJ		0.060	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ	
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	0.78	UJ	I	0.78	UJ	I	1.1	UJ	I	0.16	UJ	I	0.78	UJ	I	1.1	UJ	I	0.16	UJ	I	1.1	UJ	I	0.16	UJ	I	1.1	UJ	I	0.25	UJ	I
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	0.090	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.090	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.20	UJ	
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	2.0	UJ	I	2.0	UJ	I	5.0	UJ	L	2.0	U		2.0	U		5.0	UJ	L	2.0	U		5.0	UJ	L	2.0	U		5.0	UJ	L	2.0	U	
Total Other VOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-		
Total VOCs	NS	NS	9.8			4.4			-			-			-			-			-			-			-			-			-		
Ratio: BT/BTEX	*NS*	*NS*	*0.46*			*0.45*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*0.46*			*0.45*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*1.0*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
VPH																																		
C5-C8 Aliphatic	NS	NS							240	U		240	U																						
C9-C12 Aliphatic	NS	NS							100	U		100	U																						
C9-C10 Aromatic	NS	NS							70	U		70	U																						
Total VPH	NS	NS							-			-																							
EPH																																		
C9-C18 Aliphatic	NS	NS							30	U		30	U																						
C19-C36 Aliphatic	NS	NS							40	U		40	U																						
C11-C22 Aromatic	NS	NS							85	U		85	U																						
Total EPH	NS	NS							-			-																							

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L																															
			SH-19R						SH-19S						SH-20S						SH-21S						SH-22S						SH-23S			
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	9/5/2001			5/16/2002			9/5/2001			5/21/2002			9/5/2001			5/17/2002			9/6/2001			5/16/2002			9/5/2001			5/17/2002			9/4/2001			5/15/2002		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																				
Benzene $	5	**0.35**	0.25	UJ		0.22	UJ		0.25	UJ		0.22	UJ		0.25	UJ		0.22	UJ		0.25	UJ		0.22	UJ		0.25	UJ		0.22	UJ		0.25	UJ		0.22	UJ	
Toluene	150	**72**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	-			-			-			-			-			-			-			-			-			-			-			-		
CVOCs																																				
Carbon tetrachloride $	5	**0.17**	0.45	UJ		0.53	UJ		0.45	UJ		0.53	UJ		0.45	UJ		0.53	UJ		0.45	UJ		0.53	UJ		0.45	UJ		0.53	UJ		0.45	UJ		0.53	UJ	
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	0.22	UJ		0.27	UJ		0.22	UJ		0.27	UJ		0.59	UJ		0.27	UJ		0.32	UJ		**0.48**	J		0.40	UJ		0.27	UJ		0.22	UJ		0.27	UJ	
Chloromethane	6.7	**16**	0.57	UJ		0.29	UJ		0.57	UJ		0.29	UJ		0.57	UJ		0.29	UJ		0.57	UJ		0.29	UJ		0.57	UJ		0.29	UJ		0.57	UJ		0.29	UJ	
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.18	UJ		0.29	UJ		0.18	UJ		0.29	UJ		0.18	UJ		0.29	UJ		0.18	UJ		0.29	UJ		0.18	UJ		0.29	UJ		0.18	UJ		0.29	UJ	
Dichloroethene (1,1-)	19	**34**	0.43	UJ		0.19	UJ		0.43	UJ		0.19	UJ		0.43	UJ		0.19	UJ		0.43	UJ		0.19	UJ		0.43	UJ		0.19	UJ		0.43	UJ		0.19	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	3.5	**0.16**	0.15	UJ		0.24	UJ		0.15	UJ		0.24	UJ		0.15	UJ		0.24	UJ		0.15	UJ		0.24	UJ		0.15	UJ		0.24	UJ		0.15	UJ		0.24	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.21	UJ		0.23	UJ		0.21	UJ		0.23	UJ		0.21	UJ		0.23	UJ		0.21	UJ		0.23	UJ		0.21	UJ		0.23	UJ		0.21	UJ		0.23	UJ	
Methylene chloride	58	**4.3**	0.20	UJ		0.21	UJ		0.20	UJ		0.21	UJ		0.23	UJ		0.21	UJ		0.20	UJ		0.21	UJ		0.20	UJ		0.21	UJ		0.20	UJ		0.21	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.16	UJ		0.12	UJ		0.16	UJ		0.12	UJ		0.16	UJ		0.12	UJ		0.16	UJ		0.12	UJ		0.16	UJ		0.12	UJ		0.16	UJ		0.12	UJ	
Tetrachloroethene $	5	**0.1**	0.32	UJ		0.21	UJ		0.32	UJ		0.21	UJ		0.32	UJ		0.21	UJ		0.32	UJ		0.21	UJ		0.32	UJ		0.21	UJ		0.32	UJ		0.21	UJ	
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	0.26	UJ		0.24	UJ		0.26	UJ		0.24	UJ		0.26	UJ		0.24	UJ		0.26	UJ		0.24	UJ		0.26	UJ		0.24	UJ		0.26	UJ		0.24	UJ	
Trichloroethene $	5	**0.028**	0.26	UJ		0.26	UJ		0.26	UJ		0.26	UJ		**0.31**	J		0.26	UJ		0.26	UJ		0.26	UJ		**0.43**	J		0.26	UJ		0.26	UJ		0.26	UJ	
Vinyl chloride $	2	**0.020**	0.75	UJ		0.58	UJ		0.75	UJ		0.58	UJ		0.75	UJ		0.58	UJ		0.75	UJ		0.58	UJ		0.75	UJ		0.58	UJ		0.75	UJ		0.58	UJ	
Total CVOCs	NS	NS	-			-			-			-			0.31			-			-			0.48			0.43			-			-			-		
Other VOCs																																				
Acetone	22,000	**550**	20	UJ	L	5.0	U		1.1	J	L	2.0	J		20	UJ	L	5.0	U		20	UJ	L	5.0	U		20	UJ	L	5.0	U		20	UJ	L	5.0	U	
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ		0.23	UJ		0.22	UJ	
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	1.1	UJ	I	0.16	UJ	I	1.1	UJ	I	0.46	UJ	I	1.1	UJ	I	0.16	UJ	I	1.1	UJ	I	0.16	UJ	I	1.1	UJ	I	0.16	UJ	I	1.1	UJ	I	0.17	UJ	I
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U			R		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	0.15	UJ		0.20	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.20	UJ		0.15	UJ		0.20	UJ	
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		5.0			2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	5.0	UJ	L	2.0	U		5.0	UJ	L	2.0	U		5.0	UJ	L	2.0	U		5.0	UJ	L	2.0	U		5.0	UJ	L	2.0	U		5.0	UJ	L	2.0	U	
Total Other VOCs	NS	NS	-			-			1.1			2.0			-			-			-			5.0			-			-			-			-		
Total VOCs	NS	NS	-			-			1.1			2.0			0.31			-			-			5.5			0.43			-			-			-		
Ratio: BT/BTEX	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
VPH																																				
C5-C8 Aliphatic	NS	NS							240	U		240	U														240	U		240	U							
C9-C12 Aliphatic	NS	NS							100	U		100	U														100	U		100	U							
C9-C10 Aromatic	NS	NS							70	U		70	U														70	U		70	U							
Total VPH	NS	NS							-			-															-			-								
EPH																																				
C9-C18 Aliphatic	NS	NS							31	U		31	U														31	U		32	U							
C19-C36 Aliphatic	NS	NS							41	U		40	U														41	U		42	U							
C11-C22 Aromatic	NS	NS							87	U		85	U														87	U		89	U							
Total EPH	NS	NS							-			-															-			-								

TABLE 13F
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	COPC Screening Levels		Concentrations in µg/L																																					
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	SH-23S 11/4/2003			SH-24R 11/6/2003			SH-24S 11/6/2003			SH-25D 11/5/2003			SH-25S 11/5/2003			SH-26S 10/28/2003			SH-27D 11/19/2003			SH-27R 11/20/2003			SH-27S 11/21/2003			SH-28D 11/6/2003			SH-28R 11/7/2003			SH-28S 11/6/2003		
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																							
Benzene $	5	**0.35**	0.15	UJ	L	0.15	UJ	L	0.15	UJ	L	0.15	UJ	L	0.15	UJ	L	**2.5**	J	I	0.15	UJ		0.15	UJ		0.15	UJ		0.15	UJ	L	0.15	UJ	L	0.15	UJ	L
Toluene	150	**72**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	700	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-) †	2,200	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (o-) †	3,300	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total AVOCs	NS	NS	-			-			-			-			-			2.5			-			-			-			-			-			-		
CVOCs																																							
Carbon tetrachloride $	5	**0.17**	0.33	UJ		0.33	UJ		0.33	UJ		0.33	UJ		0.33	UJ		3.6	UJ		0.33	UJ		0.33	UJ		0.33	UJ		0.33	UJ		0.33	UJ		0.33	UJ	
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform $	80	**0.17**	0.11	UJ		0.11	UJ		0.12	J	I	0.11	UJ		0.11	UJ		0.70	UJ		0.11	UJ		0.11	UJ		0.11	UJ		0.11	UJ		0.11	UJ		0.11	UJ	
Chloromethane	6.7	**16**	0.20	UJ		0.20	UJ		0.20	UJ		0.20	UJ		0.20	UJ		4.0	UJ		0.20	UJ		0.20	UJ		0.20	UJ		0.20	UJ		0.20	UJ		0.20	UJ	
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	UJ	I	2.0	UJ	I	2.0	UJ	I	2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-) $	5	**0.12**	0.17	UJ		0.17	UJ		0.17	UJ		0.17	UJ		0.17	UJ		0.50	UJ		0.17	UJ		0.17	UJ		0.17	UJ		0.17	UJ		0.17	UJ		0.17	UJ	
Dichloroethene (1,1-)	19	**34**	0.30	UJ		0.30	UJ		0.30	UJ		0.30	UJ		0.30	UJ		1.1	UJ		0.83	J	I	1.3	J	I	0.30	UJ		0.30	UJ		0.30	UJ		0.30	UJ	
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	18	**12**	2.0	U		2.0	UJ	I	2.0	U		2.0	UJ	I	2.0	UJ	I	10	U		2.0	U		2.0	U		2.0	U		2.0	UJ	I	2.0	U		2.0	UJ	I
Dichloropropane (1,2-)	3.5	**0.16**	0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.85	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ	
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		1.0	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ	
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.55	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ	
Methylene chloride	58	**4.3**	0.25	UJ		0.25	UJ		0.25	UJ		0.25	UJ		0.25	UJ		7.8	UJ		0.25	UJ		0.25	UJ		0.25	UJ		0.25	UJ		0.25	UJ		0.25	UJ	
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		1.6	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ	
Tetrachloroethene $	5	**0.1**	0.23	UJ		0.23	UJ		0.23	UJ		0.23	UJ		0.23	UJ		0.75	UJ		0.23	UJ		0.23	UJ		0.23	UJ		0.23	UJ		0.23	UJ		0.23	UJ	
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		1.0	J	I	1.2	J	I	1.1	J	I	2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-) $	5	**0.20**	0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.60	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ	
Trichloroethene $	5	**0.028**	0.18	UJ		0.18	UJ		0.18	UJ		**1.8**	J	I	**0.73**	J	I	0.90	UJ		**2.3**			**5.1**			0.18	UJ		0.18	UJ		**0.43**	J	I	0.18	UJ	
Vinyl chloride $	2	**0.020**	0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ		1.6	UJ		0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ	
Total CVOCs	NS	NS	-			-			0.12			1.8			0.73			-			4.1			7.6			1.1			-			0.43			-		
Other VOCs																																							
Acetone	22,000	**550**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		7.5	J	I	5.0	U		5.0	U		5.0	U		2.0	U		2.0	U		2.0	U	
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	2.1	**0.18**	0.060	UJ		0.060	UJ		0.060	UJ		0.060	UJ		0.060	UJ		1.2	UJ		0.060	UJ		0.060	UJ		0.060	UJ		0.060	UJ		0.060	UJ		0.060	UJ	
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	2.0	**0.87**	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	7.7	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U			R		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	3.2	**0.13**	0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.75	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ	
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		25	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	960	**41**	2.0	U		2.0	U		2.0	UJ	L	2.0	U		2.0	U		10	U		2.0	UJ	I	2.0	UJ	I	2.0	UJ	I	2.0	U		2.0	U		2.0	U	
Total Other VOCs	NS	NS	-			-			-			-			-			7.5			-			-			-			-			-			-		
Total VOCs	NS	NS	-			-			0.12			1.8			0.73			10			4.1			7.6			1.1			-			0.43			-		
Ratio: BT/BTEX	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BT/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
Ratio: BTEX/Total VOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*0.25*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*N/A*		
VPH																																							
C5-C8 Aliphatic	NS	NS																																					
C9-C12 Aliphatic	NS	NS																																					
C9-C10 Aromatic	NS	NS																																					
Total VPH	NS	NS																																					
EPH																																							
C9-C18 Aliphatic	NS	NS																																					
C19-C36 Aliphatic	NS	NS																																					
C11-C22 Aromatic	NS	NS																																					
Total EPH	NS	NS																																					

TABLE 13F
Summary of Groundwater Data - Volatile Organic Compounds and VPH/EPH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in µg/L																											
	COPC Screening Levels		WP-01			WP-02			WP-03			WP-04			WP-05			WP-06			WP-07							
	EPA Vapor Intrusion Screening	EPA Region IX Tap Water PRG	11/4/2003			11/4/2003			11/5/2003			11/7/2003			11/7/2003			10/28/2003			10/27/2003							
			Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias					
AVOCs																												
Benzene $	5	**0.35**	0.15	UJ	L	0.15	UJ	L	0.15	UJ	L	0.15	UJ	L	0.15	UJ	L	0.19	J	I	**3.6**	J	I					
Toluene	150	**72**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Ethylbenzene	700	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Xylene (m,p-) †	2,200	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Xylene (o-) †	3,300	**21**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Styrene	890	**160**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Total AVOCs	NS	NS	-			-			-			-			-			0.19			3.6							
CVOCs																												
Carbon tetrachloride $	5	**0.17**	0.33	UJ		0.33	UJ		0.33	UJ		0.33	UJ		0.33	UJ		0.73	UJ		3.6	UJ						
Chlorobenzene	39	**11**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Chloroethane	2,800	**4.6**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Chloroform $	80	**0.17**	0.11	UJ		0.11	UJ		0.11	UJ		0.11	UJ		0.11	UJ		0.14	UJ		0.70	UJ						
Chloromethane	6.7	**16**	0.20	UJ		0.20	UJ		0.20	UJ		0.20	UJ		0.20	UJ		0.79	UJ		4.0	UJ						
Dichloroethane (1,1-)	220	**81**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Dichloroethane (1,2-) $	5	**0.12**	0.17	UJ		0.17	UJ		0.17	UJ		0.17	UJ		0.17	UJ		0.10	UJ		0.50	UJ						
Dichloroethene (1,1-)	19	**34**	0.30	UJ		0.30	UJ		0.30	UJ		0.30	UJ		0.30	UJ		0.22	UJ		1.1	UJ						
Dichloroethene (cis-1,2-)	21	**6.1**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Dichloroethene (trans-1,2-)	18	**12**	2.0	UJ	I	2.0	UJ	I	2.0	UJ	I	2.0	U		2.0	U		2.0	U		10	U						
Dichloropropane (1,2-)	3.5	**0.16**	0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.17	UJ		0.85	UJ						
Dichloropropene (cis-1,3-)	0.84	**0.40**	0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.14	UJ		0.21	UJ		1.0	UJ						
Dichloropropene (trans-1,3-)	0.84	**0.40**	0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.11	UJ		1.2	UJ						
Methylene chloride	58	**4.3**	0.25	UJ		0.25	UJ		0.25	UJ		0.25	UJ		0.25	UJ		1.6	UJ		7.8	UJ						
Tetrachloroethane (1,1,2,2-)	3	**0.055**	0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.31	UJ		1.6	UJ						
Tetrachloroethene $	5	**0.1**	0.23	UJ		0.23	UJ		0.23	UJ		0.23	UJ		0.23	UJ		0.15	UJ		0.75	UJ						
Trichloroethane (1,1,1-)	310	**320**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Trichloroethane (1,1,2-) $	5	**0.20**	0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.10	UJ		0.12	UJ		0.60	UJ						
Trichloroethene $	5	**0.028**	0.18	UJ		0.18	UJ		0.18	UJ		0.18	UJ		0.18	UJ		0.18	UJ		0.90	UJ						
Vinyl chloride $	2	**0.020**	0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ		0.32	UJ		1.6	UJ						
Total CVOCs	NS	NS	-			-			-			-			-			-			-							
Other VOCs																												
Acetone	22,000	**550**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		5.0	U		25	U						
Bromochloromethane	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Bromodichloromethane	2.1	**0.18**	0.060	UJ		0.060	UJ		0.060	UJ		0.060	UJ		0.060	UJ		0.24	UJ		1.2	UJ						
Bromoform	0.0083	**8.5**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Bromomethane	2.0	**0.87**	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	0.78	UJ	I	1.5	UJ	I	7.7	UJ	I					
Butanone (2-)	44,000	**700**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Carbon disulfide	56	**100**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Chloroethylvinyl ether (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Dibromochloromethane	3.2	**0.13**	0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.090	UJ		0.15	UJ		0.75	UJ						
Hexanone (2-)	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		5.0	U		25	U						
Methyl-2-pentanone (4-)	1,400	**200**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Methyl-tert Butyl Ether	12,000	**6.2**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Trichlorofluoromethane	18	**130**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Vinyl acetate	960	**41**	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		10	U						
Total Other VOCs	NS	NS	-			-			-			-			-			-			-							
Total VOCs	NS	NS	-			-			-			-			-			0.19			3.6							
Ratio: BT/BTEX	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*							
Ratio: BT/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*							
Ratio: BTEX/AVOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*							
Ratio: BTEX/Total VOCs	*NS*	*NS*	*N/A*			*N/A*			*N/A*			*N/A*			*N/A*			*1.0*			*1.0*							
VPH																												
C5-C8 Aliphatic	NS	NS																										
C9-C12 Aliphatic	NS	NS																										
C9-C10 Aromatic	NS	NS																										
Total VPH	NS	NS																										
EPH																												
C9-C18 Aliphatic	NS	NS																										
C19-C36 Aliphatic	NS	NS																										
C11-C22 Aromatic	NS	NS																										
Total EPH	NS	NS																										

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2A for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8260B; and extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) by Massachusetts Department of Environmental Protection (MADEP) methods MADEP-EPH-98-1 and MADEP-VPH-98-1, respectively.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002), the May 2002 Groundwater Sampling Report (SHA, 2003), and the Phase 1B RI Data Usability Report (SHA, 2004).

4. All concentrations are presented in micrograms per liter (µg/l), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health risk assessment. Analyte detections from shallow wells which exceed the EPA Vapor Intrusion Screening Value (shaded value) are shaded. Analyte detections which exceed the EPA Region IX Tap Water PRG (**bold** value) are in **bold**.

"EPA Vapor Intrusion Screening" indicates values listed are from the USEPA Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Table 2C, November 29, 2002. These values apply to shallow groundwater (SH-series wells with an S after the well number, and WP-series wells). Target groundwater concentrations based on non-carcinogenic effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999).

"EPA Region IX Tap Water PRG" indicates the values listed are from the USEPA Region IX Preliminary Remediation Goals (PRGs) Table, dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999).

6. "$" indicates the Vapor Intrusion Screening Value guidance document indicates the MCL is used as the Vapor Intrusion Screening Value because the calculated value is less than the MCL.
"+" indicates the PRG values presented are for total xylenes.
"‡" indicates the Vapor Intrusion Screening Values and PRG values presented are for 1,3-dichloropropene (isomer unspecified).

7. Total concentrations listed (e.g. Total AVOCs, CVOCs) are the sum of detected concentrations of the relevant analytes. "AVOCs" are non-chlorinated aromatic volatile organic compounds. "CVOCs" are chlorinated volatile organic compounds. "Other VOCs" are non-AVOC and non-CVOC volatile organic compounds. "EPH" are extractable petroleum hydrocarbons. "VPH" are volatile petroleum hydrocarbons.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in the Data Usability Report [SHA, 2002], and the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:
"J" - The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
"U" - The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
"UJ" - The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
"R" - Indicates data rejected during validation.

Bias:
"L" - Low
"I" - Indeterminate

TABLE 14A
Summary of Surface Water Data - Field Screening Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Monitoring Location	Date	Temperature (ºC)	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/l)	Oxidation Reduction Potential (mV)
Neponset River Surface Water Locations					
SW-102	3/20/2001	3.6	260	12.9	220
	4/5/2001	5.6	280	12.4	270
	8/1/2001	23.5	360	7.9	250
SW-103	3/20/2001	3.5	270	13.5	200
	4/4/2001	6.7	260	11.6	220
	8/1/2001	22.8	360	7.9	340
SW-105	3/20/2001	3.4	270	12.8	180
	4/4/2001	5.7	260	11.9	190
	8/1/2001	21.4	370	8.7	60
SW-106	3/20/2001	7.1	420	8.5	190
	4/4/2001	6.6	800	5.3	200
	8/1/2001	23.7	1,700	5.2	90
SW-107	3/20/2001	5.8	300	10.7	190
	4/4/2001	6.0	320	9.5	220
	8/1/2001	19.2	1,400	2.6	100
SW-108	3/20/2001	3.3	270	12.8	210
	4/4/2001	4.6	260	12.1	250
	8/1/2001	20.5	360	8.6	120
Neponset River Surface Water Reference Locations					
SWR-1	3/20/2001	3.8	260	12.8	230
	4/5/2001	6.5	280	11.3	260
	8/2/2001	23.2	390	6.7	150
SWR-2	3/20/2001	3.8	260	12.6	230
	4/5/2001	5.7	280	12.0	240
	8/2/2001	22.7	380	6.9	180
SWR-3	3/20/2001	3.7	260	12.9	230
	4/5/2001	6.5	280	12.0	250
	8/2/2001	22.3	380	6.9	190
SWR-4	3/20/2001	3.7	260	13.6	230
	4/5/2001	5.5	280	12.3	260
	8/2/2001	21.9	380	7.2	210
SWR-5	3/20/2001	3.7	260	13.1	230
	4/5/2001	5.5	280	12.2	270
	8/1/2001	23.3	360	7.3	240

Notes:

1. Field screening was completed by Sanborn, Head & Associates, Inc. personnel at the time of sample collection on the dates indicated.

2. Values reported above have been rounded from values measured in the field.

3. Refer to Appendix B for field forms/logs for further information.

4. Surface water field screening parameters were measured using a YSI 600 sonde.

5. Table 14B contains surface water pH data.

6. "mg/l" indicates milligrams per liter, which are equivalent to parts per million (ppm).
"µS/cm" indicates microSiemens per centimeter.
"ºC" indicates degrees Centigrade.
"mV" indicates milliVolts.

TABLE 14B
Summary of Surface Water Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	Measurement Date	pH Value (s.u.)	pH Qualifier	pH Bias
Neponset River Surface Water Locations				
SW-102	3/20/2001	6.6	J	I
	4/5/2001	6.2		
	8/1/2001	7.1		
SW-103	3/20/2001	6.4	J	I
	4/4/2001	6.4		
	8/1/2001	7.2		
SW-105	3/20/2001	7.5	J	I
	4/4/2001	6.9		
	8/1/2001	8.4		
SW-106	3/20/2001	9.6		
	4/4/2001	10.0		
	8/1/2001	9.3		
SW-107	3/20/2001	8.2		
	4/4/2001	8.2		
	8/1/2001	9.0		
SW-108	3/20/2001	6.6	J	I
	4/4/2001	6.3		
	8/1/2001	7.0		
Neponset River Surface Water Reference Locations				
SWR-1	3/20/2001	6.4	J	I
	4/5/2001	6.2		
	8/2/2001	6.9		
SWR-2	3/20/2001	6.3	J	I
	4/5/2001	6.4		
	8/2/2001	6.9		
SWR-3	3/20/2001	6.5	J	I
	4/5/2001	5.5		
	8/2/2001	6.9		
SWR-4	3/20/2001	6.5	J	I
	4/5/2001	6.5		
	8/2/2001	6.9		
SWR-5	3/20/2001	6.5	J	I
	4/5/2001	6.4		
	8/1/2001	7.0		

Notes:
1. pH values for surface water were measured by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated.
2. Values reported above have been rounded from values measured in the field.
3. Refer to appendices for field forms/logs for further information.
4. Surface water samples pH measurements were recorded using a YSI 600 sonde.
5. pH is reported in standard units (s.u.).
6. Data usability assessment was performed by SHA; the following qualifiers and biases were assigned during data validation by SHA. Refer to SHA's Data Usability Memoranda (included in the Data Usability Report [SHA, 2002], for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

Bias:

"I" Indeterminate

TABLE 14C
Summary of Surface Water Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/L																																	
	COPC Screening Levels			SW-102						SW-103						SW-105						SW-106						SW-107					
	Human Health	Ecological		4/5/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Dissolved Metals																																		
Aluminum †	3,600	NS	**87**	55.6	U		55.6	U		55.6	U		55.6	U		55.6	U		55.6	U		**135**			**328**			55.6	U		**535**		
Antimony	1.5	NS	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U	
Arsenic ‡$	0.045	NS	**150**	2.2			1.1	U		2.5			1.1	U		2.1			1.1	U		8.2			24.5			3.6			11.2		
Barium	260	**3.8**	NS	**17.5**			**17.8**			**16.5**			**18.4**			**17.0**			**19.6**			**28.3**	J	I	**6.6**			**13.9**			**19.3**		
Beryllium	7.3	**5.1**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Cadmium	1.8	NS	**0.25**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Calcium	NS	NS	NS	9,090			15,700			8,870			16,000			8,690			16,200			22,800			8,420			9,810			11,400		
Chromium ‡%	11	NS	**11**	1.1	U		3.8			1.1	U		1.1	U		1.1	U		1.5			2.5			3.7			1.3			9.3		
Cobalt	73	**3.0**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Copper ‡	150	NS	**9.0**	2.0			2.8			2.1			1.8			1.9			2.3			5.9			**16.2**			2.6			**17.8**		
Iron	1,100	NS	**1,000**	118			200			124			157			117			**1,280**			183	J	I	546			132			790		
Lead ‡	NS	NS	**2.5**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		**7.2**	J	I	**27.9**			**3.8**			**67.4**		
Magnesium	NS	NS	NS	2,210			3,840			2,230			4,050			2,340			4,110			3,250			544			2,270			1,380		
Manganese	88	**80**	NS	24.3			41.4			24.1			29.4			26.2			62.7			20.2			44.4			**84.4**			**125**		
Mercury ‡	1.1	NS	**0.77**	0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0090			0.0050	U		0.0050	U		0.0050	U	
Nickel ‡	73	NS	**52**	1.1	U		3.7			1.1	U		2.3			1.1	U		1.3			10.1	J	I	10.8			1.2			10.5		
Potassium	NS	NS	NS	1,670			3,160			1,700			2,950			1,680			3,010			2,150			1,350			2,890			3,227		
Selenium	18	NS	**5.0**	1.1	UJ	L	1.1	U		1.1	UJ	L	1.5			1.1	UJ	L	1.1	U		1.1	UJ	L	1.1	U		1.3	J	L	2.3		
Silver	18	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Sodium	NS	NS	NS	36,800			42,200	J	L	36,200			41,800	J	L	37,300			43,000	J	L	92,100			417,000	J	L	46,400			346,000	J	L
Thallium	0.24	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Vanadium	3.6	**19**	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		12.9			**29.2**			11.1	U		**43.6**		
Zinc ‡	1,100	NS	**120**	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		40.7			23.6			11.1	U		26.9		
Total Metals																																		
Aluminum †	3,600	NS	**87**	60.5			55.6	U		60.7			55.6	U		68.3			55.9			**1,340**	J	I	**2,070**	J	I	**5,450**			**18,000**		
Antimony	1.5	NS	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U	
Arsenic ‡$	0.045	NS	**150**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		5.8	J	I	27.1			5.7			23.1		
Barium	260	**3.8**	NS	**16.6**			**18.8**			**14.8**			**19.7**			**15.5**			**22.7**			**42.6**	J	I	**17.5**	J	I	**125**			**219**		
Beryllium	7.3	**5.1**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Cadmium	1.8	NS	**0.25**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		**1.5**		
Calcium	NS	NS	NS	8,220			16,000			7,830			16,600			8,220			17,100			25,400			9,730			16,300			24,300		
Chromium ‡%	11	NS	**11**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		3.2	J	I	7.5	U		**14.9**			**38.3**		
Cobalt	73	**3.0**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	UJ	I	1.8			**3.1**			**9.0**		
Copper ‡	150	NS	**9.0**	2.0			2.0			2.1			1.9			2.2			2.2			8.5	J	I	**21.3**			**36.1**			**90.5**		
Iron	1,100	NS	**1,000**	175			271	J	I	179			394	J	I	224			555	J	I	**1,050**	J	I	**1,930**	J	I	**5,420**			**13,800**	J	I
Lead ‡	NS	NS	**2.5**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		**20.0**	J	I	**57.5**			**185**			**576**		
Magnesium	NS	NS	NS	2,240			4,000			2,160			4,200			2,270			4,300			3,700			1,000			4,050			9,170		
Manganese	88	**80**	NS	30.0			79.0			26.3			**108**			28.5			**194**			46.8	J	I	**93.3**			**716**			**950**		
Mercury ‡	1.1	NS	**0.77**	0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.020	J	I	0.018			0.044	J	H	0.0050	U	
Nickel ‡	73	NS	**52**	1.1	U		1.3			1.1	U		1.3			1.1	U		1.1			4.5	J	I	14.1			12.1			**61.3**		
Potassium	NS	NS	NS	1,550			3,190			1,420			3,180			1,510			3,080			1,980	J	I	1,730			3,290			4,670		
Selenium	18	NS	**5.0**	2.3			1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.8			1.2			1.6			2.9		
Silver	18	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Sodium	NS	NS	NS	35,200			42,800			32,600			45,500			33,700			42,700			78,000			422,000			43,300			367,000		
Thallium	0.24	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Vanadium	3.6	**19**	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		**34.1**			**22.1**			**122**		
Zinc ‡	1,100	NS	**120**	11.1	U		24.0			11.1	U		11.1	U		11.1	U		11.1	U		78.0			33.1			**204**			**340**		
Cyanide (weak acid dissociable) &	0.62	NS	**5.2**	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L

TABLE 14C
Summary of Surface Water Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/L																														
	COPC Screening Levels			SW-108						SWR-1						SWR-2						SWR-3						SWR-4					
	Human Health	Ecological		4/4/2001			8/1/2001			4/5/2001			8/2/2001			4/5/2001			8/2/2001			4/5/2001			8/2/2001			4/5/2001			8/2/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Dissolved Metals																																	
Aluminum †	3,600	NS	**87**	55.6	U		55.6	U		55.6	U		55.6	U		55.6	U		55.6	U		55.6	U		55.6	U		55.6	U		55.6	U	
Antimony	1.5	NS	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U	
Arsenic ‡$	0.045	NS	**150**	3.6			1.1	U		2.0			1.1	U		2.0			1.1	U		2.1			1.1	U		2.2			1.1	U	
Barium	260	**3.8**	NS	**17.2**			**19.5**			**18.4**			**17.6**			**17.3**			**17.7**			**17.5**			**17.0**			**17.9**			**17.6**		
Beryllium	7.3	**5.1**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Cadmium	1.8	NS	**0.25**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Calcium	NS	NS	NS	8,830			16,600			9,130			15,400			9,290			15,700			8,940			15,300			9,220			15,400		
Chromium ‡%	11	NS	**11**	1.5			1.2			1.1	U		2.0			1.1	U		2.9			1.1	U		1.1			1.1	U		1.1	U	
Cobalt	73	**3.0**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Copper ‡	150	NS	**9.0**	2.2			2.0			1.8			2.3			1.8			1.9			2.2			2.1			2.0			2.3		
Iron	1,100	NS	**1,000**	123			214			105			210			107			238			108			394			125			199		
Lead ‡	NS	NS	**2.5**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Magnesium	NS	NS	NS	2,290			4,340			2,330			3,570			2,270			3,650			2,190			3,620			2,260			3,680		
Manganese	88	**80**	NS	26.2			60.9			26.4			30.2			25.7			58.3			25.4			43.1			26.3			40.2		
Mercury ‡	1.1	NS	**0.77**	0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U	
Nickel ‡	73	NS	**52**	1.3			1.4			1.1	U		2.4			1.1	U		1.8			1.1	U		1.7			1.1	U		1.5		
Potassium	NS	NS	NS	1,650			2,930			1,750			3,650			1,610			3,440			1,680			3,390			1,680			3,250		
Selenium	18	NS	**5.0**	1.2	J	L	1.1	U		1.1	UJ	L	1.3			1.1	UJ	L	1.6			1.1	UJ	L	1.1	U		1.1	UJ	L	1.1	U	
Silver	18	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Sodium	NS	NS	NS	37,000			42,300	J	L	37,100			44,100	J	L	37,200			43,000	J	L	37,100			42,200	J	L	38,000			41,400	J	L
Thallium	0.24	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Vanadium	3.6	**19**	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U	
Zinc ‡	1,100	NS	**120**	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		50.5	B		11.1	U		11.1	U	
Total Metals																																	
Aluminum †	3,600	NS	**87**	63.3			55.6	U		55.6	U		55.6	U		60.3			55.6	U		55.9			55.6	U		55.6	U		55.6	U	
Antimony	1.5	NS	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U	
Arsenic ‡$	0.045	NS	**150**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Barium	260	**3.8**	NS	**14.7**			**20.5**			**16.6**			**20.0**			**16.5**			**18.6**			**16.0**			**18.8**			**16.4**			**21.3**		
Beryllium	7.3	**5.1**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Cadmium	1.8	NS	**0.25**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Calcium	NS	NS	NS	8,180			16,600			8,280			16,000			8,370			15,600			8,570			16,100			8,500			15,900		
Chromium ‡%	11	NS	**11**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Cobalt	73	**3.0**	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Copper ‡	150	NS	**9.0**	2.5			2.1			2.0			2.2			2.0			2.2			2.2			1.8			2.0			1.9		
Iron	1,100	NS	**1,000**	193			336	J	I	171			500	J	I	181			334	J	I	196			359	J	I	172			503	J	I
Lead ‡	NS	NS	**2.5**	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Magnesium	NS	NS	NS	2,330			4,220			2,260			3,720			2,330			3,680			2,340			3,800			2,340			3,850		
Manganese	88	**80**	NS	28.7			**81.6**			28.1			**175**			27.0			**121**			27.0			**131**			27.8			**286**		
Mercury ‡	1.1	NS	**0.77**	0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U		0.0050	U	
Nickel ‡	73	NS	**52**	1.1	U		1.1			1.1	U		1.1			1.1	U		1.2			1.1	U		1.1	U		1.1	U		1.1		
Potassium	NS	NS	NS	1,360			3,040			1,660			3,710			1,540			3,430			1,520			3,500			1,570			3,340		
Selenium	18	NS	**5.0**	1.9			1.1	U		1.1	U		1.1	U		1.1			1.1	U		1.1	U		1.1	U		1.4			1.2		
Silver	18	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Sodium	NS	NS	NS	31,500			41,800			37,300			44,300			35,500			41,600			35,200			43,200			35,000			42,800		
Thallium	0.24	NS	NS	1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U		1.1	U	
Vanadium	3.6	**19**	NS	11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U	
Zinc ‡	1,100	NS	**120**	11.2			11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U		11.1	U	
Cyanide (weak acid dissociable) &	0.62	NS	**5.2**	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L	5.0	U		5.0	UJ	L

TABLE 14C
Summary of Surface Water Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/L								
	COPC Screening Levels			SWR-5					
	Human Health	Ecological		4/5/2001			8/1/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias
Dissolved Metals									
Aluminum †	3,600	NS	**87**	55.6	U		55.6	U	
Antimony	1.5	NS	NS	11.1	U		11.1	U	
Arsenic ‡$	0.045	NS	**150**	2.0			1.1	U	
Barium	260	**3.8**	NS	**17.4**			**18.1**		
Beryllium	7.3	**5.1**	NS	1.1	U		1.1	U	
Cadmium	1.8	NS	**0.25**	1.1	U		1.1	U	
Calcium	NS	NS	NS	9,180			15,400		
Chromium ‡%	11	NS	**11**	1.1	U		1.1	U	
Cobalt	73	**3.0**	NS	1.1	U		1.1	U	
Copper ‡	150	NS	**9.0**	2.2			1.9		
Iron	1,100	NS	**1,000**	119			132		
Lead ‡	NS	NS	**2.5**	1.1	U		1.1	U	
Magnesium	NS	NS	NS	2,240			3,660		
Manganese	88	**80**	NS	24.0			34.8		
Mercury ‡	1.1	NS	**0.77**	0.0050	U		0.0050	U	
Nickel ‡	73	NS	**52**	1.1	U		1.5		
Potassium	NS	NS	NS	1,640			3,080		
Selenium	18	NS	**5.0**	1.1	UJ	L	1.2		
Silver	18	NS	NS	1.1	U		1.1	U	
Sodium	NS	NS	NS	36,600			41,000	J	L
Thallium	0.24	NS	NS	1.1	U		1.1	U	
Vanadium	3.6	**19**	NS	11.1	U		11.1	U	
Zinc ‡	1,100	NS	**120**	11.1	U		11.1	U	
Total Metals									
Aluminum †	3,600	NS	**87**	57.1			55.6	U	
Antimony	1.5	NS	NS	11.1	U		11.1	U	
Arsenic ‡$	0.045	NS	**150**	1.1	U		1.1	U	
Barium	260	**3.8**	NS	**16.6**			**19.3**		
Beryllium	7.3	**5.1**	NS	1.1	U		1.1	U	
Cadmium	1.8	NS	**0.25**	1.1	U		1.1	U	
Calcium	NS	NS	NS	8,360			16,100		
Chromium ‡%	11	NS	**11**	1.1	U		1.1	U	
Cobalt	73	**3.0**	NS	1.1	U		1.1	U	
Copper ‡	150	NS	**9.0**	2.1			2.1		
Iron	1,100	NS	**1,000**	186			293	J	I
Lead ‡	NS	NS	**2.5**	1.1	U		1.1	U	
Magnesium	NS	NS	NS	2,340			3,910		
Manganese	88	**80**	NS	28.4			**89.9**		
Mercury ‡	1.1	NS	**0.77**	0.0050	U		0.0050	U	
Nickel ‡	73	NS	**52**	1.1	U		1.1	U	
Potassium	NS	NS	NS	1,600			3,310		
Selenium	18	NS	**5.0**	1.1	U		1.1	U	
Silver	18	NS	NS	1.1	U		1.1	U	
Sodium	NS	NS	NS	35,500			43,000		
Thallium	0.24	NS	NS	1.1	U		1.1	U	
Vanadium	3.6	**19**	NS	11.1	U		11.1	U	
Zinc ‡	1,100	NS	**120**	11.1	U		11.1	U	
Cyanide (weak acid dissociable) &	0.62	NS	**5.2**	5.0	U		5.0	UJ	L

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2C for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for metals (except mercury) by United States Environmental Protection Agency (USEPA) Method 6010B and Method 6020; mercury by USEPA Method 7471A; and weak acid dissociable cyanide (WAD cyanide) by USEPA Method 4500-CN I.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. All concentrations are presented in micrograms per liter (µg/l), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. Analyte detections that exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"EPA Region IX Tap Water PRG" indicates the values listed are from the USEPA Region IX Preliminary Remediation Goals (PRGs) Table, dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999). Analyte detections that exceed the PRG are shaded

"GLWQI Tier II Values" indicates the values listed are from the Great Lakes Water Quality Initiative (GLWQI) Tier II methodology values, as reported in Ecotox Thresholds table (USEPA, 1998).

"USEPA Aquatic SWQCs" indicates the values listed are from the USEPA National Recommended Surface Water Quality Criteria (SWQC) (314CMR 22) (USEPA, 2002) for the protection of aquatic life. The values presented are chronic freshwater criteria.

6. "†" indicates the SWQC expresses aluminum as total recoverable metal in the water column.
"‡" indicates the SWQC expresses the priority pollutant metals (arsenic, chromium, copper, lead, mercury, nickel, and zinc) in terms of dissolved metals in the water column.
"$" indicates the SWQC presented was derived from data for arsenic III, but is applied here to total arsenic.
"%" indicates the PRG and SWQC values presented are for chromium VI.
"&" indicates the PRG value presented is for hydrogen cyanide.
"NS" indicates no screeing criteria is available for the given analyte for the given criteria.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in the Data Usability Report [SHA, 2002], for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
"B" Indicates the analyte was detected in a non-matrix matched, associated method blank. The result is usable with possible uncertainty due to the potential of contamination.

Bias:

"L" Low
"I" Indeterminate
"H" High

8. Analytes whose results are qualified with either a "U" or a "UJ", but whose non-detected result is above the COPC Screening Levels, is annotated with a double underline.

9. The SWQC for aluminum is based on a pH of 6.5 to 6.6. Data indicate that at pHs greater than 6.6, aluminum is substantially less toxic. Nonetheless, as a conservative measure, aluminum concentrations in surface water samples collected from the Site are compared to the SWQC for aluminum at a pH of 6.5 to 6.6.

TABLE 14D
Summary of Surface Water Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/L																																	
	COPC Screening Levels			SW-102						SW-103						SW-105						SW-106						SW-107					
	Human Health	Ecological		4/5/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																		
Acenaphthene	37	NS	NS	0.025	U		0.010	U		0.025	U		0.028			0.025	U		0.025			0.20			0.20			0.025	U		0.39		
Acenaphthylene	NS	NS	NS	0.025	U		0.010	U		0.025	U		0.010	U		0.025	U		0.010	U		0.044	J	I	0.27			0.054			0.21		
Anthracene	180	NS	NS	0.025	U		0.010	U		0.025	U		0.010	U		0.025	U		0.010	U		0.031	J	I	0.19			0.030			0.17		
Benzo(a)anthracene	0.092	NS	NS	0.025	U		0.010	U		0.025	U		0.010	U		0.025	U		0.010	U		0.027	UJ	I	0.60			0.085			0.41		
Benzo(a)pyrene	0.0092	**0.014**	NS	0.010	U		0.0043	J		0.015	U		0.0028	J		0.010	U		0.0039	J		**0.041**	J	I	**0.89**			**0.11**			**0.51**		
Benzo(b)fluoranthene	0.092	NS	NS	0.025	U		0.0063	J	I	0.025	U		0.0049	UJ		0.025	U		0.0060	J	I	0.033	J	I	0.90			0.11			0.57		
Benzo(g,h,i)perylene	NS	NS	NS	0.025	U		0.0062	J	I	0.025	U		0.0073	J	I	0.025	U		0.011			0.030	J	I	0.47			0.079			0.31		
Benzo(k)fluoranthene	0.92	NS	NS	0.025	U		0.0048	UJ		0.025	U		0.0048	UJ		0.025	U		0.0048	UJ		0.027	UJ	I	0.47			0.078			0.30		
Chrysene	9.2	NS	NS	0.025	U		0.0054	J	I	0.025	U		0.0048	UJ		0.025	U		0.0048	UJ		0.036	J	I	0.98			0.11			0.62		
Dibenz(a,h)anthracene	0.0092	NS	NS	0.025	U		0.0043	UJ		0.025	U		0.010	U		0.025	U		0.010	U		0.025	U		0.11			0.025	U		0.065		
Fluoranthene	150	NS	NS	0.025	U		0.014			0.025	U		0.0096	J	I	0.025	U		0.0097	J	I	0.070	J	I	1.3			0.17			0.95		
Fluorene	24	**3.9**	NS	0.025	U		0.010	U		0.025	U		0.017			0.025	U		0.013			0.080			0.17			0.025	U		0.26		
Indeno(1,2,3-cd)pyrene	0.092	NS	NS	0.025	U		0.010	U		0.025	U		0.010	U		0.025	U		0.010	U		0.025	UJ	I	0.43			0.064			0.28		
Methylnaphthalene (2-)	NS	NS	NS	0.025	UJ	L	0.010	U		0.025	UJ	L	0.010	U		0.025	UJ	L	0.010	U		0.025	UJ	L	0.25			0.025	UJ	L	0.60		
Naphthalene	0.62	**24**	NS	0.025	UJ	L	0.0082	J	I	0.025	UJ	L	0.028			0.025	UJ	L	0.030			0.025	UJ	L	0.34			0.025	UJ	L	1.2		
Phenanthrene	NS	NS	NS	0.025	U		0.012			0.025	U		0.028			0.025	U		0.026			0.12	J	I	0.96			0.11			0.88		
Pyrene	18	NS	NS	0.025	U		0.011			0.025	U		0.0061	J	I	0.025	U		0.0063	J	I	0.11	J	I	1.6			0.23			1.1		
Total PAHs	NS	NS	NS	-			0.0674			-			0.1268			-			0.1309			0.795			10.13			1.23			8.825		
Other SVOCs																																		
Benzoic acid	15,000	NS	NS	10	UJ	L	2.0	UJ	L		R		2.0	UJ	L	10	UJ	L	2.0	UJ	L	10	UJ	L	2.0	UJ	L	10	UJ	L	2.0	UJ	L
Benzyl Alcohol	1,100	NS	NS	2.0	U		2.0	U		1.0	J		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
bis(2-Chloroethyl)ether	0.01	NS	NS	0.35	UJ		0.86	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ	
bis(2-Chloroisopropyl)ether	0.27	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
bis(2-Ethylhexyl)phthalate	4.8	**32**	NS	0.57	J		2.0	U		0.49	J		2.0	U		0.75	J		2.0	U		0.65	J		2.0	U		1.2	J		2.0	U	
Bromophenyl-phenylether (4-)	NS	**1.5**	NS	0.35	UJ		0.86	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ	
Butylbenzylphthalate	730	**19**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbazole	3.4	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroaniline (4-)	15	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloronaphthalene (2-)	49	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chlorophenol (2-)	3	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dibenzofuran	1.2	**20**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichlorobenzene (1,2-)	37	**14**	NS	2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dichlorobenzene (1,3-)	18	**71**	NS	2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dichlorobenzene (1,4-)	0.5	**15**	NS	2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dichlorobenzidine (3,3'-)	0.15	NS	NS	0.35	UJ		0.86	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ	
Dichlorophenol (2,4-)	11	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Diethylphthalate	2,900	**220**	NS	2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dimethylphenol (2,4-)	73	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dimethylphthalate	36,000	NS	NS		R		2.0	U			R		2.0	U			R		2.0	U			R		2.0	U			R		2.0	U	
Di-n-butylphthalate	360	**33**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dinitro-2-methylphenol (4,6-)	0.36	NS	NS	10	U		2.0	U		10	UJ	L	2.0	U		10	U		2.0	U		10	U		2.0	U		10	U		2.0	U	
Dinitrophenol (2,4-)	7.3	NS	NS	10	UJ	I	5.0	U			R		5.0	U		10	UJ	I	5.0	U		10	UJ	I	5.0	U		10	UJ	I	5.0	U	
Dinitrotoluene (2,4-)	7.3	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dinitrotoluene (2,6-)	3.6	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Di-n-octylphthalate	150	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Hexachlorobenzene	0.042	NS	NS	0.35	UJ		0.86	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ	
Hexachlorobutadiene	0.86	NS	NS	2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Hexachlorocyclopentadiene	22	NS	NS	10	UJ	L	2.0	U		10	UJ	L	2.0	U		10	UJ	L	2.0	U		10	UJ	L	2.0	U		10	UJ	L	2.0	U	
Hexachloroethane	3.6	**12**	NS	2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Isophorone	71	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methylphenol (2-)	180	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methylphenol (4-)	18	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Nitroaniline (2-)	11	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Nitroaniline (3-)	1.1	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Nitroaniline (4-)	3.2	NS	NS	2.0	U		2.0	U		0.71	J		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Nitrobenzene	0.34	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Nitrophenol (2-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Nitrophenol (4-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	UJ	L	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Nitroso-di-n-propylamine (N-)	0.0096	NS	NS	0.35	UJ		0.86	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ		0.35	UJ		0.85	UJ	
Nitrosodiphenylamine (N-)	14	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Pentachlorophenol	0.56	NS	**15**	5.0	U		2.0	U		5.0	UJ	I	2.0	U		5.0	U		2.0	U		5.0	U		2.0	U		5.0	U		2.0	U	
Phenol	1,100	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorobenzene (1,2,4-)	0.72	**110**	NS	2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Trichlorophenol (2,4,5-)	360	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorophenol (2,4,6-)	0.36	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total Other SVOCs	NS	NS	NS	0.57			-			2.2			-			0.75			-			0.65			-			1.2			-		
Total SVOCs	NS	NS	NS	0.57			0.0674			2.2			0.1268			0.75			0.1309			1.445			10.13			2.43			8.825		

TABLE 14D
Summary of Surface Water Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels			Concentrations in µg/L																													
	Human Health	Ecological		SW-108						SWR-1						SWR-2						SWR-3						SWR-4						SWR-5					
				4/4/2001			8/1/2001			4/5/2001			8/2/2001			4/5/2001			08-02-01			4/5/2001			8/2/2001			4/5/2001			8/2/2001			4/5/2001			8/1/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																							
Acenaphthene	37	NS	NS	0.025	U		0.019			0.029	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.025	U		0.010	U	
Acenaphthylene	NS	NS	NS	0.025	U		0.010	U		0.029	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.025	U		0.010	U	
Anthracene	180	NS	NS	0.025	U		0.010	U		0.029	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.025	U		0.010	U	
Benzo(a)anthracene	0.092	NS	NS	0.025	U		0.010	U		0.029	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.025	U		0.010	U	
Benzo(a)pyrene	0.0092	**0.014**	NS	0.010	U		0.0060	J	I	0.012	U		0.0028	UJ		0.010	U		0.0029	UJ		0.010	U		0.0029	UJ		0.010	U		0.0029	UJ		0.010	U		0.0028	UJ	
Benzo(b)fluoranthene	0.092	NS	NS	0.025	U		0.0062	J	I	0.029	U		0.0049	UJ		0.026	U		0.0050	UJ		0.026	U		0.0050	UJ		0.026	U		0.0050	UJ		0.025	U		0.0050	UJ	
Benzo(g,h,i)perylene	NS	NS	NS	0.025	U		0.012			0.029	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.025	U		0.010	U	
Benzo(k)fluoranthene	0.92	NS	NS	0.025	U		0.0052	J	I	0.029	U		0.0048	UJ		0.026	U		0.0049	UJ		0.026	U		0.0049	UJ		0.026	U		0.0049	UJ		0.025	U		0.0048	UJ	
Chrysene	9.2	NS	NS	0.025	U		0.0049	UJ		0.029	U		0.0048	UJ		0.026	U		0.0049	UJ		0.026	U		0.0049	UJ		0.026	U		0.0049	UJ		0.025	U		0.0048	UJ	
Dibenz(a,h)anthracene	0.0092	NS	NS	0.025	U		0.013	U		0.029	U		0.0043	UJ		0.026	U		0.0044	UJ		0.026	U		0.0044	UJ		0.026	U		0.0044	UJ		0.025	U		0.0043	UJ	
Fluoranthene	150	NS	NS	0.025	U		0.0076	J	I	0.029	U		0.0088	J	I	0.026	U		0.0074	J	I	0.026	U		0.012			0.026	U		0.0085	J	I	0.025	U		0.010	U	
Fluorene	24	**3.9**	NS	0.025	U		0.010			0.029	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.026	U		0.010	U		0.025	U		0.010	U	
Indeno(1,2,3-cd)pyrene	0.092	NS	NS	0.025	U		0.013	U		0.029	U		0.0029	UJ		0.026	U		0.0030	UJ		0.026	U		0.0030	UJ		0.026	U		0.010	U		0.025	U		0.0029	UJ	
Methylnaphthalene (2-)	NS	NS	NS	0.025	UJ	L	0.010	U		0.029	UJ	L	0.010	U		0.026	UJ	L	0.010	U		0.026	UJ	L	0.010	U		0.026	UJ	L	0.010	U		0.025	UJ	L	0.010	U	
Naphthalene	0.62	**24**	NS	0.025	UJ	L	0.025			0.029	UJ	L	0.015			0.026	UJ	L	0.0074	J	I	0.026	UJ	L	0.011			0.026	UJ	L	0.0097	J	I	0.025	UJ	L	0.0089	J	I
Phenanthrene	NS	NS	NS	0.025	U		0.024			0.029	U		0.014			0.026	U		0.011			0.026	U		0.015			0.026	U		0.011			0.025	U		0.0082	J	I
Pyrene	18	NS	NS	0.025	U		0.010	U		0.029	U		0.010	U		0.026	U		0.010	U		0.026	U		0.0057	J	I	0.026	U		0.010	U		0.025	U		0.010	U	
Total PAHs	NS	NS	NS	-			0.115			-			0.0378			-			0.0258			-			0.0437			-			0.0292			-			0.0171		
Other SVOCs																																							
Benzoic acid	15,000	NS	NS	10	UJ	L	2.0	UJ	L	12	UJ	L	2.0	UJ	L	10	UJ	L	2.0	UJ	L	10	UJ	L	2.0	UJ	L	11	UJ	L	2.0	UJ	L	10	UJ	L	2.0	UJ	L
Benzyl Alcohol	1,100	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
bis(2-Chloroethoxy)methane	NS	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
bis(2-Chloroethyl)ether	0.01	NS	NS	0.35	UJ		0.87	UJ		0.41	UJ		0.85	UJ		0.36	UJ		0.87	UJ		0.36	UJ		0.87	UJ		0.37	UJ		0.87	UJ		0.35	UJ		0.86	UJ	
bis(2-Chloroisopropyl)ether	0.27	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
bis(2-Ethylhexyl)phthalate	4.8	**32**	NS	1.5	J		2.0	U		1.4	J		2.0	U		2.1	U		2.0	U		0.36	J		2.0	U		0.77	J	H	2.0	U		2.0	U		2.0	U	
Bromophenyl-phenylether (4-)	NS	**1.5**	NS	0.35	UJ		0.87	UJ		0.41	UJ		0.85	UJ		0.36	UJ		0.87	UJ		0.36	UJ		0.87	UJ		0.37	UJ		0.87	UJ		0.35	UJ		0.86	UJ	
Butylbenzylphthalate	730	**19**	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Carbazole	3.4	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Chloroaniline (4-)	15	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Chloronaphthalene (2-)	49	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Chlorophenol (2-)	3	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Dibenzofuran	1.2	**20**	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Dichlorobenzene (1,2-)	37	**14**	NS	2.0	UJ	L	2.0	U		2.3	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dichlorobenzene (1,3-)	18	**71**	NS	2.0	UJ	L	2.0	U		2.3	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dichlorobenzene (1,4-)	0.5	**15**	NS	2.0	UJ	L	2.0	U		2.3	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dichlorobenzidine (3,3'-)	0.15	NS	NS	0.35	UJ		0.87	UJ		0.41	UJ		0.85	UJ		0.36	UJ		0.87	UJ		0.36	UJ		0.87	UJ		0.37	UJ		0.87	UJ		0.35	UJ		0.86	UJ	
Dichlorophenol (2,4-)	11	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Diethylphthalate	2,900	**220**	NS	2.0	UJ	L	2.0	U		2.3	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Dimethylphenol (2,4-)	73	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Dimethylphthalate	36,000	NS	NS		R		2.0	U			R		2.0	U			R		2.0	U			R		2.0	U			R		2.0	U			R		2.0	U	
Di-n-butylphthalate	360	**33**	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Dinitro-2-methylphenol (4,6-)	0.36	NS	NS	10	U		2.0	U		12	U		2.0	U		10	U		2.0	U		10	U		2.0	U		11	U		2.0	U		10	U		2.0	U	
Dinitrophenol (2,4-)	7.3	NS	NS	10	UJ	I	5.0	U		12	UJ	I	5.0	U		10	UJ	I	5.0	U		10	UJ	I	5.0	U		11	UJ	I	5.0	U		10	UJ	I	5.0	U	
Dinitrotoluene (2,4-)	7.3	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Dinitrotoluene (2,6-)	3.6	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Di-n-octylphthalate	150	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Hexachlorobenzene	0.042	NS	NS	0.35	UJ		0.87	UJ		0.41	UJ		0.85	UJ		0.36	UJ		0.87	UJ		0.36	UJ		0.87	UJ		0.37	UJ		0.87	UJ		0.35	UJ		0.86	UJ	
Hexachlorobutadiene	0.86	NS	NS	2.0	UJ	L	2.0	U		2.3	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Hexachlorocyclopentadiene	22	NS	NS	10	UJ	L	2.0	U		12	UJ	L	2.0	U		10	UJ	L	2.0	U		10	UJ	L	2.0	U		11	UJ	L	2.0	U		10	UJ	L	2.0	U	
Hexachloroethane	3.6	**12**	NS	2.0	UJ	L	2.0	U		2.3	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Isophorone	71	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Methylphenol (2-)	180	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Methylphenol (4-)	18	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Nitroaniline (2-)	11	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Nitroaniline (3-)	1.1	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Nitroaniline (4-)	3.2	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Nitrobenzene	0.34	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Nitrophenol (2-)	NS	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Nitrophenol (4-)	NS	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Nitroso-di-n-propylamine (N-)	0.0096	NS	NS	0.35	UJ		0.87	UJ		0.41	UJ		0.85	UJ		0.36	UJ		0.87	UJ		0.36	UJ		0.87	UJ		0.37	UJ		0.87	UJ		0.35	UJ		0.86	UJ	
Nitrosodiphenylamine (N-)	14	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Pentachlorophenol	0.56	NS	**15**	5.0	U		2.0	U		5.8	U		2.0	U		5.2	U		2.0	U		5.2	U		2.0	U		5.3	U		2.0	U		5.0	U		2.0	U	
Phenol	1,100	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Trichlorobenzene (1,2,4-)	0.72	**110**	NS	2.0	UJ	L	2.0	U		2.3	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.1	UJ	L	2.0	U		2.0	UJ	L	2.0	U	
Trichlorophenol (2,4,5-)	360	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Trichlorophenol (2,4,6-)	0.36	NS	NS	2.0	U		2.0	U		2.3	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.1	U		2.0	U		2.0	U		2.0	U	
Total Other SVOCs	NS	NS	NS	1.5			-			1.4			-			-			-			0.36			-			0.77			-			-			-		
Total SVOCs	NS	NS	NS	1.5			0.115			1.4			0.0378			-			0.0258			0.36			0.0437			0.77			0.0292			-			0.0171		

TABLE 14D
Summary of Surface Water Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2C for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels).

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. All concentrations are presented in micrograms per liter (µg/l), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. Analyte detections that exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"EPA Region IX Tap Water PRG" indicates the values listed are from the USEPA Region IX Preliminary Remediation Goals (PRGs) Table, dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999). Analyes detections that exceed PRGs are shaded.

"GLWQI Tier II Values" indicates the values listed are from the Great Lakes Water Quality Initiative (GLWQI) Tier II methodology values, as reported in Ecotox Thresholds table (USEPA, 1998).

"USEPA Aquatic SWQCs" indicates the values listed are from the USEPA National Recommended Surface Water Quality Criteria (SWQC) (314CMR 22) (USEPA, 2002) for the protection of aquatic life. The values presented are chronic freshwater criteria.

6. Total concentrations listed (e.g. Total PAHs) are the sum of detected concentrations of the relevant suite of compounds. "PAHs" are polycyclic aromatic hydrocarbons. "Other SVOCs" are non-PAH semi-volatile organic compounds.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in the Data Usability Report [SHA, 2002], for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

"R" Indicates data rejected during validation.

Bias:

"L" Low

"I" Indeterminate

"H" High

8. Analytes whose results are qualified with either a "U" or a "UJ", but whose non-detected result is above the COPC Screening Levels, are annotated with a double underline.

TABLE 14E
Summary of Surface Water Data - Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/L																									
	COPC Screening Levels			SW-102						SW-103						SW-105						SW-106					
	Human Health	Ecological		4/5/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001			4/4/2001			8/1/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																										
Benzene	0.35	**46**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Ethylbenzene	130	**290**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Styrene	160	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Toluene	72	**130**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Xylene (m,p-)	21	**1.8**	NS	0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ	L
Xylene (o-)	21	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Xylenes (total)	21	NS	NS	-			-			-			-			-			-			-			-		
Total AVOCs	NS	NS	NS	-			-			-			-			-			-			-			-		
CVOCs																										
Carbon tetrachloride	0.17	**240**	NS	5.0	U		2.0	U		5.0	U		2.0	U		5.0	U		2.0	U		5.0	U		2.0	UJ	L
Chlorobenzene	11	**130**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Chloroethane	4.6	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Chloroform	0.17	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Chloromethane	16	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloroethane (1,1-)	81	**47**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloroethane (1,2-)	0.12	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloroethene (1,1-)	34	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloroethene (cis-1,2-)	6.1	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloroethene (trans-1,2-)	12	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloropropane (1,2-)	0.16	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloropropene (cis-1,3-) †	0.4	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dichloropropene (trans-1,3-) †	0.4	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Methylene chloride	4.3	NS	NS	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	UJ	L
Tetrachloroethane (1,1,2,2-)	0.055	**420**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Tetrachloroethene	0.1	**120**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Trichloroethane (1,1,1-)	320	**62**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Trichloroethane (1,1,2-)	0.2	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Trichloroethene	0.028	**350**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Vinyl chloride	0.02	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Total CVOCs	NS	NS	NS	-			-			-			-			-			-			-			-		
Other VOCs																										
Acetone	550	NS	NS	5.0	U		1.1	J		5.0	U		5.0	U		5.0	U		1.2	J		5.0	U		6.1	J	L
Bromochloromethane	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Bromodichloromethane	0.18	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Bromoform	8.5	**320**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Bromomethane	0.87	NS	NS	2.0	UJ	L	5.0	U		2.0	UJ	L	5.0	U		2.0	U		5.0	U		2.0	U		5.0	UJ	L
Butanone (2-)	700	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Carbon disulfide	100	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Chloroethylvinyl ether (2-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Dibromochloromethane	0.13	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Hexanone (2-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Methyl-2-pentanone (4-)	200	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Methyl-tert Butyl Ether	6.2	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Trichlorofluoromethane	130	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L
Vinyl acetate	41	NS	NS	2.0	U		2.0	U		2.0	U		2.0	UJ	L	2.0	U		2.0	U		2.0	U		2.0	UJ	L
Total Other VOCs	NS	NS	NS	-			1.1			-			-			-			1.2			-			6.1		
Total VOCs	NS	NS	NS	-			1.1			-			-			-			1.2			-			6.1		

TABLE 14E
Summary of Surface Water Data - Volatile Organic Compounds
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/L																									
	COPC Screening Levels			SW-107						SW-108						SWR-1						SWR-2					
	Human Health	Ecological		4/4/2001			8/1/2001			4/4/2001			8/1/2001			4/5/2001			8/2/2001			4/5/2001			8/2/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																										
Benzene	0.35	**46**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	130	**290**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	160	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Toluene	72	**130**	NS	2.0	U		1.2	J		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-)	21	**1.8**	NS	0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ	
Xylene (o-)	21	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylenes (total)	21	NS	NS	-			-			-			-			-			-			-			-		
Total AVOCs	NS	NS	NS	-			1.2			-			-			-			-			-			-		
CVOCs																										
Carbon tetrachloride	0.17	**240**	NS	5.0	U		2.0	U		5.0	U		2.0	U		5.0	U		2.0	U		5.0	U		2.0	U	
Chlorobenzene	11	**130**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	4.6	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform	0.17	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloromethane	16	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,1-)	81	**47**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-)	0.12	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (1,1-)	34	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (cis-1,2-)	6.1	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	12	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	0.16	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropene (cis-1,3-) †	0.4	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropene (trans-1,3-) †	0.4	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methylene chloride	4.3	NS	NS	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Tetrachloroethane (1,1,2,2-)	0.055	**420**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Tetrachloroethene	0.1	**120**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,1-)	320	**62**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-)	0.2	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethene	0.028	**350**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl chloride	0.02	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total CVOCs	NS	NS	NS	-			-			-			-			-			-			-			-		
Other VOCs																										
Acetone	550	NS	NS	5.0	U		4.1	J		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Bromochloromethane	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	0.18	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromoform	8.5	**320**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	0.87	NS	NS	2.0	U		5.0	U		2.0	U		5.0	U		2.0	UJ	L	5.0	U		2.0	UJ	L	5.0	U	
Butanone (2-)	700	NS	NS	2.0	U		1.9	J		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	100	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	0.13	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Hexanone (2-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	200	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	6.2	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	130	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	41	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L
Total Other VOCs	NS	NS	NS	-			6.0			-			-			-			-			-			-		
Total VOCs	NS	NS	NS	-			7.2			-			-			-			-			-			-		

TABLE 14E
Summary of Surface Water Data - Volatile Organic Compounds
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Walpole, Massachusetts

Analyte	Concentrations in µg/L																				
	COPC Screening Levels			SWR-3						SWR-4						SWR-5					
	Human Health	Ecological		4/5/2001			8/2/2001			4/5/2001			8/2/2001			4/5/2001			8/1/2001		
	EPA Region IX Tap Water PRG	GLWQI Tier II Values	USEPA Aquatic SWQCs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																					
Benzene	0.35	**46**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Ethylbenzene	130	**290**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Styrene	160	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Toluene	72	**130**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylene (m,p-)	21	**1.8**	NS	0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ		0.59	UJ		0.60	UJ	
Xylene (o-)	21	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Xylenes (total)	21	NS	NS	-			-			-			-			-			-		
Total AVOCs	NS	NS	NS	-			-			-			-			-			-		
CVOCs																					
Carbon tetrachloride	0.17	**240**	NS	5.0	U		2.0	U		5.0	U		2.0	U		5.0	U		2.0	U	
Chlorobenzene	11	**130**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethane	4.6	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroform	0.17	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloromethane	16	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,1-)	81	**47**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethane (1,2-)	0.12	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (1,1-)	34	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (cis-1,2-)	6.1	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloroethene (trans-1,2-)	12	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropane (1,2-)	0.16	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropene (cis-1,3-) †	0.4	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dichloropropene (trans-1,3-) †	0.4	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methylene chloride	4.3	NS	NS	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Tetrachloroethane (1,1,2,2-)	0.055	**420**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Tetrachloroethene	0.1	**120**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,1-)	320	**62**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethane (1,1,2-)	0.2	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichloroethene	0.028	**350**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl chloride	0.02	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Total CVOCs	NS	NS	NS	-			-			-			-			-			-		
Other VOCs																					
Acetone	550	NS	NS	5.0	U		1.1	J		5.0	U		1.4	J		5.0	U		2.4	J	
Bromochloromethane	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromodichloromethane	0.18	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromoform	8.5	**320**	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Bromomethane	0.87	NS	NS	2.0	UJ	L	5.0	U		2.0	UJ	L	5.0	U		2.0	U		5.0	U	
Butanone (2-)	700	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Carbon disulfide	100	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Dibromochloromethane	0.13	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Hexanone (2-)	NS	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-2-pentanone (4-)	200	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl-tert Butyl Ether	6.2	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Trichlorofluoromethane	130	NS	NS	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vinyl acetate	41	NS	NS	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L	2.0	U		2.0	UJ	L
Total Other VOCs	NS	NS	NS	-			1.1			-			1.4			-			2.4		
Total VOCs	NS	NS	NS	-			1.1			-			1.4			-			2.4		

TABLE 14E
Summary of Surface Water Data - Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2C for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8260B.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. All concentrations are presented in micrograms per liter (µg/l), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. Analyte detections that exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"EPA Region IX Tap Water PRG" indicates the values listed are from the USEPA Region IX Preliminary Remediation Goals (PRGs) Table, dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999). Analyes detections that exceed PRGs are shaded.

"GLWQI Tier II Values" indicates the values listed are from the Great Lakes Water Quality Initiative (GLWQI) Tier II methodology values, as reported in Ecotox Thresholds table (USEPA, 1998).

"USEPA Aquatic SWQCs" indicates the values listed are from the USEPA National Recommended Surface Water Quality Criteria (SWQC) (314CMR 22) (USEPA, 2002) for the protection of aquatic life. The values presented are chronic freshwater criteria.

6. "†" indicates the PRG presented is for 1,3-dichloropropene (isomer unspecified).

7. Total concentrations listed (e.g. Total AVOCs, CVOCs) are the sum of detected concentrations of the relevant suite of compounds. "AVOCs" are non-chlorinated aromatic volatile organic compounds. "CVOCs" are chlorinated volatile organic compounds. "Other VOCs" are non-AVOC and non-CVOC volatile organic compounds.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

Bias:

"L" Low

9. Analytes whose results are qualified with either a "U" or a "UJ", but whose non-detected result is above the COPC Screening Levels, are annotated with a <u>double underline</u>.

TABLE 14F
Summary of Surface Water Data - Asbestos
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location / Date	COPC Screening Levels			Concentrations in mf/l									Type of Asbestos
	Human Health	Ecological		Total Asbestos			Asbestos > 5 microns			Asbestos > 10 microns			
	USEPA Region IX Tap Water PRGs	USEPA SWQCs	GLWQI Tier II	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	
Neponset River Surface Water Samples													
SW-102 / 04-05-01	NS	NS	NS	0.3	U		0.3	U		0.3	U		
SW-102 / 08-01-01	NS	NS	NS	0.37	U		0.37	U		0.37	U		
SW-103 / 04-04-01	NS	NS	NS	0.3	U		0.3	U		0.3	U		
SW-103 / 08-01-01	NS	NS	NS	0.62	U		0.62	U		0.62	U		
SW-105 / 04-04-01	NS	NS	NS	0.3			0.59			0.3	U		Chrysotile/ Tremolite
SW-105 / 08-01-01	NS	NS	NS	0.37	U		0.37	U		0.37	U		
SW-106 / 04-04-01	NS	NS	NS	49.3	J	I	506	J		49.3	J	I	Chrysotile
SW-106 / 08-01-01	NS	NS	NS	1780	J	I	3690	J	I	1780			Chrysotile
SW-107 / 04-04-01	NS	NS	NS	103.6			369			103.6			Chrysotile/ Amosite
SW-107 / 08-01-01	NS	NS	NS	5920			17760			5920			Chrysotile
SW-108 / 04-04-01	NS	NS	NS	0.3			0.3			0.3	U		Chrysotile
SW-108 / 08-01-01	NS	NS	NS	0.93	U		0.93	U		0.93	U		
Neponset River Surface Water Reference Samples													
SWR-1 / 04-05-01	NS	NS	NS	0.3	U		0.3	U		0.3	U		
SWR-1 / 08-02-01	NS	NS	NS	0.37	U		0.37	U		0.37	U		
SWR-2 / 04-05-01	NS	NS	NS	0.3	U		0.3	U		0.3	U		
SWR-2 / 08-02-01	NS	NS	NS	0.37	U		0.37	U		0.37	U		
SWR-3 / 04-05-01	NS	NS	NS	0.3			0.3			0.3	U		Chrysotile
SWR-3 / 08-02-01	NS	NS	NS	0.62	U		0.62	U		0.62	U		
SWR-4 / 04-05-01	NS	NS	NS	0.3			0.3			0.3	U		Chrysotile
SWR-4 / 08-02-01	NS	NS	NS	0.37	U		0.37	U		0.37	U		
SWR-5 / 04-05-01	NS	NS	NS	0.3	U		0.3	U		0.3	U		
SWR-5 / 08-01-01	NS	NS	NS	0.37	U		0.37	U		0.37	U		

TABLE 14F
Summary of Surface Water Data - Asbestos
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2C for identity of sample delivery groups (SDGs).

2. Samples were submitted to International Asbestos Testing Laboratory (IATL) of Mt. Laurel, New Jersey for analysis of asbestos in accordance with the United States Environmental Protection Agency (USEPA) Methods 600/4-83-043 and EPA Method 100.1.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. All concentrations are presented in millions of fibers per liter (mf/l).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. There were no human health or ecological screening levels selected for asbestos in surface water.

"EPA Region IX Tap Water PRG" indicates the values listed are from the USEPA Region IX Preliminary Remediation Goals (PRGs) Table, dated October 1, 2002. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region I, Risk Update Number 5, September 1999).

"GLWQI Tier II Values" indicates the values listed are from the Great Lakes Water Quality Initiative (GLWQI) Tier II methodology values, as reported in Ecotox Thresholds table (USEPA, 1998).

"USEPA Aquatic SWQCs" indicates the values listed are from the USEPA National Recommended Surface Water Quality Criteria (SWQC) (314CMR 22) (USEPA, 2002) for the protection of aquatic life. The values presented are chronic freshwater criteria.

6. "NS" indicates no screening level available from this reference.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in the Data Usability Report [SHA, 2002]).

Qualifiers:	"J"	The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
	"U"	The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
Bias:	"I"	Indeterminate

TABLE 15A
Summary of Sediment Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
Neponset River Sediments				
NR-1	7/26/2001	6.3		
NR-2	7/26/2001	6.5		
NR-3	7/26/2001	6.4		
NR-4	7/26/2001	6.4		
NR-5	7/26/2001	7.1		
NR-5A	12/18/2002	6.2		
NR-6	7/26/2001	7.8		
NR-7	7/25/2001	6.4		
	12/18/2002	6.0		
NR-8	7/25/2001	7.5		
	12/18/2002	6.2		
Neponset River (Upstream of the Site) Reference Area Sediments				
SedRN-1	7/26/2001	6.6		
	5/24/2002	6.2		
SedRN-2	7/26/2001	6.5		
	5/24/2002	6.2		
SedRN-3	7/26/2001	6.4		
	5/24/2002	6.1		
SedRN-4	7/26/2001	6.5		
	5/24/2002	6.1		
	12/18/2002	6.1		
SedRN-5	7/26/2001	6.1		
	5/24/2002	5.4		
Lewis Pond Sediments				
LP-01	7/31/2001	6.5		
	12/18/2002	6.2		
LP-02	7/31/2001	5.4		
LP-03	7/31/2001	5.7		
LP-04	7/31/2001	6.2		
LP-05	7/30/2001	5.7		
LP-06	7/30/2001	5.6		
	12/18/2002	5.9		
LP-07	7/30/2001	6.4		
LP-08	7/30/2001	6.7		
LP-09	7/30/2001	6.8		
	12/18/2002	6.2		
LP-10	7/30/2001	7.0		
Lower Pond (Norwood, Massachusetts) Reference Sediments				
SedRNwd-01	11/15/2001	7.0		
	12/17/2002	6.4		
SedRNwd-02	11/15/2001	6.5		
	12/17/2002	6.3		
SedRNwd-03	11/15/2001	6.4		
	12/17/2002	6.0		

TABLE 15A
Summary of Sediment Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
SedRNwd-04	11/15/2001	6.5		
	12/17/2002	6.2		
SedRNwd-05	11/15/2001	6.7		
	12/17/2002	6.7		
SedRNwd-06	11/15/2001	6.5		
	12/17/2002	6.3		
SedRNwd-07	11/15/2001	6.4		
	12/17/2002	6.1		
SedRNwd-08	11/15/2001	6.8		
	12/17/2002	6.6		
SedRNwd-09	11/15/2001	6.5		
	12/17/2002	6.8		
SedRNwd-10	11/15/2001	6.6		
	12/17/2002	6.9		
Stoughton Pond (Stoughton, Massachusetts) Reference Sediments				
SedRS-01	11/15/2001	6.4		
SedRS-02	11/15/2001	6.3		
SedRS-03	11/15/2001	6.6		
SedRS-04	11/15/2001	6.3		
SedRS-05	11/15/2001	6.5		
SedRS-06	11/15/2001	6.4		
SedRS-07	11/15/2001	6.5		
SedRS-08	11/15/2001	6.5		
SedRS-09	11/15/2001	6.4		
SedRS-10	11/15/2001	6.4		
Memorial Pond (Walpole, Massachusetts) Reference Sediments				
SedRW-01	11/15/2001	6.0		
SedRW-02	11/15/2001	6.2		
SedRW-03	11/15/2001	6.1		
SedRW-04	11/15/2001	6.0		
SedRW-05	11/15/2001	6.0		
SedRW-06	11/15/2001	6.3		
SedRW-07	11/15/2001	6.0		
SedRW-08	11/15/2001	6.0		
SedRW-09	11/15/2001	6.0		
SedRW-10	11/15/2001	6.0		
Floodplain Sediments				
FP-01	10/10/2001	5.4		
FP-02	10/10/2001	5.5		
FP-03	10/10/2001	5.3		
FP-04	10/10/2001	4.9		
FP-05	10/10/2001	5.4		
FP-05 (0-1')	8/5/2003	5.1		
FP-05 (1-3')	8/5/2003	5.4		

TABLE 15A
Summary of Sediment Data - pH
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Collection Date	pH Value (s.u.)	pH Qualifier	pH Bias
FP-06	10/10/2001	6.7		
FP-06 (0-1')	8/5/2003	5.7		
FP-06 (1-3')	8/5/2003	6.2		
FP-08	10/10/2001	4.4		
FP-09	10/10/2001	4.2		
FP-09 (0-1')	8/5/2003	4.4		
FP-09 (1-3')	8/5/2003	5.5		
FP-10	10/10/2001	4.1		
Floodplain Reference Sediments				
FPR-01	10/9/2001	3.9		
FPR-02	10/9/2001	5.0		
FPR-03	10/9/2001	5.8		
FPR-04	10/9/2001	4.4		
FPR-05	10/9/2001	4.7		
FPR-06	10/9/2001	4.1		
FPR-07	10/9/2001	4.4		
FPR-08	10/9/2001	5.7		
FPR-09	10/9/2001	5.2		
FPR-10	10/9/2001	5.9		
Former Mill Tailrace Sediments				
TR-1	7/25/2001	10.3		
TR-2	7/25/2001	8.4		
TR-3	7/25/2001	9.4		
	12/16/2002	8.5		
	8/6/2003	9.6		
TR-4	7/25/2001	9.4		
	8/7/2003	8.8		
TR-5	7/25/2001	8.5		
	8/6/2003	7.0		

Notes:

1. Sediment samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated.

2. Refer to appendices for Field Sampling Summary Forms for further information.

3. In general, field measurements of pH were made in accordance with Standard Operating Procedure (SOP) F-1669B (B.7.3), using USEPA "Method 9045C Soil and Waste pH," in Test Methods for Evaluating Soil and Waste and, SW846, Third Edition, January 1995 (Revision 3) method as promulgated in the final update, December 1996. Data verification procedures included in United States Environmental Protection Agency (USEPA)- New England (NE) Quality Assurance Project Plan (QAPP) Worksheet #9c and #23a were also followed.

4. pH measurements were made using a Beckman 240 pH meter. pH is reported in standard units (s.u.). Values reported above have been rounded from values measured in the field.

5. Data validation and data usability assessment was performed by SHA and discussed in the the Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).

TABLE 15B
Summary of Sediment Data - Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in mg/kg (except as noted)																																	
	COPC Screening Levels								Neponset River Sediments																											
	Human Health	Ecological							NR-1			NR-2			NR-3			NR-4			NR-5						NR-6			NR-7					
									~0-0.3'			~0-0.2'			~0-0.2'			~0-0.5'			~0-0.2'			~0-0.5'			~0-0.3'			~0-0.1'			~0-0.5'		
									7/26/2001			7/26/2001			7/26/2001			7/26/2001			7/26/2001			12/18/2002			7/26/2001			7/25/2001			12/18/2002		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals (mg/kg)																																		
Aluminum	7,600	NS	NS	NS	NS	NS	NS	NS	2,090			2,800			4,220			2,150			1,700			3,500	J	H	2,590			2,200			2,800	J	H
Antimony	3.1	**2**	NS	NS	NS	NS	NS	NS	0.72	UJ	L	0.59	UJ	L	0.58	UJ	L	0.65	UJ	L	0.73	UJ	L	0.18	U		0.72	UJ	L	0.57	UJ	L	0.19	U	
Arsenic	0.39	33	**5.9**	17	6	NS	NS	9.79	0.93			0.71			0.78			1.2			1.3			5.9			1.1			1.4			2.1		
Barium	540	NS	NS	NS	NS	NS	NS	NS	18.6			14.1			24.2			11.3			11.7			19.0			20.0			27.8			30.0		
Beryllium	15	NS	NS	NS	NS	NS	NS	NS	0.33	U		0.27	U		0.24	U		0.26	U		0.25	U		0.24			0.30	U		0.29	U		0.13		
Cadmium	3.7	5	**0.596**	3.53	0.6	NS	NS	0.99	0.38			0.12			0.16			0.13			0.18			**1.3**	J	L	0.31			0.42			0.23	J	L
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	680			863			1,140			724			548			1,000	JB	I	820			679			1,000	JB	I
Chromium †	22	80	37.3	90	**26**	NS	NS	43.4	4.8	J	H	5.0	J	H	5.9	J	H	5.5	J	H	3.1	J	H	8.6			4.6	J	H	5.8	J	H	6.6		
Cobalt	140	NS	NS	NS	NS	NS	NS	NS	2.5			2.2			2.6			2.4			2.4			2.4	JB	I	3.0			3.6			2.7	JB	I
Copper	310	70	35.7	197	**16**	NS	NS	31.6	6.4			4.9			9.4			4.1			3.8			15.0			6.6			7.3			13.0		
Iron	2,300	NS	NS	NS	**21,200**	NS	NS	NS	5,320			5,700			19,500			6,120			4,130			12,000			7,310			6,120			8,800		
Lead	400	35	35	91.3	**31**	NS	NS	35.8	17.4			8.8			11.3			10.2			12.0			**64.0**	J	I	13.5			23.9			**41.0**	J	I
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	1,030			1,630			2,190			1,290			900			1,700	B	H	1,320			1,150			1,400	B	H
Manganese	180	NS	NS	NS	**460**	NS	NS	NS	170			257			**586**			103			286			140	J	L	**502**			**692**			**700**	J	L
Mercury	2.3	**0.15**	0.174	0.486	0.2	NS	NS	0.18	0.031	U		0.032	U		0.026	U		0.028	U		0.030	U		0.040			0.031	U		0.032	U		0.0067		
Nickel	160	30	18	36	**16**	NS	NS	22.7	3.6	UJ	L	3.0	J	L	5.1	J	L	3.2	UJ	L	3.7	UJ	L	3.8			3.6	UJ	L	3.1	J	L	4.9		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	114			135			156			168			134			150	B	H	188			152			160	B	H
Selenium	39	NS	NS	NS	NS	NS	NS	NS	0.11	UJ	I	0.087	UJ	I	0.079	UJ	I	0.085	UJ	I	0.080	UJ	I	0.31			0.097	UJ	I	0.093	UJ	I	0.13		
Silver	39	**1**	NS	NS	NS	NS	NS	NS	0.43	U		0.35	U		0.35	U		0.39	U		0.44	U		0.18	U		0.43	U		0.34	U		0.19	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	54.2			53.0			55.1			41.7			36.6	U		76.0	B	H	73.0			52.7			65.0	B	H
Thallium ‡	0.52	NS	NS	NS	NS	NS	NS	NS	0.049	UJ	I	0.040	UJ	I	0.036	UJ	I	0.039	UJ	I	0.037	UJ	I	0.092	U		0.045	UJ	I	0.043	UJ	I	0.080	U	
Vanadium	7.8	NS	NS	NS	NS	NS	NS	NS	8.9	J	L	9.3	J	L	18.3	J	L	8.9	J	L	6.8	J	L	17.0			10.3	J	L	8.9	J	L	12.0		
Zinc	2,300	**120**	123	315	**120**	NS	NS	121	39.4			28.1	B		44.7			22.8	B		28.9			72.0			33.5			37.2			55.0	B	H
Cyanide (weak acid dissociable) $	1.1	NS	NS	NS	NS	NS	NS	NS	0.59	UJ	L	0.58	UJ	L	0.47	UJ	L	0.47	UJ	L	0.57	UJ	L				0.44	UJ	L	0.50	UJ	L			
Ammonia as Nitrogen	NS	NS	NS	NS	NS	NS	NS	NS																								20.0		
AVS/SEM (µmol/g)																																		
Cadmium - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.0054	U		0.0056	U		0.0026	U		0.0025	U		0.0026	U					0.0026	U		0.0024	U				
Copper - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.036			0.038			0.014			0.052			0.036						0.048			0.059					
Lead - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.067			0.091			0.038			0.053			0.041						0.073			0.10					
Nickel - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.10	U		0.11	U		0.049	U		0.048	U		0.050	U					0.050	U		0.046	U				
Zinc - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.29			0.33			0.092			0.29			0.17						0.30			0.25					
SEM - AVS	NS	NS	NS	NS	NS	NS	NS	NS	0.14	J	I	0.46	J	H	0.14	J	H	-0.60	J	H	0.24	J	H				0.33	J	H	0.41	J	H			
Sulfide, AVS	NS	NS	NS	NS	NS	NS	NS	NS	0.25	J	I	0.20	UJ	L	0.090	UJ	L	1.0	J	L	0.090	UJ	L				0.095	J	L	0.084	UJ	L			
SEM/AVS Ratio (unitless)	NS	NS	NS	NS	NS	NS	NS	NS	1.5	J	I	2.4	J	H	1.6	J	H	0.40	J	H	2.7	J	H				4.5	J	H	4.9	J	H			

TABLE 15B
Summary of Sediment Data - Inorganic Parameters
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Analyte	Concentrations in mg/kg (except as noted)																																						
	COPC Screening Levels								Neponset River (Upstream of the Site) Reference Sediments																				Lewis Pond Sediments														
	Human Health	Ecological							SedRN-1			SedRN-2			SedRN-3			SedRN-4						SedRN-5			LP-01						LP-02			LP-03			LP-04		
									~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.3'			~0-0.4'			~0-0.5'		
									5/24/2002			5/24/2002			5/24/2002			5/24/2002			12/18/2002			5/24/2002			7/31/2001			12/18/2002			7/31/2001			7/31/2001			7/31/2001		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals (mg/kg)																																							
Aluminum	7,600	NS	NS	NS	NS	NS	NS	NS	3,500	J	I	2,100	J	I	2,300	J	I	2,500	J	I	2,900	J	H	2,700	J	I	5,650			4,500	J	H	9,830			8,010			6,520		
Antimony	3.1	**2**	NS	NS	NS	NS	NS	NS	0.37	UJ	L	0.37	UJ	L	0.33	UJ	L	0.40	UJ	L	0.16	U		0.34	UJ	L	1.4	J	L	**13.0**			1.6	J	L	1.2	UJ	L	1.3	UJ	L
Arsenic	0.39	33	**5.9**	17	6	NS	NS	9.79	4.2			0.82			1.1			0.49	B	H	0.65			1.1			4.9			3.2			**28.2**			**7.2**			4.8		
Barium	540	NS	NS	NS	NS	NS	NS	NS	100			18.0			24.0			10.0			19.0			14.0			93.2			43.0			104			94.4			122		
Beryllium	15	NS	NS	NS	NS	NS	NS	NS	0.24			0.10			0.098			0.089			0.13			0.14			0.50	U		0.25			0.89			0.65			0.54	U	
Cadmium	3.7	5	**0.596**	3.53	0.6	NS	NS	0.99	**1.0**			0.16			0.19			0.14			0.30	J	L	0.18			**2.2**			**0.64**	J	L	**5.3**			**3.6**			**4.6**		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	1,300	J	I	670	BJ	I	680	BJ	I	690	BJ	I	920	JB	I	600	BJ	I	2,830	J	I	1,400	JB	I	3,400	J	I	2,490	J	I	2,000	J	I
Chromium †	22	80	37.3	90	**26**	NS	NS	43.4	6.0			4.0			5.3			9.9			6.1			7.2			**64.9**			**220**			**57.3**			**45.2**			**35.2**		
Cobalt	140	NS	NS	NS	NS	NS	NS	NS	5.1	J	I	2.2	J	I	2.7	J	I	2.6	J	I	3.7	JB	I	2.9	J	I	8.5			5.6	J	L	9.3			4.7			10.0		
Copper	310	70	35.7	197	**16**	NS	NS	31.6	10.0			4.8			4.1			3.6			3.4			6.6			**69.6**			**90.0**			**95.3**			**82.1**			**81.4**		
Iron	2,300	NS	NS	NS	**21,200**	NS	NS	NS	14,000	J	I	5,200			5,900			4,400			7,600			6,800			15,300			9,200			14,500			10,600			15,300		
Lead	400	35	35	91.3	**31**	NS	NS	35.8	17.0			7.2			11.0			9.0			7.4	J	I	13.0			**817**			**240**	J	I	**623**			**615**			**487**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	1,900	J	I	1,100	J	I	1,200	J	I	1,500	J	I	1,500	B	H	1,600	J	I	6,620			1,800	B	H	3,190			3,040			3,480		
Manganese	180	NS	NS	NS	**460**	NS	NS	NS	**1,900**	J	I	**620**	J	I	**850**	J	I	140	J	I	450	J	L	260	J	I	**928**	J	I	280	J	L	**539**			241			332		
Mercury	2.3	**0.15**	0.174	0.486	0.2	NS	NS	0.18	0.0096			0.0061	U		0.0085			0.0076			0.0069			0.0097			**0.32**	J	H	**0.17**			**0.54**	J	H	**0.47**	J	H	**0.36**	J	H
Nickel	160	30	18	36	**16**	NS	NS	22.7	6.7			3.1			3.5			6.1			2.6			3.9			**44.0**			8.6			**26.7**			**22.0**			**22.9**		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	130	B	H	73.0	BJ	H	95.0	BJ	H	71.0	BJ	H	120	B	H	130	B	H	392			200	B	H	461			282			358		
Selenium	39	NS	NS	NS	NS	NS	NS	NS	0.18	U		0.19	U		0.17	U		0.20	U		0.12			0.26			0.56	J	L	0.51			1.3	J	L	0.86	J	L	0.73	J	L
Silver	39	**1**	NS	NS	NS	NS	NS	NS	0.037	U		0.037	U		0.033	U		0.040	U		0.16	U		0.034	U		0.81	U		0.20	U		**1.9**			0.74	U		0.79	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	49.0	B	H	42.0	B	H	39.0	B	H	36.0	B	H	62.0	B	H	42.0	B	H	394			190	B	H	260			196			200		
Thallium ‡	0.52	NS	NS	NS	NS	NS	NS	NS	0.18	U		0.19	U		0.17	U		0.20	U		0.084	U		0.16	U		0.074	UJ	I	0.099	U		0.14	J	I	0.084	J	I	0.089	J	I
Vanadium	7.8	NS	NS	NS	NS	NS	NS	NS	13.0			7.8			8.8			8.4			18.0			9.5			29.3	J	H	18.0			84.6	J	H	55.6	J	H	35.8	J	H
Zinc	2,300	**120**	123	315	**120**	NS	NS	121	87.0			23.0			24.0			20.0			34.0	B	H	27.0			**271**	J	H	**160**			**206**	J	H	**164**	J	H	**348**	J	H
Cyanide (weak acid dissociable) $	1.1	NS	NS	NS	NS	NS	NS	NS	0.093	U		0.092	U		0.10	U		0.10	U					0.097	U		0.81	UJ	L				0.89	UJ	L	0.91	UJ	L	0.95	UJ	L
Ammonia as Nitrogen	NS	NS	NS	NS	NS	NS	NS	NS													10.0									31.0											
AVS/SEM (µmol/g)																																							
Cadmium - SEM	NS	NS	NS	NS	NS	NS	NS	NS																			0.010	U					0.024			0.033			0.030		
Copper - SEM	NS	NS	NS	NS	NS	NS	NS	NS																			0.25						0.90			0.94			0.28		
Lead - SEM	NS	NS	NS	NS	NS	NS	NS	NS																			0.56	J	I				2.1			2.6			1.7		
Nickel - SEM	NS	NS	NS	NS	NS	NS	NS	NS																			0.19	U					0.22			0.32			0.22	U	
Zinc - SEM	NS	NS	NS	NS	NS	NS	NS	NS																			1.3	J	I				2.0	J	L	2.8	J	L	4.0	J	L
SEM - AVS	NS	NS	NS	NS	NS	NS	NS	NS																			-0.38	J	I				5.2	J	I	4.6	J	I	-16.0	J	I
Sulfide, AVS	NS	NS	NS	NS	NS	NS	NS	NS																			2.5	J	I				0.33	UJ	I	2.2	J	I	22.0	J	I
SEM/AVS Ratio (unitless)	NS	NS	NS	NS	NS	NS	NS	NS																			0.85	J	I				16.0	J	I	3.1	J	I	0.28	J	I

TABLE 15B
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Walpole, Massachusetts

Concentrations in mg/kg (except as noted)

Analyte	COPC Screening Levels: Human Health	COPC Screening Levels: Ecological							Lewis Pond Sediments (cont.): LP-05 ~0-0.5' 7/30/2001			LP-06 ~0-0.5' 7/30/2001			LP-06 ~0-0.5' 12/18/2002			LP-07 ~0-0.5' 7/30/2001			LP-08 ~0-0.5' 7/30/2001			LP-09 ~0-0.5' 7/30/2001			LP-09 ~0-0.5' 12/18/2002			LP-10 ~0-0.5' 7/30/2001			Lower Pond (Norwood, Massachusetts) Reference Sediments: SedRNwd-01 ~0-0.5' 12/17/2002			SedRNwd-02 ~0-0.5' 12/17/2002			SedRNwd-03 ~0-0.5' 12/17/2002			SedRNwd-04 ~0-0.5' 12/17/2002		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals (mg/kg)																																												
Aluminum	7,600	NS	NS	NS	NS	NS	NS	NS	9,750			8,780			11,000	J	H	5,070			8,420			5,310			6,800	J	H	8,840			7,000	J	I	3,500			5,400			13,000		
Antimony	3.1	**2**	NS	NS	NS	NS	NS	NS	1.4	J	L	1.2	UJ	L	**3.5**			1.6	J	L	1.3	UJ	L	1.1	UJ	L	1.0			1.4	UJ	L	0.58	J	L	0.25	J	L	0.54	J	L	1.1	J	L
Arsenic	0.39	33	**5.9**	17	6	NS	NS	9.79	**6.6**			5.3			**22.0**			3.9			5.6			3.5			4.7			**6.8**			**8.8**	J	I	1.8			5.1			**14.0**		
Barium	540	NS	NS	NS	NS	NS	NS	NS	115			127			26.0			69.0			99.0			57.8			88.0			99.5			140	J	I	35.0			91.0			250		
Beryllium	15	NS	NS	NS	NS	NS	NS	NS	0.78			0.62			0.38			0.41	U		0.55			0.42	U		0.49			0.66			0.63	J	I	0.19			0.42			1.2		
Cadmium	3.7	5	**0.596**	3.53	0.6	NS	NS	0.99	**6.5**			**3.7**			**0.88**	J	L	**2.7**			**4.9**			**2.1**			**3.0**	J	L	**8.0**			**2.0**	J	I	0.19	J	L	**2.3**	J	L	**4.6**	J	L
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	2,780	J	I	2,140	J	I	2,200	JB	I	2,210	J	I	3,170	J	I	6,570	J	I	3,000	JB	I	3,910	J	I	2,400	J	I	1,200	J	L	2,900	J	L	6,000	J	L
Chromium †	22	80	37.3	90	**26**	NS	NS	43.4	**99.4**			**69.9**			**410**			**58.3**			**56.2**			**43.4**			**59.0**			**60.9**			23.0	J	I	14.0	J	I	23.0	J	I	**38.0**	J	I
Cobalt	140	NS	NS	NS	NS	NS	NS	NS	8.7			8.1			25.0	J	L	7.0			10.7			6.8			11.0	J	L	12.8			13.0	J	I	4.1			7.0			22.0		
Copper	310	70	35.7	197	**16**	NS	NS	31.6	**136**			**104**			**180**			**59.7**			**91.7**			**49.6**			**68.0**			**113**			**54.0**	J	I	16.0	J	L	**73.0**	J	L	**110**	J	L
Iron	2,300	NS	NS	NS	**21,200**	NS	NS	NS	13,100			19,700			18,000			11,800			16,700			11,100			17,000			16,800			16,000			9,000			10,000			**25,000**		
Lead	400	35	35	91.3	**31**	NS	NS	35.8	**1,260**			**784**			**7,600**	J	I	**425**			**565**			**276**			**300**	J	I	**573**			**700**	J	I	**60.0**	J	L	**240**	J	L	**840**	J	L
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	12,400			9,180			79,000	J	L	4,010			6,230			3,580			3,800			5,460			2,500	J	I	2,200	J	I	2,000	J	I	3,400	J	I
Manganese	180	NS	NS	NS	**460**	NS	NS	NS	208			313			210	J	L	365			**1,010**			**636**			**520**	J	L	**915**			**1,100**	J	I	210	J	L	290	J	L	**1,400**	J	L
Mercury	2.3	**0.15**	0.174	0.486	0.2	NS	NS	0.18	**0.67**	J	H	**0.51**	J	H	**0.90**			**0.25**	J	H	**0.36**	J	H	**0.20**	J	H	**0.26**			**0.39**	J	H	**0.66**	J	I	0.048	J	I	**0.26**	J	I	**1.0**	J	I
Nickel	160	30	18	36	**16**	NS	NS	22.7	**57.9**			**42.4**			**510**			**23.5**			**36.6**			**20.6**			**23.0**			**36.3**			16.0	J	I	9.5	J	I	12.0	J	I	**30.0**	J	I
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	360			342			200	B	H	320			538			306			470	B	H	667			400			230			370			760		
Selenium	39	NS	NS	NS	NS	NS	NS	NS	1.3	J	L	0.87	J	L	1.1			0.46	J	L	0.84	J	L	0.44	J	L	0.93			0.96	J	L	0.94	J	I	0.14			0.63			2.1		
Silver	39	**1**	NS	NS	NS	NS	NS	NS	0.71			0.72	U		0.35	U		0.63	U		0.79	U		0.66	U		0.31			0.83	U		0.34			0.19	U		0.23	U		0.49		
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	365			206			660	B	H	216			212			217			340	B	H	283			210	J	I	65.0			230			820		
Thallium ‡	0.52	NS	NS	NS	NS	NS	NS	NS	0.13	J	I	0.11	J	I	0.17	U		0.062	UJ	I	0.099	J	I	0.064	UJ	I	0.15	U		0.13	J	I	0.19			0.094	U		0.15	U		0.27		
Vanadium	7.8	NS	NS	NS	NS	NS	NS	NS	49.8	J	H	43.4	J	H	26.0			25.1	J	H	37.6	J	H	22.2	J	H	29.0			41.5	J	H	47.0	J	I	15.0			27.0			82.0		
Zinc	2,300	**120**	123	315	**120**	NS	NS	121	**246**	J	H	**210**	J	H	**390**			**235**	J	H	**362**	J	H	**208**	J	H	**320**			**477**	J	H	**250**	J	I	59.0	J	L	**190**	J	L	**540**	J	L
Cyanide (weak acid dissociable) $	1.1	NS	NS	NS	NS	NS	NS	NS	1.1	UJ	L	1.1	UJ	L				0.80	UJ	L	0.74	UJ	L	0.66	UJ	L				1.1	UJ	L	0.38	UJ	I	0.23	UJ	L	0.70	UJ	I	1.4	UJ	I
Ammonia as Nitrogen	NS	NS	NS	NS	NS	NS	NS	NS																									38.0	J	I									
AVS/SEM (µmol/g)																																												
Cadmium - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.045	J	I	0.046	J	I				0.024			0.022			0.010	U					0.039	J	I												
Copper - SEM	NS	NS	NS	NS	NS	NS	NS	NS	1.4	J	I	1.2	J	I				0.28			0.29			0.22						0.068	J	I												
Lead - SEM	NS	NS	NS	NS	NS	NS	NS	NS	3.7	J	I	3.4	J	I				1.5			1.6			0.74						1.6	J	I												
Nickel - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.40	J	I	0.41	J	I				0.24			0.24			0.20	U					0.32	UJ	I												
Zinc - SEM	NS	NS	NS	NS	NS	NS	NS	NS	3.4	J	L	4.5	J	L				3.1	J	L	3.1	J	L	2.0	J	L				5.3	J	L												
SEM - AVS	NS	NS	NS	NS	NS	NS	NS	NS	8.2	J	I	9.0	J	I				-1.3	J	I	-4.5	J	I	-3.5	J	I				-28.0	J	I												
Sulfide, AVS	NS	NS	NS	NS	NS	NS	NS	NS	0.74	J	I	0.50	J	I				6.3	J	I	9.7	J	I	6.6	J	I				35.0	J	I												
SEM/AVS Ratio (unitless)	NS	NS	NS	NS	NS	NS	NS	NS	12.0	J	I	19.0	J	I				0.80	J	I	0.54	J	I	0.46	J	I				0.20	J	I												

TABLE 15B
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Walpole, Massachusetts

Analyte	Concentrations in mg/kg (except as noted)																																	
	COPC Screening Levels								Lower Pond (Norwood, Massachusetts) Reference Sediments (cont.)																Floodplain Sediments											
	Human Health	Ecological							SedRNwd-05			SedRNwd-07			SedRNwd-08			SedRNwd-09			SedRNwd-10			FP-01			FP-02			FP-03			FP-04		
									~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-1'			~0-1'			~0-1'			~0-1'		
									12/17/2002			12/17/2002			12/17/2002			12/17/2002			12/17/2002			10/10/2001			10/10/2001			10/10/2001			10/10/2001		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals (mg/kg)																																		
Aluminum	7,600	NS	NS	NS	NS	NS	NS	NS	3,600			14,000			14,000			23,000			15,000			4,370			6,820			7,100			10,200	J	H
Antimony	3.1	**2**	NS	NS	NS	NS	NS	NS	0.46	J	L	0.70	J	L	0.76	J	L	0.70	J	L	0.86	J	L	0.80	UJ	L	0.79	UJ	L	0.88	UJ	L	0.88	UJ	L
Arsenic	0.39	33	**5.9**	17	6	NS	NS	9.79	2.3			**14.0**			**16.0**			**8.5**			**17.0**			4.9			**8.9**			3.6			**6.8**	J	I
Barium	540	NS	NS	NS	NS	NS	NS	NS	51.0			220			180			170			210			37.9	J	I	49.5			34.6			24.3		
Beryllium	15	NS	NS	NS	NS	NS	NS	NS	0.42			1.1			0.95			0.80			1.0			0.32	U		0.37			0.34	U		0.34	U	
Cadmium	3.7	5	**0.596**	3.53	0.6	NS	NS	0.99	0.25	J	L	**4.1**	J	L	**2.6**	J	L	**2.7**	J	L	**3.2**	J	L	0.33			0.36			0.24			0.26		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	1,200	J	L	4,300	J	L	4,400	J	L	3,600	J	L	3,900	J	L	1,460	J	I	1,860			1,220			454		
Chromium †	22	80	37.3	90	**26**	NS	NS	43.4	11.0	J	I	**39.0**	J	I	**33.0**	J	I	**39.0**	J	I	**38.0**	J	I	10.9			18.4			12.0			18.5		
Cobalt	140	NS	NS	NS	NS	NS	NS	NS	4.9			14.0			17.0			13.0			18.0			4.1			3.3			3.4			3.2		
Copper	310	70	35.7	197	**16**	NS	NS	31.6	**17.0**	J	L	**99.0**	J	L	**90.0**	J	L	**100**	J	L	**84.0**	J	L	**51.6**			**39.1**			**117**			14.1		
Iron	2,300	NS	NS	NS	**21,200**	NS	NS	NS	16,000			**29,000**			**25,000**			**38,000**			**25,000**			19,300	J	I	12,800			**46,800**			9,070		
Lead	400	35	35	91.3	**31**	NS	NS	35.8	**57.0**	J	L	**770**	J	L	**630**	J	L	**650**	J	L	**720**	J	L	**256**	J	L	**152**	J	L	**52.2**	J	L	**90.5**	J	H
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	1,600	J	I	3,500	J	I	3,700	J	I	2,800	J	I	3,900	J	I	1,810			7,780			1,440			1,240		
Manganese	180	NS	NS	NS	**460**	NS	NS	NS	**610**	J	L	**880**	J	L	**810**	J	L	**1,000**	J	L	**1,200**	J	L	**657**			391			347			143		
Mercury	2.3	**0.15**	0.174	0.486	0.2	NS	NS	0.18	0.071	J	I	**1.2**	J	I	**1.2**	J	I	**0.75**	J	I	**1.9**	J	I	**0.21**			**0.21**			0.11			**0.35**		
Nickel	160	30	18	36	**16**	NS	NS	22.7	7.0	J	I	**27.0**	J	I	**24.0**	J	I	**25.0**	J	I	**26.0**	J	I	7.2			**30.8**			**165**			5.1		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	310			710			700			560			720			228	J	I	213			340			114		
Selenium	39	NS	NS	NS	NS	NS	NS	NS	0.14			1.6			1.7			1.6			1.7			0.17	J	I	0.15	J	I	0.11	UJ	I	0.59		
Silver	39	**1**	NS	NS	NS	NS	NS	NS	0.18	U		0.45			0.41			0.36			0.43			0.48	U		0.48	U		0.53	U		0.53	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	92.0			770			390			340			330			68.6			51.3			45.7			75.8		
Thallium ‡	0.52	NS	NS	NS	NS	NS	NS	NS	0.075	U		0.26			0.20			0.16	U		0.23			0.066	J	I	0.070	J	I	0.071	J	I	0.098	J	I
Vanadium	7.8	NS	NS	NS	NS	NS	NS	NS	21.0			77.0			82.0			53.0			79.0			27.6	J	H	36.5	J	H	33.6	J	H	28.3	J	H
Zinc	2,300	**120**	123	315	**120**	NS	NS	121	93.0	J	L	**550**	J	L	**370**	J	L	**380**	J	L	**400**	J	L	70.0			98.7			50.3			47.9		
Cyanide (weak acid dissociable) $	1.1	NS	NS	NS	NS	NS	NS	NS	0.37	UJ	L	0.50	UJ	I	0.22	UJ	L	0.63	UJ	I	0.47	UJ	I	0.25	UJ	L	0.23	UJ	L	0.27	UJ	L	0.37	UJ	L
Ammonia as Nitrogen	NS	NS	NS	NS	NS	NS	NS	NS																										
AVS/SEM (µmol/g)																																		
Cadmium - SEM	NS	NS	NS	NS	NS	NS	NS	NS																0.0022	U		0.0030			0.0024	U		0.0032	U	
Copper - SEM	NS	NS	NS	NS	NS	NS	NS	NS																1.0			0.32			1.9			0.19		
Lead - SEM	NS	NS	NS	NS	NS	NS	NS	NS																0.91	J	H	0.54	J	H	0.15	J	H	0.37	J	H
Nickel - SEM	NS	NS	NS	NS	NS	NS	NS	NS																0.042	U		0.050	U		0.11			0.061	U	
Zinc - SEM	NS	NS	NS	NS	NS	NS	NS	NS																0.19			0.58			0.24			0.38		
SEM - AVS	NS	NS	NS	NS	NS	NS	NS	NS																2.11	J	H	1.44	J	H	2.38	J	H	0.93	J	H
Sulfide, AVS	NS	NS	NS	NS	NS	NS	NS	NS																0.076	UJ	L	0.091	UJ	L	0.085	UJ	L	0.11	UJ	L
SEM/AVS Ratio (unitless)	NS	NS	NS	NS	NS	NS	NS	NS																										

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Analyte	Concentrations in mg/kg (except as noted)																																						
	COPC Screening Levels								Floodplain Sediments (cont.)																																
	Human Health	Ecological							FP-05									FP-06									FP-08			FP-09									FP-10		
									~0-1'			~0-1'			~1-3'			~0-1'			~0-1'			~1-3'			~0-1'			~0-1'			~0-1'			~1-3'			~0-1'		
									10/10/2001			8/5/2003			8/5/2003			10/10/2001			8/5/2003			8/5/2003			10/10/2001			10/10/2001			8/5/2003			8/5/2003			10/10/2001		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals (mg/kg)																																							
Aluminum	7,600	NS	NS	NS	NS	NS	NS	NS	5,480	J	H	6,700			4,300			6,500			8,100			6,500			10,400	J	H	6,680	J	H	8,200			11,000			7,870	J	H
Antimony	3.1	**2**	NS	NS	NS	NS	NS	NS	0.94	UJ	L	1.1	J	L	0.42	UJ	L	0.93	UJ	L	0.37	UJ	L	0.37	UJ	L	0.85	UJ	L	**6.7**	J	L	**2.4**	J	L	0.75	J	L	**4.0**	J	L
Arsenic	0.39	33	**5.9**	17	6	NS	NS	9.79	**10.5**	J	I	3.6			1.2			4.3			4.5			1.6			5.7	J	I	**28.3**	J	I	**7.4**			1.4			**7.6**	J	I
Barium	540	NS	NS	NS	NS	NS	NS	NS	113			120			19.0			116			81.0			31.0			24.1			156			84.0			23.0			61.3		
Beryllium	15	NS	NS	NS	NS	NS	NS	NS	0.37			0.42			0.17			0.36	U		0.34			0.27			0.37	U		0.42			0.51			0.29			0.38		
Cadmium	3.7	5	**0.596**	3.53	0.6	NS	NS	0.99	**1.1**			**1.5**			0.13			**0.66**			0.31			0.15			0.15			**2.8**			**2.2**			0.16			0.19		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	1,280									7,240									682			1,460									729		
Chromium †	22	80	37.3	90	**26**	NS	NS	43.4	26.0			21.0			9.3			21.8			23.0			14.0			25.3			**96.8**			**38.0**			**35.0**			20.9		
Cobalt	140	NS	NS	NS	NS	NS	NS	NS	4.3			5.5			1.2			3.4			3.3			4.2			2.0			6.0			2.8			2.6			3.3		
Copper	310	70	35.7	197	**16**	NS	NS	31.6	**56.5**			**49.0**			6.3			**21.8**			**22.0**			**18.0**			16.0			**163**			**76.0**			15.0			**19.1**		
Iron	2,300	NS	NS	NS	**21,200**	NS	NS	NS	10,300			13,000			4,500			9,180			11,000			9,100			10,200			**35,700**			8,800			6,200			12,100		
Lead	400	35	35	91.3	**31**	NS	NS	35.8	**657**	J	H	**480**			**54.0**			**474**	J	L	**200**			**61.0**			**77.2**	J	H	**730**	J	H	**450**			**40.0**			**130**	J	H
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	2,430									2,480									798			2,720									1,230		
Manganese	180	NS	NS	NS	**460**	NS	NS	NS	275			430	J	L	53.0	J	L	170			170	J	L	190	J	L	98.4			109			53.0	J	L	51.0	J	L	97.0		
Mercury	2.3	**0.15**	0.174	0.486	0.2	NS	NS	0.18	**0.58**			**0.30**			0.043			**0.38**			**0.87**			0.063			0.13			**1.4**			**0.33**			0.076			**0.20**		
Nickel	160	30	18	36	**16**	NS	NS	22.7	14.1			13.0			2.8			8.2			8.4			7.0			4.8			**26.7**			16.0			4.8			6.3		
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	166									317									152			225									164		
Selenium	39	NS	NS	NS	NS	NS	NS	NS	0.83			0.66			0.41			0.43			0.51			0.37	U		1.1			1.5			1.6			0.39	U		1.0		
Silver	39	**1**	NS	NS	NS	NS	NS	NS	0.57	U		0.46	U		0.42	U		0.56	U		0.37	U		0.37	U		0.51	U		0.54	U		0.43			0.37	U		0.56	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	137									66.1									63.0			249									124		
Thallium ‡	0.52	NS	NS	NS	NS	NS	NS	NS	0.10	J	I	0.47	U		0.34	U		0.063	J	I	0.38	U		0.37	U		0.12			0.15			0.35	U		0.39	U		0.13		
Vanadium	7.8	NS	NS	NS	NS	NS	NS	NS	35.9	J	H	24.0			10.0			22.6	J	H	16.0			13.0			39.2	J	H	48.6	J	H	46.0			16.0			45.4	J	H
Zinc	2,300	**120**	123	315	**120**	NS	NS	121	**290**			**220**			34.0			**184**			85.0			50.0			20.4			**460**			**150**			45.0			29.1		
Cyanide (weak acid dissociable) $	1.1	NS	NS	NS	NS	NS	NS	NS	0.42	UJ	L							0.28	UJ	L							0.47	UJ	L	0.44	UJ	L							0.34	UJ	L
Ammonia as Nitrogen	NS	NS	NS	NS	NS	NS	NS	NS																																		
AVS/SEM (µmol/g)																																							
Cadmium - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.0054									0.0039									0.0046	U		0.010									0.0028	U	
Copper - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.49									0.20									0.13			1.2									0.15		
Lead - SEM	NS	NS	NS	NS	NS	NS	NS	NS	1.7	J	H							2.4	J	H							0.17	J	H	1.3	J	H							0.32	J	H
Nickel - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.078	U								0.049	U								0.089	U		0.16									0.054	U	
Zinc - SEM	NS	NS	NS	NS	NS	NS	NS	NS	1.8									1.5									0.12			2.8									0.12		
SEM - AVS	NS	NS	NS	NS	NS	NS	NS	NS	4.01	J	H							4.16	J	H							0.41	J	H	5.51	J	H							0.59	J	H
Sulfide, AVS	NS	NS	NS	NS	NS	NS	NS	NS	0.14	UJ	L							0.089	UJ	L							0.16	UJ	L	0.13	UJ	L							0.099	UJ	L
SEM/AVS Ratio (unitless)	NS	NS	NS	NS	NS	NS	NS	NS																																		

TABLE 15B
Summary of Sediment Data - Inorganic Parameters
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Analyte	Concentrations in mg/kg (except as noted)																																						
	COPC Screening Levels								Floodplain Reference Sediments																																
	Human Health	Ecological							FPR-01			FPR-02			FPR-03			FPR-04			FPR-05			FPR-06			FPR-07			FPR-08			FPR-09			FPR-10			SedRNwd-06		
									~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-0.5'		
									10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			12/17/2002		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals (mg/kg)																																							
Aluminum	7,600	NS	NS	NS	NS	NS	NS	NS	4,450	J	H	9,990	J	H	4,210	J	H	11,200	J	H	13,600			4,470	J	H	9,300	J	H	6,480	J	H	11,700	J	H	6,500	J	H	8,700		
Antimony	3.1	**2**	NS	NS	NS	NS	NS	NS	1.1	J	L	0.89	UJ	L	0.78	UJ	L	0.76	UJ	L	0.97	UJ	L	0.93	UJ	L	0.91	UJ	L	0.91	UJ	L	0.83	UJ	L	0.84	UJ	L	0.68	J	L
Arsenic	0.39	33	**5.9**	17	6	NS	NS	9.79	**9.5**	J	I	1.9	J	I	1.2	J	I	3.1	J	I	3.6			2.6	J	I	**7.7**	J	I	2.2	J	I	2.1	J	I	1.6	J	I	**9.3**		
Barium	540	NS	NS	NS	NS	NS	NS	NS	65.3			26.8			20.0			24.5			25.4			29.1			14.4			24.5			24.4			38.8			150		
Beryllium	15	NS	NS	NS	NS	NS	NS	NS	0.36	U		0.38	U		0.34	U		0.36	U		0.38	U		0.36	U		0.33	U		0.36	U		0.38			0.37	U		0.65		
Cadmium	3.7	5	**0.596**	3.53	0.6	NS	NS	0.99	0.35			0.11			0.14			0.24			0.18			0.23			0.16			0.23			0.49			0.45			**1.8**	J	L
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	832			628			2,570			320			519			1,740			804			1,120			1,480			2,550			2,500	J	L
Chromium †	22	80	37.3	90	**26**	NS	NS	43.4	18.4			9.3			20.2			11.5			10.2			7.7			10.6			10.9			13.7			15.1			**29.0**	J	I
Cobalt	140	NS	NS	NS	NS	NS	NS	NS	1.8	U		2.3			1.7	U		2.0			2.1			2.1			2.2			4.2			2.6			3.3			12.0		
Copper	310	70	35.7	197	**16**	NS	NS	31.6	**37.6**			5.6			1.9			7.0			11.6			**72.3**			13.2			**19.3**			13.9			**55.8**			**68.0**	J	L
Iron	2,300	NS	NS	NS	**21,200**	NS	NS	NS	14,800			7,550			4,460			10,300			14,100			5,990			12,500			7,930			6,670			7,700			18,000		
Lead	400	35	35	91.3	**31**	NS	NS	35.8	**135**	J	H	30.4	J	H	5.5	J	H	26.2	J	H	**66.7**	J	L	**96.8**	J	H	**78.3**	J	H	**34.2**	J	H	**50.1**	J	H	**76.0**	J	H	**540**	J	L
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	384			783			755			631			821			1,110			2,790			2,140			793			1,430			2,700	J	I
Manganese	180	NS	NS	NS	**460**	NS	NS	NS	17.8			44.4			148			76.5			82.2			84.2			138			108			103			109			**860**	J	L
Mercury	2.3	**0.15**	0.174	0.486	0.2	NS	NS	0.18	**0.30**			0.094			0.027			0.057			0.082			**0.17**			0.11			0.052			0.14			**0.17**			**0.87**	J	I
Nickel	160	30	18	36	**16**	NS	NS	22.7	5.3			4.5	U		3.9	U		3.8	U		4.8	U		8.2			9.4			7.6			4.7			6.6			**18.0**	J	I
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	163			109			101			82.9			155			382			305			287			179			246			470		
Selenium	39	NS	NS	NS	NS	NS	NS	NS	5.0			0.60			0.71			0.93			0.79			0.62			0.63			0.12	J	I	0.89			0.45			0.95		
Silver	39	**1**	NS	NS	NS	NS	NS	NS	0.54	U		0.54	U		0.47	U		0.46	U		0.58	U		0.56	U		0.55	U		0.55	U		0.50	U		0.50	U		0.26		
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	152			44.6	U		54.5			44.9			48.3	U		121			69.8			67.4			196			107			180		
Thallium ‡	0.52	NS	NS	NS	NS	NS	NS	NS	0.18			0.087	J	I	0.051	UJ	I	0.093	J	I	0.15			0.083	J	I	0.094	J	I	0.054	UJ	I	0.053	J	I	0.055	UJ	I	0.13	U	
Vanadium	7.8	NS	NS	NS	NS	NS	NS	NS	44.1	J	H	24.2	J	H	15.1	J	H	28.0	J	H	32.6	J	H	37.1	J	H	52.1	J	H	23.0	J	H	34.8	J	H	23.8	J	H	49.0		
Zinc	2,300	**120**	123	315	**120**	NS	NS	121	13.4			17.2			7.1			16.3			24.8			37.7			27.3			36.8			69.2			63.3			**280**	J	L
Cyanide (weak acid dissociable) $	1.1	NS	NS	NS	NS	NS	NS	NS	0.98	UJ	L	0.35	UJ	L	0.35	UJ	L	0.39	UJ	L	0.28	UJ	L	0.59	UJ	L	0.42	UJ	L	0.33	UJ	L	0.35	UJ	L	0.42	UJ	L	0.42	UJ	L
Ammonia as Nitrogen	NS	NS	NS	NS	NS	NS	NS	NS																																		
AVS/SEM (µmol/g)																																							
Cadmium - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.020	J	I	0.0032	U		0.0041	U		0.0039	U		0.0031	U		0.0062	U		0.0044	U		0.0027	U		0.0032	U		0.0040	U				
Copper - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.45	J	I	0.065			0.014	U		0.065			0.10			0.34			0.090			0.055			0.045			0.96					
Lead - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.96	J	H	0.14	J	H	0.044	U		0.097	J	H	0.11	J	H	0.40	J	H	0.28	J	H	0.069	J	H	0.058	J	H	0.31	J	H			
Nickel - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.20	UJ	I	0.062	U		0.078	U		0.075	U		0.060	U		0.12	U		0.084	U		0.051	U		0.061	U		0.093					
Zinc - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.50	J	I	0.13			0.070	U		0.13			0.086			0.35			0.075	U		0.075			0.30			0.86					
SEM - AVS	NS	NS	NS	NS	NS	NS	NS	NS	1.92	J	H	0.34	J	H	0.0	J	H	0.30	J	H	0.30	J	H	1.09	J	H	0.37	J	H	0.20	J	H	0.40	J	H	2.22	J	H			
Sulfide, AVS	NS	NS	NS	NS	NS	NS	NS	NS	0.36	UJ	L	0.11	UJ	L	0.14	UJ	L	0.14	UJ	L	0.11	UJ	L	0.22	UJ	L	0.15	UJ	L	0.094	UJ	L	0.11	UJ	L	0.14	UJ	L			
SEM/AVS Ratio (unitless)	NS	NS	NS	NS	NS	NS	NS	NS																																		

TABLE 15B
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Analyte	Concentrations in mg/kg (except as noted)																									
	COPC Screening Levels								Former Mill Tailrace Sediments																	
	Human Health	Ecological							TR-1			TR-2			TR-3						TR-4			TR-5		
									~0-0.5'			~0-0.4'			~0-0.4'			~0-0.5'			~0-0.4'			~0-0.6'		
									7/25/2001			7/25/2001			7/25/2001			12/16/2002			7/25/2001			7/25/2001		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals (mg/kg)																										
Aluminum	7,600	NS	NS	NS	NS	NS	NS	NS	5,870			5,260			13,100			6,300	J	H	10,500			14,000		
Antimony	3.1	**2**	NS	NS	NS	NS	NS	NS	0.67	UJ	L	0.69	UJ	L	1.1	UJ	L	0.25			0.91	UJ	L	1.1	UJ	L
Arsenic	0.39	33	**5.9**	17	6	NS	NS	9.79	1.5			2.6			**9.3**			4.0			**8.4**			**8.7**		
Barium	540	NS	NS	NS	NS	NS	NS	NS	12.7			17.0			143			29.0			59.3			135		
Beryllium	15	NS	NS	NS	NS	NS	NS	NS	0.23	U		0.29	U		0.59			0.32			0.41	U		0.50		
Cadmium	3.7	5	**0.596**	3.53	0.6	NS	NS	0.99	0.058	U		0.081			**2.1**			0.17	J	L	0.58			**1.6**		
Calcium	NS	NS	NS	NS	NS	NS	NS	NS	578			1,800			10,700			2,800	JB	I	9,710			8,940		
Chromium †	22	80	37.3	90	**26**	NS	NS	43.4	5.7	J	H	5.7	J	H	**34.9**	J	H	9.5			**38.0**	J	H	**29.7**	J	H
Cobalt	140	NS	NS	NS	NS	NS	NS	NS	2.1			2.4			12.5			3.7	JB	I	9.1			10.1		
Copper	310	70	35.7	197	**16**	NS	NS	31.6	4.0			7.5			**53.3**			11.0			**40.7**			**47.5**		
Iron	2,300	NS	NS	NS	**21,200**	NS	NS	NS	7,320			8,030			19,100			9,200			13,600			19,000		
Lead	400	35	35	91.3	**31**	NS	NS	35.8	11.3			**40.5**			**535**			**99.0**	J	I	**850**			**419**		
Magnesium	NS	NS	NS	NS	NS	NS	NS	NS	920			1,490			8,740			2,300			14,500			7,520		
Manganese	180	NS	NS	NS	**460**	NS	NS	NS	85.2			143			**2,500**			180	J	L	355			**2,340**		
Mercury	2.3	**0.15**	0.174	0.486	0.2	NS	NS	0.18	0.028	U		0.026	U		0.14			0.037			0.11			**0.16**		
Nickel	160	30	18	36	**16**	NS	NS	22.7	3.4	J	L	6.3	J	L	**56.5**	J	L	13.0			**93.1**	J	L	**44.5**	J	L
Potassium	NS	NS	NS	NS	NS	NS	NS	NS	233			289			865			400	B	H	557			875		
Selenium	39	NS	NS	NS	NS	NS	NS	NS	0.075	UJ	I	0.095	UJ	I	0.61			0.31			0.36			0.56		
Silver	39	**1**	NS	NS	NS	NS	NS	NS	0.40	U		0.42	U		0.66	U		0.18	U		0.55	U		0.67	U	
Sodium	NS	NS	NS	NS	NS	NS	NS	NS	1,270			804			3,380			1,200	B	H	2,540			3,620		
Thallium ‡	0.52	NS	NS	NS	NS	NS	NS	NS	0.044	J	I	0.044	UJ	I	0.11	J	I	0.19			0.095	J	I	0.10	J	I
Vanadium	7.8	NS	NS	NS	NS	NS	NS	NS	12.0	J	L	12.2	J	L	49.1	J	L	13.0			32.6	J	L	48.4	J	L
Zinc	2,300	**120**	123	315	**120**	NS	NS	121	24.6	B		29.7			**264**			55.0	B	H	**143**			**219**		
Cyanide (weak acid dissociable) $	1.1	NS	NS	NS	NS	NS	NS	NS	0.49	UJ	L	0.55	UJ	L	0.90	UJ	L				1.6	UJ	L	1.7	UJ	L
Ammonia as Nitrogen	NS	NS	NS	NS	NS	NS	NS	NS										91.0								
AVS/SEM (µmol/g)																										
Cadmium - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.0049	U		0.0060	U		0.0099	U					0.012	UJ	I	0.021	UJ	I
Copper - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.025			0.067			0.14						0.31	J	I	0.29	J	I
Lead - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.053	U		0.27			0.75						2.1	J	I	1.7	J	I
Nickel - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.094	U		0.11	U		0.19	U					0.24	UJ	I	0.40	UJ	I
Zinc - SEM	NS	NS	NS	NS	NS	NS	NS	NS	0.085			0.38			1.2						2.1	J	I	3.5	J	I
SEM - AVS	NS	NS	NS	NS	NS	NS	NS	NS	-0.19	J	H	-5.9	J	H	-24	J	H				-3.7	J	H	-60	J	H
Sulfide, AVS	NS	NS	NS	NS	NS	NS	NS	NS	0.35	J	L	6.6	J	L	26	J	L				8.2	J	L	66	J	L
SEM/AVS Ratio (unitless)	NS	NS	NS	NS	NS	NS	NS	NS	0.071	J	H	0.11	J	H	0.081	J	H				0.55	J	H	0.083	J	H

TABLE 15B
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Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2D for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for metals (except mercury) by United States Environmental Protection Agency (USEPA) Methods 6010B and 6020; mercury by USEPA Method 7471A; weak acid dissociable cyanide (WAD cyanide) by USEPA Method 4500-CN I; acid volatile sulfides and simultaneously extracted metals (AVS/SEM) by USEPA AVSSEM SOP v2.0 9/4/92; and ammonia as nitrogen by USEPA Method 350.1.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. Metals, WAD cyanide, and ammonia as nitrogen concentrations are presented in milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm). AVS/SEM concentrations are presented in micromoles per gram (µmoles/g).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. Analyte detections that exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"USEPA Region IX Res. Soil PRGs" indicates the values presented are from the USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999). The soil PRGs are used as a conservative estimate of target risk levels, and some exposure pathways included in the residential soil PRG development may not be applicable for sediment exposure.

"1990 NOAA ER-Ls" indicates National Oceanic and Atmospheric Administration (NOAA) Effects Range - Low (ER-L). The values presented are from "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program," from the National Ocean Service, Rockville, Maryland, March 1990, NOAA, page 138.

"Threshold Effects Levels (TELs)" and "Probable Effects Levels (PELs)" indicate the values presented are from "A Preliminary Evaluation of Sediment Quality Assessment Values for Freshwater Ecosystems," by Smith, et al., J. Great Lakes Res., 22(3): 624-638.

"Ontario Lowest Effect Levels (LELs)" indicates the values presented are from "Development of the Ontario Provincial Sediment Quality Guidelines for Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, and Zinc," Ministry of Environment and Energy, Ontario, Canada, August 1993.

"USEPA SQBs" indicates the values presented are Sediment Quality Benchmarks (SQBs) from USEPA Ecotox Thresholds (1996).

"USEPA SQCs" indicates the values presented are Sediment Quality Criteria (SQC) from USEPA Ecotox Thresholds (1996). The values are the lower limit of the 95 percent confidence interval.

"MADEP TECs" indicates the values presented are from the Massachusetts Department of Environmental Protection (MADEP) "Recommended Freshwater Sediment Screening Values" (May 2002), which are based on the consensus-based threshold effect concentrations (TECs) from "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems," by MacDonald, et al., Archives of Environmental Contamination and Toxicology, 36:20 31.

6. "†" indicates the PRG value presented is for chromium VI.
"‡" indicates the PRG value presented is for thallium chloride.
"$" indicates the PRG value presented is for hydrogen cyanide because cyanide in this form easily dissociates and becomes available for uptake as free cyanide.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002], and Appendix B.7 of the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
- "B" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with sediment metals analyses). The result is usable with possible uncertainty due to the potential for contamination.

Bias:

- "L" Low
- "I" Intermediate
- "H" High

TABLE 15C
Summary of Sediment Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in μg/kg																																																																
	COPC Screening Levels								Neponset River Sediments																																		Neponset River (Upstream of the Site) Reference Sediments																		Lewis Pond Sediments					
	Human Health	Ecological							NR-1			NR-2			NR-3			NR-4			NR-5						NR-6			NR-7						NR-8						SedRN-1			SedRN-2			SedRN-3			SedRN-4						SedRN-5			LP-01					
									~0-0.3'			~0-0.2'			~0-0.2'			~0-0.5'			~0-0.2'			~0-0.5'			~0-0.3'			~0-0.1'			~0-0.5'			~0-0.2'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'		
									7/26/2001			7/26/2001			7/26/2001			7/26/2001			7/26/2001			12/18/2002			7/26/2001			7/25/2001			12/18/2002			7/25/2001			12/18/2002			5/24/2002			5/24/2002			5/24/2002			5/24/2002			12/18/2002			5/24/2002			7/31/2001			12/18/2002		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																																																	
Acenaphthene	370,000	**150**	NS	NS	NS	NS	NS	NS	21			6.5	U		12			18			150			19			**290**			22			50			67			19			2.8	U		3.0	U		3.1	U		3.1	U		7.8	U		3.3			**180**	J		31		
Acenaphthylene	NS	NS	NS	NS	NS	NS	NS	NS	98			41			31			31			18			39			110			71			43			56			98			2.8	U		3.0	U		8.7			3.6			7.8	U		51			900	J	I	470		
Anthracene	2,200,000	85	NS	NS	220	NS	NS	**57**	**78**			23			20			35			51			41			**600**			**73**			**350**			**160**			**59**			2.8	U		3.0	U		5.5			3.7			7.8	U		35			**930**	J	I	**300**		
Benzo(a)anthracene	620	230	**32**	385	320	NS	NS	108	**300**			**120**			**59**			**110**			**130**			**110**			**1,700**			**340**			**970**			**390**			**200**			5.2			3.0	U		27			13			7.8	U		**140**			**2,800**			**1,800**		
Benzo(a)pyrene	62	400	**32**	782	370	NS	NS	150	**230**			**99**			**61**			**110**			**88**			**120**			**1,900**			**290**			**950**			**290**			**200**			3.3			3.0	U		27			12			7.8	U		**120**			**2,600**			**1,800**		
Benzo(b)fluoranthene	620	NS	NS	NS	NS	NS	NS	NS	250			96			59			120			130			92			2,200			340			900			360			160			4.7			3.5			22			11			7.9			82			2,800			1,300		
Benzo(g,h,i)perylene	NS	NS	NS	NS	**170**	NS	NS	NS	150			63			40			33			30			74			**550**			110			**500**			150			110			2.8	U		3.0	U		17			8.7			7.8	U		75			**410**			**650**		
Benzo(k)fluoranthene	6,200	NS	NS	NS	**240**	NS	NS	NS	110			62			36			88			63			94			**890**			220			**840**			150			160			3.9			3.0	U		19			8.9			7.8	U		87			**2,600**			**1,300**		
Chrysene	62,000	400	**57**	862	340	NS	NS	166	**300**			**120**			**80**			**99**			**120**			**130**			**1,900**			**330**			**1,100**			**340**			**250**			5.4			3.1			22			13			8.6			**130**			**3,100**			**1,900**		
Dibenz(a,h)anthracene	62	60	NS	NS	60	NS	NS	**33**	**42**			16			8.8			10			9.9			20			**210**			**36**			**170**			**49**			29			2.8	U		3.0	U		5.0			3.1	U		7.8	U		23			**200**	J		**230**		
Fluoranthene	230,000	600	**111**	2,355	750	NS	NS	423	**540**			**190**			**130**			**270**			**270**			**240**			**2,700**			**700**			**2,900**			**820**			**440**			13	J	I	5.0			44			25			13			**220**			**5,100**	J	I	**2,700**		
Fluorene	270,000	**35**	NS	NS	190	540	NS	77	**88**	J	I	14			18			19			**120**			24			**370**	J	H	27			**110**			**110**	J	H	**40**			2.8	UJ	L	3.0	UJ	L	3.1	UJ	L	3.1	UJ	L	7.8	U		9.8	J	L	**310**			**51**		
Indeno(1,2,3-cd)pyrene	620	NS	NS	NS	**200**	NS	NS	NS	150			59			36			35			34			69			**700**			120			**540**			170			100			2.8	U		3.0	U		17			7.8			7.8	U		67			**590**			**720**		
Methylnaphthalene (2-)	NS	**65**	NS	NS	NS	NS	NS	NS	37	J	I	7.0			28			14			**240**			17			37			26			7.7	U		9.3			8.4			2.8	UJ	I	3.0	U		3.1	U		8.3			7.8	U		22			**250**	J		27		
Naphthalene	5,600	340	NS	NS	NS	480	NS	**176**	25			9.1			45			17			**730**			49			50			71			9.0			16			12			2.8	U		3.0	U		3.1	U		10			7.8	U		9.1			**760**	J	I	61		
Phenanthrene	NS	225	**42**	515	560	NS	NS	204	**580**			**160**			**120**			**220**			**310**			**190**			**1,800**			**390**			**1,600**			**650**			**380**			2.8	U		3.1			14			16			7.8	U		**150**			**2,700**	J	I	**690**		
Pyrene	230,000	350	**53**	875	490	NS	NS	195	**640**			**220**			**140**			**260**			**230**			**270**			**2,100**			**680**			**1,900**			**730**			**440**			12	J	I	4.4			39			24			11			**230**			**4,600**			**2,100**		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	3,639			1,299.1			923.8			1,489			2,723.9			1,598			18,107			3,846			12,932			4,517.3			2,705.4			47.5			19.1			267.2			165			40.5			1,454.2			30,830			16,130		
Other SVOCs																																																																	
Benzoic acid	24,000,000	NS	NS	NS	NS	NS	NS	NS	54	J	L		R		41	J	L	79	J	L		R			R		43	J	L	40	J	L		R		44	J	L		R		110	UJ	L	120	UJ	L	120	UJ	L	47	J	L		R		120	UJ	L	1,200	J	L	120	J	L
Benzyl Alcohol	1,800,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U		200	UJ	L	250	U		240	U		190	UJ	L	240	U		200	UJ	L	110	U		120	U		120	U		120	U		200	UJ	L	120	U		57	J		210	UJ	L
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
bis(2-Chloroethyl)ether	220	NS	NS	NS	NS	NS	NS	NS	35	UJ		45	UJ		41	UJ		40	UJ		42	UJ					44	UJ		41	UJ					42	UJ					41	UJ		43	UJ		45	UJ		44	UJ					43	UJ		52	UJ				
bis(2-Chloroisopropyl)ether	2,900	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
bis(2-Ethylhexyl)phthalate	35,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		6,500			460			360	U		600			310			420	U		44	J		300	U		110	U		120	U		120	U		120	U		330	U		120	U		380			400	U	
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	**1,300**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Butylbenzylphthalate	1,200,000	NS	NS	NS	NS	**11,000**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		290	J				
Carbazole	24,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U		200	U		340			50	J		230			110	J		200	U		110	U		120	U		120	U		120	U		200	U		120	U		210	J		210	U	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Chloroaniline (4-)	24,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	UJ	L	120	UJ	L	120	UJ	L	120	UJ	L				120	UJ	L	300	U				
Chloronaphthalene (2-)	490,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Chlorophenol (2-)	6,300	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Dibenzofuran	15,000	NS	NS	NS	NS	**2,000**	NS	NS	200	U		260	U		230	U		230	U		120	J					120	J		240	U					240	U					110	U		120	U		120	U		120	U					120	U		150	J				
Dichlorobenzene (1,2-)	110,000	NS	NS	NS	NS	**340**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Dichlorobenzene (1,3-)	53,000	NS	NS	NS	NS	**1,700**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Dichlorobenzene (1,4-)	3,400	NS	NS	NS	NS	**350**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Dichlorobenzidine (3,3'-)	1,100	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	UJ	L	120	UJ	L	120	UJ	L	120	UJ	L				120	UJ	L	300	U				
Dichlorophenol (2,4-)	18,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Diethylphthalate	4,900,000	NS	NS	NS	NS	**630**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Dimethylphenol (2,4-)	120,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	UJ	L	120	UJ	L	120	UJ	L	120	UJ	L				120	UJ	L	120	J	H			
Dimethylphthalate	61,000,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Di-n-butylphthalate	610,000	NS	NS	NS	NS	**11,000**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Dinitro-2-methylphenol (4,6-)	610	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					280	U		300	U		310	U		310	U					300	U		300	U				
Dinitrophenol (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS	500	UJ	L	650	UJ	L	580	UJ	L	570	UJ	L	600	UJ	L				630	UJ	L	590	UJ	L				610	UJ	L				110	UJ	I	120	UJ	I	120	UJ	I	120	UJ	I				120	UJ	I	750	UJ	L			
Dinitrotoluene (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Dinitrotoluene (2,6-)	6,100	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Di-n-octylphthalate	240,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		53	J		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Hexachlorobenzene	300	NS	NS	NS	**20**	NS	NS	NS	28	UJ		36	UJ		33	UJ		32	UJ		34	UJ					35	UJ		33	UJ					34	UJ					41	UJ		43	UJ		45	UJ		44	UJ					43	UJ		42	UJ				
Hexachlorobutadiene	1,800	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Hexachlorocyclopentadiene	37,000	NS	NS	NS	NS	NS	NS	NS	200	UJ	L	260	U		230	U		230	U		240	U					250	U		240	U					240	U						R			R			R			R						R		300	UJ	L			
Hexachloroethane	6,100	NS	NS	NS	NS	**1,000**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Isophorone	510,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Methylphenol (2-)	310,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Methylphenol (4-)	31,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		200	J				
Nitroaniline (2-)	18,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Nitroaniline (3-)	1,800	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Nitroaniline (4-)	18,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Nitrobenzene	2,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Nitrophenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Nitroso-di-n-propylamine (N-)	69	NS	NS	NS	NS	NS	NS	NS	35	UJ		45	UJ		41	UJ		40	UJ		42	UJ					44	UJ		41	UJ					42	UJ					41	UJ		43	UJ		45	UJ		44	UJ					43	UJ		52	UJ				
Nitrosodiphenylamine (N-)	99,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Pentachlorophenol	3,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Phenol	1,800,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		81	J				
Trichlorobenzene (1,2,4-)	6,200	NS	NS	NS	NS	**9,200**	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Trichlorophenol (2,4,5-)	610,000	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Trichlorophenol (2,4,6-)	610	NS	NS	NS	NS	NS	NS	NS	200	U		260	U		230	U		230	U		240	U					250	U		240	U					240	U					110	U		120	U		120	U		120	U					120	U		300	U				
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	54			-			41			6,632			580			-			1,103			400			230			198			-			-			-			-			47			-			-			2,688			120		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	3,693			1,299.1			964.8			8,121			3,303.9			1,598			19,210			4,246			13,162			4,715.3			2,705.4			47.5			19.1			267.2			212			40.5			1,454.2			33,518			16,250		

TABLE 15C
Summary of Sediment Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Concentrations in µg/kg

Analyte	COPC Screening Levels: Human Health: USEPA Region IX Res. Soil PRGs	COPC Screening Levels: Ecological: 1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Lewis Pond Sediments (cont.): LP-02 ~0-0.3' 7/31/2001	LP-03 ~0-0.4' 7/31/2001	LP-04 ~0-0.5' 7/31/2001	LP-05 ~0-0.5' 7/30/2001	LP-06 ~0-0.5' 7/30/2001	LP-06 ~0-0.5' 12/18/2002	LP-07 ~0-0.5' 7/30/2001	LP-08 ~0-0.5' 7/30/2001	LP-09 ~0-0.5' 7/30/2001	LP-09 ~0-0.5' 12/18/2002	LP-10 ~0-0.5' 7/30/2001	Lower Pond (Norwood, Massachusetts) Reference Sediments: SedRNwd-01 ~0-0.5' 12/17/2002	SedRNwd-02 ~0-0.5' 12/17/2002	SedRNwd-03 ~0-0.5' 12/17/2002	SedRNwd-04 ~0-0.5' 12/17/2002	SedRNwd-05 ~0-0.5' 12/17/2002	SedRNwd-06 ~0-0.5' 12/17/2002	SedRNwd-07 ~0-0.5' 12/17/2002
									Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias	Result / Qualifier / Bias
PAHs																									
Acenaphthene	370,000	**150**	NS	NS	NS	NS	NS	NS	76 J	62 J	**230** J	87 J	120 J	**180**	**170** J	140 J	100 J	71	**160** J	**200**	**190**	**450**	120	82	**170**	**240**
Acenaphthylene	NS	NS	NS	NS	NS	NS	NS	NS	550	420	750	620	720	850	700	500	290	320	540	210	82	540	350	81	490	800
Anthracene	2,200,000	85	NS	NS	220	NS	NS	**57**	**440**	**390**	**830**	**520**	**580**	**1,100**	**890**	**610**	**400**	**360**	**790**	**590**	**540**	**1,500**	**530**	**330**	**830**	**1,000**
Benzo(a)anthracene	620	230	**32**	385	320	NS	NS	108	**1,200**	**1,000**	**2,300**	**1,300**	**1,600**	**3,400**	**2,100**	**1,700**	**1,000**	**1,200**	**2,400**	**2,000**	**830**	**5,900**	**1,900**	**1,000**	**2,700**	**3,400**
Benzo(a)pyrene	62	400	**32**	782	370	NS	NS	150	**1,200**	**1,000**	**2,200** J L	**1,600**	**1,600** J L	**3,700**	**2,000** J L	**1,800** J L	**900**	**1,600**	**2,200** J L	**2,400**	**750**	**6,000**	**2,600**	**1,200**	**3,100**	**4,100**
Benzo(b)fluoranthene	620	NS	NS	NS	NS	NS	NS	NS	1,400	1,400	2,800 J L	2,200	2,100 J L	4,000	2,500 J L	2,800 J L	1,300	2,100	3,900 J L	2,500	620	6,100	3,600	1,200	3,400	4,900
Benzo(g,h,i)perylene	NS	NS	NS	NS	**170**	NS	NS	NS	**330**	**300**	**390** J L	**320**	**300** J L	**530** J L	**300** J L	**380** J L	**190** J	**310** J L	**520** J L	**950**	**310**	**1,700** J L	**710** J L	**470**	**690** J L	**900** J L
Benzo(k)fluoranthene	6,200	NS	NS	NS	**240**	NS	NS	NS	**1,400**	**950**	**2,100** J L	**2,000**	**2,100** J L	**3,900**	**2,300** J L	**2,300** J L	**1,000**	**2,000**	**3,900** J L	**2,300**	**720**	**5,400**	**3,000**	**1,100**	**3,400**	**4,700**
Chrysene	62,000	400	**57**	862	340	NS	NS	166	**1,500**	**1,500**	**2,500**	**1,700**	**2,000**	**4,100**	**2,100**	**2,100**	**1,100**	**1,900**	**2,900**	**2,700**	**970**	**7,200**	**3,100**	**1,300**	**3,600**	**4,900**
Dibenz(a,h)anthracene	62	60	NS	NS	60	NS	NS	**33**	**150** J	**120** J	**140** J L	**100** J	**110** J L	**250**	**130** J L	**140** J L	**100** J	**130**	**140** J L	**290**	**110**	**690**	**250**	**140**	**250**	**350**
Fluoranthene	230,000	600	**111**	2,355	750	NS	NS	423	**2,300**	**2,000**	**3,900**	**2,700**	**2,800**	**6,100**	**3,200**	**3,100**	**2,000**	**2,600**	**4,900**	**4,600**	**2,000**	**15,000**	**4,600**	**3,000**	**5,100**	**7,400**
Fluorene	270,000	**35**	NS	NS	190	540	NS	77	**140** J	**110** J	**360**	**190** J	**210** J	**340**	**300**	**280**	**170** J	**130**	**300** J	**330**	**230**	**750**	**220**	**150**	**340**	**410**
Indeno(1,2,3-cd)pyrene	620	NS	NS	NS	**200**	NS	NS	NS	**430**	**420**	**470** J L	**400**	**410** J L	**710**	**360** J L	**480** J L	**240** J	**410**	**540** J L	**1,000**	**330**	**2,200**	**820**	**530**	**850**	**1,100**
Methylnaphthalene (2-)	NS	**65**	NS	NS	NS	NS	NS	NS	**130** J	**120** J	**160** J	**190** J	**160** J	**190**	**150** J	**130** J	**94** J	**71**	**160** J	**76**	61	**110**	**73**	21	**120**	**220**
Naphthalene	5,600	340	NS	NS	NS	480	NS	**176**	**240** J	**220** J	**290** J	**370**	**320**	**350**	**230**	**250** J	**180** J	130	**290** J	88	86	160	100	30 EB	170	**310**
Phenanthrene	NS	225	**42**	515	560	NS	NS	204	**1,400**	**1,200**	**2,300**	**1,600**	**1,600**	**2,200**	**1,800**	**1,900**	**1,100**	**1,400**	**2,400**	**3,300**	**2,000**	**7,100**	**2,500**	**1,900**	**3,800**	**4,500**
Pyrene	230,000	350	**53**	875	490	NS	NS	195	**2,100**	**2,000**	**4,500**	**2,500**	**3,000**	**7,300**	**3,200**	**4,100**	**1,900**	**3,100**	**5,200**	**4,100**	**1,900**	**13,000**	**4,700**	**2,300**	**5,900**	**7,300**
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	14,986	13,212	26,220	18,397	19,730	39,200	22,430	22,710	12,064	17,832	31,240	27,634	11,729	73,800	29,173	14,834	34,910	46,530
Other SVOCs																										
Benzoic acid	24,000,000	NS	NS	NS	NS	NS	NS	NS	1,000 J L	990 J L	1,600 J L	850 J L	1,000	R	930 J L	1,100 J L	640 J L	690 J L	1,200 J L	220 J L	130 J L	950 J L	1,500 J L	210 J L	590 J L	1,100 J L
Benzyl Alcohol	1,800,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	100 J	260 U	240 U	370 UJ L	87 J	68 J	47 J	310 UJ L	54 J	210 UJ L	200 UJ L	300 UJ L	410 UJ L	200 UJ L	270 UJ L	320 UJ L
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
bis(2-Chloroethyl)ether	220	NS	NS	NS	NS	NS	NS	NS	54 UJ	46 UJ	50 UJ	45 UJ	43 UJ		40 UJ	49 UJ	43 UJ		54 UJ	85 UJ	79 UJ	120 UJ	160 UJ	79 UJ	110 UJ	130 UJ
bis(2-Chloroisopropyl)ether	2,900	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
bis(2-Ethylhexyl)phthalate	35,000	NS	NS	NS	NS	NS	NS	NS	220 J	300	920	360	330	710 U	310	1,300	590	1,900 U	3,000	4,100 EB	530 U	2,700 U	5,400 EB	1,600 U	2,900 U	2,300 U
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	**1,300**	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Butylbenzylphthalate	1,200,000	NS	NS	NS	NS	**11,000**	NS	NS	160 J	140 J	620	220 J	290		91 J	650	160 J		530	200 J	200 U	350	830	390	900	560
Carbazole	24,000	NS	NS	NS	NS	NS	NS	NS	150 J	120 J	190 J	160 J	170 J	180 J	140 J	160 J	100 J	160 J	280 J	240 J I	210	790	290 J	250	310	400
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Chloroaniline (4-)	24,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 UJ L		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Chloronaphthalene (2-)	490,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Chlorophenol (2-)	6,300	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Dibenzofuran	15,000	NS	NS	NS	NS	**2,000**	NS	NS	71 J	61 J	140 J	110 J	120 J		120 J	150 J	86 J		160 J	160 J	170 J	320	410 U	95 J	180 J	220 J
Dichlorobenzene (1,2-)	110,000	NS	NS	NS	NS	**340**	NS	NS	59 J	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Dichlorobenzene (1,3-)	53,000	NS	NS	NS	NS	**1,700**	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Dichlorobenzene (1,4-)	3,400	NS	NS	NS	NS	**350**	NS	NS	54 J	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Dichlorobenzidine (3,3'-)	1,100	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	R		230 U	280 U	250 U		310 U	210 U	200 UJ L	300 U	410 U	200 U	270 U	320 U
Dichlorophenol (2,4-)	18,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Diethylphthalate	4,900,000	NS	NS	NS	NS	**630**	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Dimethylphenol (2,4-)	120,000	NS	NS	NS	NS	NS	NS	NS	62 J H	52 J H	65 J H	87 J H	97 J H		67 J H	68 J H	250 U		62 J H	210 UJ L	200 UJ L	300 UJ L	410 UJ L	200 UJ L	270 UJ L	320 UJ L
Dimethylphthalate	61,000,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Di-n-butylphthalate	610,000	NS	NS	NS	NS	**11,000**	NS	NS	310 U	260 U	62 J	56 J	43 J		230 U	58 J	72 J		61 J	210 U	200 U	300 U	410 U	170 J	150 J	320 U
Dinitro-2-methylphenol (4,6-)	610	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	R		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Dinitrophenol (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS	780 UJ L	660 UJ L	720 UJ L	640 UJ L	R		570 UJ L	710 UJ L	620 UJ L		780 UJ L	210 UJ L	200 UJ L	300 UJ L	410 UJ L	200 UJ L	270 UJ L	320 UJ L
Dinitrotoluene (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Dinitrotoluene (2,6-)	6,100	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Di-n-octylphthalate	240,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 UJ L	260 U	240 UJ L		230 UJ L	280 UJ L	250 U		310 UJ L	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Hexachlorobenzene	300	NS	NS	NS	**20**	NS	NS	NS	43 UJ	37 UJ	40 UJ	36 UJ	34 UJ		32 UJ	39 UJ	35 UJ		43 UJ	85 UJ	79 UJ	120 UJ	160 UJ	79 UJ	110 UJ	130 UJ
Hexachlorobutadiene	1,800	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Hexachlorocyclopentadiene	37,000	NS	NS	NS	NS	NS	NS	NS	310 UJ L	260 UJ L	290 UJ L	260 UJ L	R		230 UJ L	280 UJ L	250 UJ L		310 UJ L	210 UJ I	R	300 UJ I	410 UJ I	200 UJ I	270 UJ I	320 UJ I
Hexachloroethane	6,100	NS	NS	NS	NS	**1,000**	NS	NS	310 U	260 U	290 U	260 U	R		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Isophorone	510,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Methylphenol (2-)	310,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Methylphenol (4-)	31,000	NS	NS	NS	NS	NS	NS	NS	82 J	96 J	210 J	120 J	140 J		550	140 J	74 J		130 J	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Nitroaniline (2-)	18,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Nitroaniline (3-)	1,800	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	R		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Nitroaniline (4-)	18,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	R		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Nitrobenzene	2,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Nitrophenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Nitroso-di-n-propylamine (N-)	69	NS	NS	NS	NS	NS	NS	NS	54 UJ	46 UJ	50 UJ	45 UJ	43 UJ		40 UJ	49 UJ	43 UJ		54 UJ	85 UJ	79 UJ	120 UJ	160 UJ	79 UJ	110 UJ	130 UJ
Nitrosodiphenylamine (N-)	99,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Pentachlorophenol	3,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	210 J	410 U	200 U	270 U	320 U
Phenol	1,800,000	NS	NS	NS	NS	NS	NS	NS	310 U	58 J	69 J	81 J	74 J		110 J	82 J	48 J		98 J	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Trichlorobenzene (1,2,4-)	6,200	NS	NS	NS	NS	**9,200**	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Trichlorophenol (2,4,5-)	610,000	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Trichlorophenol (2,4,6-)	610	NS	NS	NS	NS	NS	NS	NS	310 U	260 U	290 U	260 U	240 U		230 U	280 U	250 U		310 U	210 U	200 U	300 U	410 U	200 U	270 U	320 U
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	1,858	1,817	3,976	2,044	2,264	180	2,405	3,776	1,817	850	5,575	4,920	510	2,620	8,020	1,115	2,270	2,280
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	16,844	15,029	30,196	20,441	21,994	39,380	24,835	26,486	13,881	18,682	36,815	32,554	12,239	76,420	37,193	15,949	37,180	48,810

TABLE 15C
Summary of Sediment Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

COPC Screening Levels

Analyte	Human Health: USEPA Region IX Res. Soil PRGs	Ecological: 1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs
PAHs								
Acenaphthene	370,000	**150**	NS	NS	NS	NS	NS	NS
Acenaphthylene	NS	NS	NS	NS	NS	NS	NS	NS
Anthracene	2,200,000	85	NS	NS	220	NS	NS	**57**
Benzo(a)anthracene	620	230	**32**	385	320	NS	NS	108
Benzo(a)pyrene	62	400	**32**	782	370	NS	NS	150
Benzo(b)fluoranthene	620	NS	NS	NS	NS	NS	NS	NS
Benzo(g,h,i)perylene	NS	NS	NS	NS	**170**	NS	NS	NS
Benzo(k)fluoranthene	6,200	NS	NS	NS	**240**	NS	NS	NS
Chrysene	62,000	400	**57**	862	340	NS	NS	166
Dibenz(a,h)anthracene	62	60	NS	NS	60	NS	NS	**33**
Fluoranthene	230,000	600	**111**	2,355	750	NS	NS	423
Fluorene	270,000	**35**	NS	NS	190	540	NS	77
Indeno(1,2,3-cd)pyrene	620	NS	NS	NS	**200**	NS	NS	NS
Methylnaphthalene (2-)	NS	**65**	NS	NS	NS	NS	NS	NS
Naphthalene	5,600	340	NS	NS	NS	480	NS	**176**
Phenanthrene	NS	225	**42**	515	560	NS	NS	204
Pyrene	230,000	350	**53**	875	490	NS	NS	195
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS
Other SVOCs								
Benzoic acid	24,000,000	NS	NS	NS	NS	NS	NS	NS
Benzyl Alcohol	1,800,000	NS	NS	NS	NS	NS	NS	NS
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS
bis(2-Chloroethyl)ether	220	NS	NS	NS	NS	NS	NS	NS
bis(2-Chloroisopropyl)ether	2,900	NS	NS	NS	NS	NS	NS	NS
bis(2-Ethylhexyl)phthalate	35,000	NS	NS	NS	NS	NS	NS	NS
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	**1,300**	NS	NS
Butylbenzylphthalate	1,200,000	NS	NS	NS	NS	**11,000**	NS	NS
Carbazole	24,000	NS	NS	NS	NS	NS	NS	NS
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS
Chloroaniline (4-)	24,000	NS	NS	NS	NS	NS	NS	NS
Chloronaphthalene (2-)	490,000	NS	NS	NS	NS	NS	NS	NS
Chlorophenol (2-)	6,300	NS	NS	NS	NS	NS	NS	NS
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS
Dibenzofuran	15,000	NS	NS	NS	NS	**2,000**	NS	NS
Dichlorobenzene (1,2-)	110,000	NS	NS	NS	NS	**340**	NS	NS
Dichlorobenzene (1,3-)	53,000	NS	NS	NS	NS	**1,700**	NS	NS
Dichlorobenzene (1,4-)	3,400	NS	NS	NS	NS	**350**	NS	NS
Dichlorobenzidine (3,3'-)	1,100	NS	NS	NS	NS	NS	NS	NS
Dichlorophenol (2,4-)	18,000	NS	NS	NS	NS	NS	NS	NS
Diethylphthalate	4,900,000	NS	NS	NS	NS	**630**	NS	NS
Dimethylphenol (2,4-)	120,000	NS	NS	NS	NS	NS	NS	NS
Dimethylphthalate	61,000,000	NS	NS	NS	NS	NS	NS	NS
Di-n-butylphthalate	610,000	NS	NS	NS	NS	**11,000**	NS	NS
Dinitro-2-methylphenol (4,6-)	610	NS	NS	NS	NS	NS	NS	NS
Dinitrophenol (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS
Dinitrotoluene (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS
Dinitrotoluene (2,6-)	6,100	NS	NS	NS	NS	NS	NS	NS
Di-n-octylphthalate	240,000	NS	NS	NS	NS	NS	NS	NS
Hexachlorobenzene	300	NS	NS	NS	**20**	NS	NS	NS
Hexachlorobutadiene	1,800	NS	NS	NS	NS	NS	NS	NS
Hexachlorocyclopentadiene	37,000	NS	NS	NS	NS	NS	NS	NS
Hexachloroethane	6,100	NS	NS	NS	NS	**1,000**	NS	NS
Isophorone	510,000	NS	NS	NS	NS	NS	NS	NS
Methylphenol (2-)	310,000	NS	NS	NS	NS	NS	NS	NS
Methylphenol (4-)	31,000	NS	NS	NS	NS	NS	NS	NS
Nitroaniline (2-)	18,000	NS	NS	NS	NS	NS	NS	NS
Nitroaniline (3-)	1,800	NS	NS	NS	NS	NS	NS	NS
Nitroaniline (4-)	18,000	NS	NS	NS	NS	NS	NS	NS
Nitrobenzene	2,000	NS	NS	NS	NS	NS	NS	NS
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS
Nitrophenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS
Nitroso-di-n-propylamine (N-)	69	NS	NS	NS	NS	NS	NS	NS
Nitrosodiphenylamine (N-)	99,000	NS	NS	NS	NS	NS	NS	NS
Pentachlorophenol	3,000	NS	NS	NS	NS	NS	NS	NS
Phenol	1,800,000	NS	NS	NS	NS	NS	NS	NS
Trichlorobenzene (1,2,4-)	6,200	NS	NS	NS	NS	**9,200**	NS	NS
Trichlorophenol (2,4,5-)	610,000	NS	NS	NS	NS	NS	NS	NS
Trichlorophenol (2,4,6-)	610	NS	NS	NS	NS	NS	NS	NS
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS

Concentrations in μg/kg

Lower Pond (Norwood, MA) Ref. Sediments

Analyte	SedRNwd-08 ~0-0.5' 12/17/2002			SedRNwd-09 ~0-0.5' 12/17/2002			SedRNwd-10 ~0-0.5' 12/17/2002		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs									
Acenaphthene	**180**			130			**470**		
Acenaphthylene	550			380			920		
Anthracene	**830**			**530**			**1,600**		
Benzo(a)anthracene	**2,600**			**2,100**			**3,800**		
Benzo(a)pyrene	**3,000**			**2,800**			**4,400**		
Benzo(b)fluoranthene	3,900			3,700			3,800		
Benzo(g,h,i)perylene	**600**	J	L	**610**	J	L	**790**	J	L
Benzo(k)fluoranthene	**3,600**			**3,400**			**5,000**		
Chrysene	**3,500**			**3,200**			**5,100**		
Dibenz(a,h)anthracene	**230**			**210**			**330**		
Fluoranthene	**4,500**			**5,700**			**8,500**		
Fluorene	**310**			**220**			**1,200**		
Indeno(1,2,3-cd)pyrene	**770**			**760**			**1,000**		
Methylnaphthalene (2-)	**160**			**71**			**460**		
Naphthalene	**210**			110			**420**		
Phenanthrene	**2,600**			**2,500**			**6,300**		
Pyrene	**5,500**			**5,100**			**8,400**		
Total PAHs	33,040			31,521			52,490		
Other SVOCs									
Benzoic acid	630	J	L	1,100	J	L	640	J	L
Benzyl Alcohol	230	UJ	L	340	UJ	L	260	UJ	L
bis(2-Chloroethoxy)methane	230	U		340	U		260	U	
bis(2-Chloroethyl)ether	92	UJ		140	UJ		110	UJ	
bis(2-Chloroisopropyl)ether	230	U		340	U		260	U	
bis(2-Ethylhexyl)phthalate	1,700	U		4,000	EB		1,600	U	
Bromophenyl-phenylether (4-)	230	U		340	U		260	U	
Butylbenzylphthalate	210	J		2,000			260	U	
Carbazole	310			260	J		420		
Chloro-3-methylphenol (4-)	230	U		340	U		260	U	
Chloroaniline (4-)	230	U		340	U		260	U	
Chloronaphthalene (2-)	230	U		340	U		260	U	
Chlorophenol (2-)	230	U		340	U		260	U	
Chlorophenyl-phenylether (4-)	230	U		340	U		260	U	
Dibenzofuran	170	J		340	U		360		
Dichlorobenzene (1,2-)	230	U		340	U		260	U	
Dichlorobenzene (1,3-)	230	U		340	U		260	U	
Dichlorobenzene (1,4-)	230	U		340	U		260	U	
Dichlorobenzidine (3,3'-)	230	U		340	U		260	U	
Dichlorophenol (2,4-)	230	U		340	U		260	U	
Diethylphthalate	230	U		160	J		260	U	
Dimethylphenol (2,4-)	230	UJ	L	340	UJ	L	260	UJ	L
Dimethylphthalate	230	U		340	U		260	U	
Di-n-butylphthalate	230	U		220	J		260	U	
Dinitro-2-methylphenol (4,6-)	230	U		340	U		260	U	
Dinitrophenol (2,4-)	230	UJ	L	340	UJ	L	260	UJ	L
Dinitrotoluene (2,4-)	230	U		340	U		260	U	
Dinitrotoluene (2,6-)	230	U		340	U		260	U	
Di-n-octylphthalate	230	U		340	U		260	U	
Hexachlorobenzene	92	UJ		140	UJ		110	UJ	
Hexachlorobutadiene	230	U		340	U		260	U	
Hexachlorocyclopentadiene	230	UJ	I	340	UJ	I	260	UJ	I
Hexachloroethane	230	U		340	U		260	U	
Isophorone	230	U		340	U		260	U	
Methylphenol (2-)	230	U		340	U		260	U	
Methylphenol (4-)	230	U		340	U		260	U	
Nitroaniline (2-)	230	U		340	U		260	U	
Nitroaniline (3-)	230	U		340	U		260	U	
Nitroaniline (4-)	230	U		340	U		260	U	
Nitrobenzene	230	U		340	U		260	U	
Nitrophenol (2-)	230	U		340	U		260	U	
Nitrophenol (4-)	230	U		340	U		260	U	
Nitroso-di-n-propylamine (N-)	92	UJ		140	UJ		110	UJ	
Nitrosodiphenylamine (N-)	230	U		340	U		260	U	
Pentachlorophenol	230	U		340	U		260	U	
Phenol	230	U		340	U		260	U	
Trichlorobenzene (1,2,4-)	230	U		340	U		260	U	
Trichlorophenol (2,4,5-)	230	U		340	U		260	U	
Trichlorophenol (2,4,6-)	230	U		340	U		260	U	
Total Other SVOCs	1,320			7,740			1,420		
Total SVOCs	34,360			39,261			53,910		

Flood Plain Sediments

Analyte	FP-01 ~0-1' 10/10/2001			FP-02 ~0-1' 10/10/2001			FP-03 ~0-1' 10/10/2001			FP-04 ~0-1' 10/10/2001		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs												
Acenaphthene	36			11			22			17		
Acenaphthylene	230			50			160			87		
Anthracene	**150**			47			**140**			**86**		
Benzo(a)anthracene	**730**			**170**			**530**			**370**		
Benzo(a)pyrene	**660**			**170**			**610**			**420**		
Benzo(b)fluoranthene	570			200			800			430		
Benzo(g,h,i)perylene	**210**			110			**210**			130		
Benzo(k)fluoranthene	**580**			140			**530**			**400**		
Chrysene	**880**			**240**			**790**			**570**		
Dibenz(a,h)anthracene	**54**			25			**54**			**41**		
Fluoranthene	**1,200**			**320**			**1,300**			**890**		
Fluorene	**58**			18			**98**			34		
Indeno(1,2,3-cd)pyrene	**220**			96			**220**			170		
Methylnaphthalene (2-)	32			15			35			24		
Naphthalene	75			26			56			42		
Phenanthrene	**700**			**220**			**790**			**550**		
Pyrene	**1,500**			**350**			**1,200**			**810**		
Total PAHs	7,885			2,208			7,545			5,071		
Other SVOCs												
Benzoic acid	150	J		260			830			50	J	L
Benzyl Alcohol	220	U		220	U		230	U		190	U	
bis(2-Chloroethoxy)methane	220	U		220	U		230	U		190	U	
bis(2-Chloroethyl)ether	38	UJ		38	UJ		40	UJ		34	UJ	
bis(2-Chloroisopropyl)ether	220	U		220	U		230	U		190	U	
bis(2-Ethylhexyl)phthalate	220	U		92	J		72	J		51	J	
Bromophenyl-phenylether (4-)	220	U		220	U		230	U		190	U	
Butylbenzylphthalate	220	U		220	U		230	U		190	U	
Carbazole	220	U		220	U		85	J		66	J	
Chloro-3-methylphenol (4-)	220	U		220	U		230	U		190	U	
Chloroaniline (4-)	220	U		220	U		230	U		190	U	
Chloronaphthalene (2-)	220	U		220	U		230	U		190	U	
Chlorophenol (2-)	220	U		220	U		230	U		190	U	
Chlorophenyl-phenylether (4-)	220	U		220	U		230	U		190	U	
Dibenzofuran	220	U		220	U		40	J		190	U	
Dichlorobenzene (1,2-)	220	U		220	U		230	U		40	J	
Dichlorobenzene (1,3-)	220	U		220	U		230	U		190	U	
Dichlorobenzene (1,4-)	220	U		220	U		230	U		190	U	
Dichlorobenzidine (3,3'-)	220	U		220	U		230	U		190	U	
Dichlorophenol (2,4-)	220	U		220	U		230	U		190	U	
Diethylphthalate	220	U		220	U		230	U		190	U	
Dimethylphenol (2,4-)	220	U		220	U		230	U		190	U	
Dimethylphthalate	220	U		220	U		230	U		190	U	
Di-n-butylphthalate	220	U		220	U		230	U		190	U	
Dinitro-2-methylphenol (4,6-)	220	U		220	U		230	U		190	U	
Dinitrophenol (2,4-)	220	UJ	I	220	UJ	I	230	UJ	I	190	UJ	I
Dinitrotoluene (2,4-)	220	U		220	U		230	U		190	U	
Dinitrotoluene (2,6-)	220	U		220	U		230	U		190	U	
Di-n-octylphthalate	220	U		220	U		230	U		190	U	
Hexachlorobenzene	30	UJ		31	UJ		32	UJ		27	UJ	
Hexachlorobutadiene	220	U		220	U		230	U		190	U	
Hexachlorocyclopentadiene	220	U		220	U		230	UJ	I	190	U	
Hexachloroethane	220	U		220	U		230	U		190	U	
Isophorone	220	U		220	U		230	U		190	U	
Methylphenol (2-)	220	U		220	U		230	U		190	U	
Methylphenol (4-)	220	U		220	U		230	U		190	U	
Nitroaniline (2-)	220	U		220	U		230	U		190	U	
Nitroaniline (3-)	220	U		220	U		230	U		190	U	
Nitroaniline (4-)	220	U		220	U		230	U		190	U	
Nitrobenzene	220	U		220	U		230	U		190	U	
Nitrophenol (2-)	220	U		220	U		230	U		190	U	
Nitrophenol (4-)	220	U		220	U		49	J		190	U	
Nitroso-di-n-propylamine (N-)	38	UJ		38	UJ		40	UJ		34	UJ	
Nitrosodiphenylamine (N-)	220	U		220	U		230	U		190	U	
Pentachlorophenol	220	U		220	U		230	U		190	U	
Phenol	220	U		220	U		230	U		190	U	
Trichlorobenzene (1,2,4-)	220	U		220	U		230	U		190	U	
Trichlorophenol (2,4,5-)	220	U		220	U		230	U		190	U	
Trichlorophenol (2,4,6-)	220	U		220	U		230	U		190	U	
Total Other SVOCs	150			352			1,076			207		
Total SVOCs	8,035			2,560			8,621			5,278		

Analyte	FP-05 ~0-1' 10/10/2001			FP-05 ~0-1' 8/5/2003			FP-05 ~1-3' 8/5/2003			FP-06 ~0-1' 10/10/2001			FP-06 ~0-1' 8/5/2003			FP-06 ~1-3' 8/5/2003		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																		
Acenaphthene	53			57			10	U		**1,300**			47			11		
Acenaphthylene	220			220			16			59			49			73		
Anthracene	**210**			**200**			12			**1,500**			**120**			45		
Benzo(a)anthracene	**790**			**780**			**41**			**3,600**			**320**			**160**		
Benzo(a)pyrene	**660**			**820**			**46**			**2,700**			**320**			**170**		
Benzo(b)fluoranthene	810			980			57			3,200			320			160		
Benzo(g,h,i)perylene	160	J	L	**550**			35			**660**			**260**			110		
Benzo(k)fluoranthene	**640**			**620**			31			**1,800**			**250**			99		
Chrysene	**1,100**			**870**			46			**3,400**			**320**			**160**		
Dibenz(a,h)anthracene	**58**			**150**			10			**160**			**62**			31		
Fluoranthene	**1,500**			**1,700**			93			**10,000**			**770**			**280**		
Fluorene	**78**			**75**			10	U		**970**			**40**			21		
Indeno(1,2,3-cd)pyrene	200	J	L	**730**			48			**720**			**330**			140		
Methylnaphthalene (2-)	49			**88**			20			**310**			64			38		
Naphthalene	100			72			10	U		**600**			41			28		
Phenanthrene	**1,000**			**1,000**			**59**			**11,000**			**560**			**260**		
Pyrene	**1,400**			**1,600**			**86**			**9,200**			**650**			**330**		
Total PAHs	9,028			10,512			600			51,179			4,523			2,116		
Other SVOCs																		
Benzoic acid	140	J	L							280	J							
Benzyl Alcohol	200	U								970	U							
bis(2-Chloroethoxy)methane	200	U								970	U							
bis(2-Chloroethyl)ether	35	UJ								170	UJ							
bis(2-Chloroisopropyl)ether	200	U								970	U							
bis(2-Ethylhexyl)phthalate	210			530	EB	H	400	EB	H	170	J		260	EB	H	190	U	
Bromophenyl-phenylether (4-)	200	U								970	U							
Butylbenzylphthalate	37	J								970	U							
Carbazole	57	J		220	U		200	U		1,200			190	U		190	U	
Chloro-3-methylphenol (4-)	200	U								970	U							
Chloroaniline (4-)		R								970	U							
Chloronaphthalene (2-)	200	U								970	U							
Chlorophenol (2-)	200	U								970	U							
Chlorophenyl-phenylether (4-)	200	U								970	U							
Dibenzofuran	200	U								680	J							
Dichlorobenzene (1,2-)	200	U								970	U							
Dichlorobenzene (1,3-)	200	U								970	U							
Dichlorobenzene (1,4-)	200	U								970	U							
Dichlorobenzidine (3,3'-)		R								970	U							
Dichlorophenol (2,4-)	200	U								970	U							
Diethylphthalate	200	U								970	U							
Dimethylphenol (2,4-)	200	U								970	U							
Dimethylphthalate	200	U								970	U							
Di-n-butylphthalate	200	U								970	U							
Dinitro-2-methylphenol (4,6-)	200	UJ	L							970	U							
Dinitrophenol (2,4-)		R								970	UJ	I						
Dinitrotoluene (2,4-)	200	U								970	U							
Dinitrotoluene (2,6-)	200	U								970	U							
Di-n-octylphthalate	200	UJ	L							970	U							
Hexachlorobenzene	28	UJ								140	UJ							
Hexachlorobutadiene	200	U								970	U							
Hexachlorocyclopentadiene		R								970	UJ	I						
Hexachloroethane	200	UJ	L							970	U							
Isophorone	200	U								970	U							
Methylphenol (2-)	200	U								970	U							
Methylphenol (4-)	200	U								970	U							
Nitroaniline (2-)	200	U								970	U							
Nitroaniline (3-)	200	UJ	L							970	U							
Nitroaniline (4-)	200	UJ	L							970	U							
Nitrobenzene	200	U								970	U							
Nitrophenol (2-)	200	U								970	U							
Nitrophenol (4-)	200	U								970	U							
Nitroso-di-n-propylamine (N-)	35	UJ								170	UJ							
Nitrosodiphenylamine (N-)	200	U								970	U							
Pentachlorophenol	200	U								970	U							
Phenol	200	U								970	U							
Trichlorobenzene (1,2,4-)	200	U								970	U							
Trichlorophenol (2,4,5-)	200	U								970	U							
Trichlorophenol (2,4,6-)	200	U								970	U							
Total Other SVOCs	444			530			400			2,330			260			-		
Total SVOCs	9,472			11,042			1,000			53,509			4,783			2,116		

Analyte	FP-08 ~0-1' 10/10/2001			FP-09 ~0-1' 10/10/2001			FP-09 ~0-1' 8/5/2003			FP-09 ~1-3' 8/5/2003			FP-10 ~0-1' 10/10/2001		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs															
Acenaphthene	10	U		32			30			10	U		14		
Acenaphthylene	28			120			99			12			34		
Anthracene	24			**130**			**170**			10	U		38		
Benzo(a)anthracene	**100**			**580**			**610**			24			**150**		
Benzo(a)pyrene	**100**			**570**			**620**			22			**150**		
Benzo(b)fluoranthene	150			840			860			35			200		
Benzo(g,h,i)perylene	40			**200**			**390**			21			58		
Benzo(k)fluoranthene	120			**640**			**570**			15			190		
Chrysene	**180**			**820**			**750**			25			**250**		
Dibenz(a,h)anthracene	13			**55**			**120**			10	U		18		
Fluoranthene	**240**			**1,100**			**1,300**			49			**360**		
Fluorene	13			**100**			**89**			10	U		19		
Indeno(1,2,3-cd)pyrene	50			**210**			**570**			30			71		
Methylnaphthalene (2-)	30			**1,100**			**260**			26			34		
Naphthalene	50			**1,100**			140			12			65		
Phenanthrene	**190**			**830**			**840**			35			**270**		
Pyrene	**190**			**930**			**950**			41			**290**		
Total PAHs	1,518			9,357			8,368			347			2,211		
Other SVOCs															
Benzoic acid	100	J	L	190	J	L							100	J	L
Benzyl Alcohol	200	U		270	U								190	U	
bis(2-Chloroethoxy)methane	200	U		270	U								190	U	
bis(2-Chloroethyl)ether	35	UJ		47	UJ								34	UJ	
bis(2-Chloroisopropyl)ether	200	U		270	U								190	U	
bis(2-Ethylhexyl)phthalate	46	J		120	J		440	EB	H	230	EB	H	130	J	
Bromophenyl-phenylether (4-)	200	U		270	U								190	U	
Butylbenzylphthalate	200	U		270	U								190	U	
Carbazole	200	U		96	J		210	U		210	U		190	U	
Chloro-3-methylphenol (4-)	200	U		270	U								190	U	
Chloroaniline (4-)	200	U		270	U								190	U	
Chloronaphthalene (2-)	200	U		270	U								190	U	
Chlorophenol (2-)	200	U		270	U								190	U	
Chlorophenyl-phenylether (4-)	200	U		270	U								190	U	
Dibenzofuran	200	U		99	J								190	U	
Dichlorobenzene (1,2-)	200	U		270	U								190	U	
Dichlorobenzene (1,3-)	200	U		270	U								190	U	
Dichlorobenzene (1,4-)	200	U		270	U								190	U	
Dichlorobenzidine (3,3'-)	200	U		270	U								190	U	
Dichlorophenol (2,4-)	200	U		270	U								190	U	
Diethylphthalate	200	U		270	U								190	U	
Dimethylphenol (2,4-)	200	U		270	U								190	U	
Dimethylphthalate	200	U		270	U								190	U	
Di-n-butylphthalate	200	U		270	U								190	U	
Dinitro-2-methylphenol (4,6-)	200	U		270	U								190	U	
Dinitrophenol (2,4-)	200	UJ	I	270	UJ	I							190	UJ	I
Dinitrotoluene (2,4-)	200	U		270	U								190	U	
Dinitrotoluene (2,6-)	200	U		270	U								190	U	
Di-n-octylphthalate	200	U		270	UJ	L							190	U	
Hexachlorobenzene	28	UJ		37	UJ								27	UJ	
Hexachlorobutadiene	200	U		270	U								190	U	
Hexachlorocyclopentadiene	200	U		270	UJ	I							190	U	
Hexachloroethane	200	U		270	U								190	U	
Isophorone	200	U		270	U								190	U	
Methylphenol (2-)	200	U		270	U								190	U	
Methylphenol (4-)	200	U		93	J								190	U	
Nitroaniline (2-)	200	U		270	U								190	U	
Nitroaniline (3-)	200	U		270	U								190	U	
Nitroaniline (4-)	200	U		270	U								190	U	
Nitrobenzene	200	U		270	U								190	U	
Nitrophenol (2-)	200	U		270	U								190	U	
Nitrophenol (4-)	200	U		270	U								190	U	
Nitroso-di-n-propylamine (N-)	35	UJ		47	UJ								34	UJ	
Nitrosodiphenylamine (N-)	200	U		270	U								190	U	
Pentachlorophenol	200	U		270	U								190	U	
Phenol	200	U		270	U								190	U	
Trichlorobenzene (1,2,4-)	200	U		270	U								190	U	
Trichlorophenol (2,4,5-)	200	U		270	U								190	U	
Trichlorophenol (2,4,6-)	200	U		270	U								190	U	
Total Other SVOCs	146			598			440			230			230		
Total SVOCs	1,664			9,955			8,808			577			2,441		

TABLE 15C
Summary of Sediment Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Concentrations in µg/kg

Analyte	COPC Screening Levels								Flood Plain Reference Sediments																												Former Mill Tailrace Sediments																	
	Human Health	Ecological							FPR-01			FPR-02			FPR-03			FPR-04			FPR-05			FPR-06			FPR-07			FPR-08			FPR-09			FPR-10			TR-1			TR-2			TR-3						TR-4			TR-5		
									~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-1'			~0-0.5'			~0-0.4'			~0-0.4'			~0-0.5'			~0-0.4'			~0-0.6'		
									10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			10/9/2001			7/25/2001			7/25/2001			7/25/2001			12/16/2002			7/25/2001			7/25/2001		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																																						
Acenaphthene	370,000	**150**	NS	NS	NS	NS	NS	NS	45			9.6	U		9.7	U		9.8	U		12	U		10	U		10	U		50			10	U		9.7	U		130			25			**250**			55			**600**			**220**		
Acenaphthylene	NS	NS	NS	NS	NS	NS	NS	NS	91			9.6	U		9.7	U		9.8	U		16			34			30			610			17			46			30			44			670			240			1300			460		
Anthracene	2,200,000	85	NS	NS	220	NS	NS	**57**	**130**			9.6	U		9.7	U		9.8	U		12			26			22			**360**			17			33			44			34			**780**			**170**			**1,400**			**520**		
Benzo(a)anthracene	620	230	**32**	385	320	NS	NS	108	**400**			27			9.7	U		14			**53**			**94**			**87**			**1,300**			**67**			**130**			30			**110**			**2,700**			**430**			**4,000**			**1,200**		
Benzo(a)pyrene	62	400	**32**	782	370	NS	NS	150	**510**			26			9.7	U		14			**56**			**100**			**100**			**1,200**			**76**			**160**			25			**160**			**2,400**	J	L	**670**			**3,200**			**1,200**	J	L
Benzo(b)fluoranthene	620	NS	NS	NS	NS	NS	NS	NS	740			29			9.7	U		20			81			150			160			1,200			86			170			26			140			4,400	J	L	580			4600			2,000	J	L
Benzo(g,h,i)perylene	NS	NS	NS	NS	**170**	NS	NS	NS	160			14			9.7	U		11			45			39			38			**350**			26			60			18			80			**380**	J	L	120	J	L	**1,600**			**270**	J	L
Benzo(k)fluoranthene	6,200	NS	NS	NS	**240**	NS	NS	NS	**530**			31			9.7	U		18			60			120			100			**880**			71			160			18			85			**3,200**	J	L	**660**			**3,800**			**1,400**	J	L
Chrysene	62,000	400	**57**	862	340	NS	NS	166	**740**			38			9.7	U		24			**95**			**170**			**160**			**1,900**			**100**			**230**			30			**150**			**3,000**			**630**			**4,500**			**1,500**		
Dibenz(a,h)anthracene	62	60	NS	NS	60	NS	NS	**33**	**44**			9.6	U		9.7	U		9.8	U		12	U		11			11			**110**			10	U		15			6.3			21			**180**	J	L	**48**			**240**			**100**	J	L
Fluoranthene	230,000	600	**111**	2,355	750	NS	NS	423	**1,100**			60			9.7	U		39			**130**			**240**			**250**			**2,700**			**150**			**300**			72			**250**			**3,900**			**720**			**9,000**			**2,300**		
Fluorene	270,000	**35**	NS	NS	190	540	NS	77	**72**			9.6	U		9.7	U		9.8	U		12	U		17			14			**230**			11			22			**110**			30			**360**			**73**			**870**			**340**		
Indeno(1,2,3-cd)pyrene	620	NS	NS	NS	**200**	NS	NS	NS	180			17			9.7	U		12			41			47			46			**360**			31			56			17			84			**440**	J	L	150			**1,800**			**430**	J	L
Methylnaphthalene (2-)	NS	**65**	NS	NS	NS	NS	NS	NS	**78**			9.6	U		9.7	U		9.8	U		12	U		17			17			**84**			16			23			**420**			**73**			**450**			**170**			**730**			**420**		
Naphthalene	5,600	340	NS	NS	NS	480	NS	**176**	130			11			9.7	U		11			22			28			35			98			23			25			**380**			96			**520**			**260**			**920**			**510**		
Phenanthrene	NS	225	**42**	515	560	NS	NS	204	**870**			**52**			9.7	U		29			**110**			**210**			**190**			**2,400**			**120**			**290**			**340**			**190**			**2,000**			**550**			**6,900**			**1,700**		
Pyrene	230,000	350	**53**	875	490	NS	NS	195	**900**			51			9.7	U		30			**110**			**200**			**190**			**3,000**			**140**			**340**			**76**			**300**			**4,800**			**1,300**			**8,500**			**3,600**		
Total PAHs	NS	NS	NS	NS	NS	NS	NS	NS	6,720			356			-			222			831			1,503			1,450			16,832			951			2,060			1,772.3			1,872			30,430			6,826			53,960			18,170		
Other SVOCs																																																							
Benzoic acid	24,000,000	NS	NS	NS	NS	NS	NS	NS	270	J	L	88	J	L	73	J	L	81	J	L	530			190	J	L	180	J	L	390	UJ	L	180	J	L	190	UJ	L	42	J	L	67	J	L	480	J	L	170	J	L	620	J	L	500	J	L
Benzyl Alcohol	1,800,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		34	J		200	U		390	U		200	U		190	U		250	U		200	U		66	J		190	UJ	L	54	J		57	J	
bis(2-Chloroethoxy)methane	NS	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
bis(2-Chloroethyl)ether	220	NS	NS	NS	NS	NS	NS	NS	66	UJ		34	UJ		34	UJ		43	UJ		35	UJ		35	UJ		35	UJ		68	UJ		35	UJ		34	UJ		43	UJ		35	UJ		51	UJ					41	UJ		46	UJ	
bis(2-Chloroisopropyl)ether	2,900	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
bis(2-Ethylhexyl)phthalate	35,000	NS	NS	NS	NS	NS	NS	NS	440			190	U		190	U		200	U		43	J		93	J		130	J		100	J		50	J		310			46	J		200	U		290			340	U		110	J		290		
Bromophenyl-phenylether (4-)	NS	NS	NS	NS	NS	**1,300**	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Butylbenzylphthalate	1,200,000	NS	NS	NS	NS	**11,000**	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		52	J		250	U		200	U		290	U					230	U		270	U	
Carbazole	24,000	NS	NS	NS	NS	NS	NS	NS	95	J		190	U		190	U		200	U		250	U		200	U		200	U		91	J		200	U		190	U		250	U		200	U		290	U		190	U		630			170	J	
Chloro-3-methylphenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Chloroaniline (4-)	24,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Chloronaphthalene (2-)	490,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Chlorophenol (2-)	6,300	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Chlorophenyl-phenylether (4-)	NS	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dibenzofuran	15,000	NS	NS	NS	NS	**2,000**	NS	NS	64	J		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		100	J					460			82	J	
Dichlorobenzene (1,2-)	110,000	NS	NS	NS	NS	**340**	NS	NS	380	U		35	J		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dichlorobenzene (1,3-)	53,000	NS	NS	NS	NS	**1,700**	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dichlorobenzene (1,4-)	3,400	NS	NS	NS	NS	**350**	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dichlorobenzidine (3,3'-)	1,100	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dichlorophenol (2,4-)	18,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Diethylphthalate	4,900,000	NS	NS	NS	NS	**630**	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dimethylphenol (2,4-)	120,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		60	J	H	190	UJ	L	72	J	H	270	U	
Dimethylphthalate	61,000,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Di-n-butylphthalate	610,000	NS	NS	NS	NS	**11,000**	NS	NS	70	J		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dinitro-2-methylphenol (4,6-)	610	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	UJ	L	200	U		290	U					230	U		270	U	
Dinitrophenol (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS	380	UJ	I	190	UJ	I	190	UJ	I	200	UJ	I	250	UJ	I	200	UJ	I	200	UJ	I	390	UJ	I	200	UJ	I	190	UJ	I		R		500	UJ	L	730	UJ	L				580	UJ	L	660	UJ	L
Dinitrotoluene (2,4-)	12,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Dinitrotoluene (2,6-)	6,100	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Di-n-octylphthalate	240,000	NS	NS	NS	NS	NS	NS	NS	380	UJ	L	190	U		190	U		200	U		250	U		200	UJ	L	200	UJ	L	390	U		200	U		190	U		250	U		200	U		290	UJ	L	190	U		230	U		270	UJ	L
Hexachlorobenzene	300	NS	NS	NS	**20**	NS	NS	NS	53	UJ		27	UJ		27	UJ		28	UJ		35	UJ		28	UJ		28	UJ		54	UJ		28	UJ		27	UJ		35	UJ		28	UJ		41	UJ					33	UJ		37	UJ	
Hexachlorobutadiene	1,800	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Hexachlorocyclopentadiene	37,000	NS	NS	NS	NS	NS	NS	NS	380	UJ	I	190	U		190	U		200	U		250	U		200	U		200	U		390	UJ	I	200	U		190	UJ	I	250	UJ	L	200	UJ	L	290	UJ	L				230	UJ	L	270	UJ	L
Hexachloroethane	6,100	NS	NS	NS	NS	**1,000**	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Isophorone	510,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Methylphenol (2-)	310,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Methylphenol (4-)	31,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		160	J		190	U		190	J		150	J	
Nitroaniline (2-)	18,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Nitroaniline (3-)	1,800	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Nitroaniline (4-)	18,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U		190	U		230	U		270	U	
Nitrobenzene	2,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Nitrophenol (2-)	NS	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Nitrophenol (4-)	NS	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Nitroso-di-n-propylamine (N-)	69	NS	NS	NS	NS	NS	NS	NS	66	UJ		34	UJ		34	UJ		34	UJ		43	UJ		35	UJ		35	UJ		68	UJ		35	UJ		34	UJ		43	UJ		35	UJ		51	UJ					41	UJ		46	UJ	
Nitrosodiphenylamine (N-)	99,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Pentachlorophenol	3,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Phenol	1,800,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		95	J					70	J		85	J	
Trichlorobenzene (1,2,4-)	6,200	NS	NS	NS	NS	**9,200**	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Trichlorophenol (2,4,5-)	610,000	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Trichlorophenol (2,4,6-)	610	NS	NS	NS	NS	NS	NS	NS	380	U		190	U		190	U		200	U		250	U		200	U		200	U		390	U		200	U		190	U		250	U		200	U		290	U					230	U		270	U	
Total Other SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	939			123			73			81			573			317			310			191			230			362			88			67			1,461			170			2,206			1,334		
Total SVOCs	NS	NS	NS	NS	NS	NS	NS	NS	7,659			479			73			303			1,404			1,820			1,760			17,023			1,181			2,422			1,860.3			1,939			31,891			6,996			56,166			19,504		

TABLE 15C
Summary of Sediment Data - Semi-Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2D for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels).

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. Analyte detections that exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"USEPA Region IX Res. Soil PRGs" indicates the values presented are from the USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999). The soil PRGs are used as a conservative estimate of target risk levels, and some exposure pathways included in the residential soil PRG development may not be applicable for sediment exposure.

"1990 NOAA ER-Ls" indicates National Oceanic and Atmospheric Administration (NOAA) Effects Range - Low (ER-L). The values presented are from "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program," from the National Ocean Service, Rockville, Maryland, March 1990, NOAA, page 138.

"Threshold Effects Levels (TELs)" and "Probable Effects Levels (PELs)" indicate the values presented are from "A Preliminary Evaluation of Sediment Quality Assessment Values for Freshwater Ecosystems," by Smith, et al., J. Great Lakes Res., 22(3): 624-638.

"Ontario Lowest Effect Levels (LELs)" indicates the values presented are from "Development of the Ontario Provincial Sediment Quality Guidelines for Polycyclic Aromatic Hydrocarbons (PAHs)," Ministry of Environment and Energy, Ontario, Canada, January 1994.

"USEPA SQBs" indicates the values presented are Sediment Quality Benchmarks (SQBs) from USEPA Ecotox Thresholds (1996).

"USEPA SQCs" indicates the values presented are Sediment Quality Criteria (SQC) from USEPA Ecotox Thresholds (1996). The values are the lower limit of the 95 percent confidence interval.

"MADEP TECs" indicates the values presented are from the Massachusetts Department of Environmental Protection (MADEP) "Recommended Freshwater Sediment Screening Values" (May 2002), which are based on the consensus-based threshold effect concentrations (TECs) from "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems," by MacDonald, et al., Archives of Environmental Contamination and Toxicology, 36:20-31.

6. Total concentrations listed (e.g. Total PAHs) are the sum of detected concentrations of the relevant suite of compounds. "PAHs" are polycyclic aromatic hydrocarbons. "Other SVOCs" are non-PAH semi-volatile organic compounds.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002] and Appendix B.7 of the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
- "R" Indicates data rejected during validation.

Bias:

- "L" Low
- "I" Indeterminate

TABLE 15D
Summary of Sediment Data - Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Concentrations in µg/kg

Analyte	COPC Screening Levels: Human Health: USEPA Region IX Res. Soil PRGs	Ecological: 1990 NOAA ER-Ls	Ecological: Threshold Effects Levels (TELs)	Ecological: Probable Effects Levels (PELs)	Ecological: Ontario Lowest Effect Levels (LELs)	Ecological: USEPA SQBs	Ecological: USEPA SQCs	Ecological: MADEP TECs	Neponset River Sediments: NR-1			NR-2			NR-3			NR-4			NR-5			NR-6			NR-7			NR-8		
									~0-0.3'			~0-0.2'			~0-0.2'			~0-0.5'			~0-0.2'			~0-0.3'			~0-0.1'			~0-0.2'		
									7/26/2001			7/26/2001			7/26/2001			7/26/2001			7/26/2001			7/26/2001			7/25/2001			7/25/2001		
									Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																																
Benzene	640	NS	NS	NS	NS	**57**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Ethylbenzene	190,000	NS	NS	NS	NS	**3,600**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Styrene	440,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Toluene	66,000	NS	NS	NS	NS	**670**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Xylene (m,p-)	27,000	NS	NS	NS	NS	**25**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Xylene (o-)	27,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Xylenes (total)	27,000	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-		
CVOCs																																
Carbon tetrachloride	220	NS	NS	NS	NS	**1,200**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Chlorobenzene	15,000	NS	NS	NS	NS	**820**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Chloroethane	3,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Chloroform	220	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Chloromethane	4,700	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloroethane (1,1-)	51,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloroethane (1,2-)	280	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloroethene (1,1-)	12,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloroethene (cis-1,2-)	4,300	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloroethene (trans-1,2-)	6,900	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloropropane (1,2-)	340	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloropropene (cis-1,3-) †	780	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dichloropropene (trans-1,3-) †	780	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Methylene chloride	9,100	NS	NS	NS	NS	NS	NS	NS	7.3	UJ	I	6.1	UJ	I	5.3	UJ	I	5.8	UJ	I	5.0	UJ	I	6.8	UJ	I	4.8	UJ	I	5.0	UJ	I
Tetrachloroethane (1,1,2,2-)	410	NS	NS	NS	NS	**940**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Tetrachloroethene	480	NS	NS	NS	NS	**530**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Trichloroethane (1,1,1-)	200,000	NS	NS	NS	NS	**170**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Trichloroethane (1,1,2-)	730	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Trichloroethene	53	NS	NS	NS	NS	**1,600**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Vinyl chloride	79	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-		
Other VOCs																																
Acetone	1,400,000	NS	NS	NS	NS	NS	NS	NS	7.3	U		6.1	U		5.3	U		5.4	U		5.0	U		6.8	U		12	U		5.0	U	
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Bromodichloromethane	820	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Bromoform	62,000	NS	NS	NS	NS	**650**	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Bromomethane	390	NS	NS	NS	NS	NS	NS	NS	2.9	UJ	I	2.4	UJ	I	2.1	UJ	I	2.2	UJ	I	2.0	UJ	I	2.7	UJ	I	1.9	UJ	I	2.0	UJ	I
Butanone (2-)	2,200,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Carbon disulfide	36,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Dibromochloromethane	1,100	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Methyl-2-pentanone (4-)	530,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Methyl-tert Butyl Ether	17,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Trichlorofluoromethane	39,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Vinyl acetate	43,000	NS	NS	NS	NS	NS	NS	NS	2.9	U		2.4	U		2.1	U		2.2	U		2.0	U		2.7	U		1.9	U		2.0	U	
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-			-		

Analyte	Neponset River (Upstream of the Site) Reference Sediments: SedRN-1			SedRN-2			SedRN-3			SedRN-4			SedRN-5			Lewis Pond Sediments: LP-01			LP-02			LP-03		
	~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.5'			~0-0.3'			~0-0.4'		
	5/24/2002			5/24/2002			5/24/2002			5/24/2002			5/24/2002			7/31/2001			7/31/2001			7/31/2001		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																								
Benzene	2.0	U		2.1	U		2.1	U		1.9	U		2.1	UJ	L	4.9	UJ	L	5.1	U		5.8	UJ	L
Ethylbenzene	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Styrene	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Toluene	2.0	U		2.1	U		2.1	U		1.9	U		2.1	UJ	L	2.5	J	L	5.1	U		5.8	UJ	L
Xylene (m,p-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Xylene (o-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Xylenes (total)	-			-			-			-			-			-			-			-		
Total AVOCs	-			-			-			-			-			2.5			-			-		
CVOCs																								
Carbon tetrachloride	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Chlorobenzene	2.0	U		2.1	U		2.1	U		1.9	U		2.1	UJ	L	4.9	UJ	L	5.1	U		5.8	UJ	L
Chloroethane	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Chloroform	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Chloromethane	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloroethane (1,1-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloroethane (1,2-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloroethene (1,1-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	UJ	L	4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloroethene (cis-1,2-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloroethene (trans-1,2-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloropropane (1,2-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloropropene (cis-1,3-) †	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Dichloropropene (trans-1,3-) †	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Methylene chloride	20	U		21	U		21	U		19	U		21	U		43	UJ	I	21	UJ	I	21	UJ	I
Tetrachloroethane (1,1,2,2-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Tetrachloroethene	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Trichloroethane (1,1,1-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Trichloroethane (1,1,2-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Trichloroethene	2.0	U		2.1	U		2.1	U		1.9	U		2.1	UJ	L	4.9	UJ	L	5.1	U		5.8	UJ	L
Vinyl chloride	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Total CVOCs	-			-			-			-			-			-			-			-		
Other VOCs																								
Acetone	660	J	I	24	U		63			76			200	J		180	J	I	32	UJ	I	20	J	I
Bromochloromethane	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Bromodichloromethane	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Bromoform	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Bromomethane	4.9	UJ	I	5.2	UJ	I	5.4	UJ	I	4.8	UJ	I	5.3	UJ	I	4.9	UJ	L	5.1	U		5.8	UJ	L
Butanone (2-)	40			2.1	U		6.9			7.2			20			26	J	L	5.1	UJ	L	5.8	UJ	L
Carbon disulfide	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Chloroethylvinyl ether (2-)	4.9	U		5.2	U		5.4	U		4.8	U		5.3	U		24	UJ	L	26	U		30	UJ	L
Dibromochloromethane	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Hexanone (2-)	4.9	U		5.2	U		5.4	U		4.8	U		5.3	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Methyl-2-pentanone (4-)	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Methyl-tert Butyl Ether	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Trichlorofluoromethane	2.0	U		2.1	U		2.1	U		1.9	U		2.1	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Vinyl acetate	4.9	U		5.2	U		5.4	U		4.8	U		5.3	U		4.9	UJ	L	5.1	U		5.8	UJ	L
Total Other VOCs	700			-			69.9			83.2			220			206			-			20		
Total VOCs	700			-			69.9			83.2			220			208.5			-			20		

TABLE 15D
Summary of Sediment Data - Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Concentrations in µg/kg

Analyte	COPC Screening Levels: Human Health: USEPA Region IX Res. Soil PRGs	Ecological: 1990 NOAA ER-Ls	Ecological: Threshold Effects Levels (TELs)	Ecological: Probable Effects Levels (PELs)	Ecological: Ontario Lowest Effect Levels (LELs)	Ecological: USEPA SQBs	Ecological: USEPA SQCs	Ecological: MADEP TECs	Lewis Pond Sediments (cont.): LP-04 ~0-0.5' 7/31/2001 Result	Qualifier	Bias	LP-05 ~0-0.5' 7/30/2001 Result	Qualifier	Bias	LP-06 ~0-0.5' 7/30/2001 Result	Qualifier	Bias	LP-07 ~0-0.5' 7/30/2001 Result	Qualifier	Bias	LP-08 ~0-0.5' 7/30/2001 Result	Qualifier	Bias	LP-09 ~0-0.5' 7/30/2001 Result	Qualifier	Bias	LP-10 ~0-0.5' 7/30/2001 Result	Qualifier	Bias
AVOCs																													
Benzene	640	NS	NS	NS	NS	**57**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Ethylbenzene	190,000	NS	NS	NS	NS	**3,600**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Styrene	440,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Toluene	66,000	NS	NS	NS	NS	**670**	NS	NS	3.2	J		7.9	UJ	I	3.7	J	L	4.5	J		4.5	U		5.2	U		6.8	UJ	I
Xylene (m,p-)	27,000	NS	NS	NS	NS	**25**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Xylene (o-)	27,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Xylenes (total)	27,000	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	3.2			-			3.7			4.5			-			-			-		
CVOCs																													
Carbon tetrachloride	220	NS	NS	NS	NS	**1,200**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Chlorobenzene	15,000	NS	NS	NS	NS	**820**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Chloroethane	3,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Chloroform	220	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Chloromethane	4,700	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloroethane (1,1-)	51,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloroethane (1,2-)	280	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloroethene (1,1-)	12,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloroethene (cis-1,2-)	4,300	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloroethene (trans-1,2-)	6,900	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloropropane (1,2-)	340	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloropropene (cis-1,3-) †	780	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Dichloropropene (trans-1,3-) †	780	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Methylene chloride	9,100	NS	NS	NS	NS	NS	NS	NS	28	UJ	I	40	UJ	I	38	UJ	I	28	UJ	I	19	UJ	I	22	UJ	I	40	UJ	I
Tetrachloroethane (1,1,2,2-)	410	NS	NS	NS	NS	**940**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Tetrachloroethene	480	NS	NS	NS	NS	**530**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Trichloroethane (1,1,1-)	200,000	NS	NS	NS	NS	**170**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Trichloroethane (1,1,2-)	730	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Trichloroethene	53	NS	NS	NS	NS	**1,600**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Vinyl chloride	79	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-			-			-		
Other VOCs																													
Acetone	1,400,000	NS	NS	NS	NS	NS	NS	NS	260	J	I	440	J	I	86	UJ	I	190	UJ	I	170	UJ	I	85	UJ	I	140	UJ	I
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Bromodichloromethane	820	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Bromoform	62,000	NS	NS	NS	NS	**650**	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Bromomethane	390	NS	NS	NS	NS	NS	NS	NS	5.1	UJ	L	7.9	UJ	I	7.0	UJ	L	4.9	UJ	L	4.5	UJ	L	5.2	UJ	L	6.8	UJ	I
Butanone (2-)	2,200,000	NS	NS	NS	NS	NS	NS	NS	68			46	J	I	7.0	UJ	L	55			44			20			29	J	I
Carbon disulfide	36,000	NS	NS	NS	NS	NS	NS	NS	8.2			7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	26	U		40	UJ	I	34	UJ	L	24	U		22	U		26	U		34	UJ	I
Dibromochloromethane	1,100	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Methyl-2-pentanone (4-)	530,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Methyl-tert Butyl Ether	17,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	2.7	J		4.5	U		5.2	U		6.8	UJ	I
Trichlorofluoromethane	39,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Vinyl acetate	43,000	NS	NS	NS	NS	NS	NS	NS	5.1	U		7.9	UJ	I	7.0	UJ	L	4.9	U		4.5	U		5.2	U		6.8	UJ	I
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	336.2			486			-			57.7			44			20			29		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	339.4			486			3.7			62.2			44			20			29		

Analyte	Flood Plain Sediments: FP-01 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-02 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-03 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-04 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-05 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-06 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-08 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-09 ~0-1' 10/10/2001 Result	Qualifier	Bias	FP-10 ~0-1' 10/10/2001 Result	Qualifier	Bias
AVOCs																											
Benzene	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Ethylbenzene	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Styrene	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.7	U	
Toluene	1.8	U		2.1	U		2.1	U		3.2	U		3.2	UJ	L	2.1	U		3.7	U		4.0	U		2.8	U	
Xylene (m,p-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Xylene (o-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.7	U	
Xylenes (total)	-			-			-			-			-			-			-			-			-		
Total AVOCs	-			-			-			-			-			-			-			-			-		
CVOCs																											
Carbon tetrachloride	4.4	U		5.4	U		5.2	U		8.1	U		8.0	U		5.3	U		9.4	U		10	U		6.9	U	
Chlorobenzene	1.8	U		2.1	U		2.1	U		3.2	U		3.2	UJ	L	2.1	U		3.7	U		4.0	U		2.9	U	
Chloroethane	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Chloroform	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Chloromethane	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloroethane (1,1-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloroethane (1,2-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloroethene (1,1-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloroethene (cis-1,2-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloroethene (trans-1,2-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloropropane (1,2-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloropropene (cis-1,3-) †	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Dichloropropene (trans-1,3-) †	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Methylene chloride	4.4	UJ	I	11	UJ	I	5.2	UJ	I	17	UJ	I	8.0	UJ	I	5.3	UJ	I	10	UJ	I	13	UJ	I	6.9	UJ	I
Tetrachloroethane (1,1,2,2-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.6	U	
Tetrachloroethene	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		3.0	U	
Trichloroethane (1,1,1-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Trichloroethane (1,1,2-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Trichloroethene	1.8	U		2.1	U		2.1	U		3.2	U		3.2	UJ	L	2.1	U		3.7	U		4.0	U		2.8	U	
Vinyl chloride	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Total CVOCs	-			-			-			-			-			-			-			-			-		
Other VOCs																											
Acetone	4.4	UJ	I	11	UJ	I	5.2	UJ	I	8.1	UJ	I	8.0	UJ	I	5.3	UJ	I	9.4	UJ	I	73	J	I	6.9	UJ	I
Bromochloromethane	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Bromodichloromethane	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Bromoform	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.6	U	
Bromomethane	4.4	UJ	I	5.4	UJ	I	5.2	UJ	I	8.1	UJ	I	8.0	UJ	I	5.3	UJ	I	9.4	UJ	I	10	UJ	I	6.9	UJ	I
Butanone (2-)	4.4	U		5.4	U		5.2	U		8.1	U		8.0	U		5.3	U		9.4	U		10	U		6.9	U	
Carbon disulfide	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Chloroethylvinyl ether (2-)	4.4	U		5.4	U		5.2	U		8.1	U		8.0	U		5.3	U		9.4	U		10	U		6.9	U	
Dibromochloromethane	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.9	U	
Hexanone (2-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Methyl-2-pentanone (4-)	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Methyl-tert Butyl Ether	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Trichlorofluoromethane	1.8	U		2.1	U		2.1	U		3.2	U		3.2	U		2.1	U		3.7	U		4.0	U		2.8	U	
Vinyl acetate	4.4	U		5.4	U		5.2	U		8.1	U		8.0	U		5.3	U		9.4	U		10	U		6.9	U	
Total Other VOCs	-			-			-			-			-			-			-			73			-		
Total VOCs	-			-			-			-			-			-			-			73			-		

TABLE 15D
Summary of Sediment Data - Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Concentrations in µg/kg

Analyte	COPC Screening Levels: Human Health	COPC Screening Levels: Ecological							Flood Plain Reference Sediments: FPR-01 ~0-1' 10/9/2001			FPR-02 ~0-1' 10/9/2001			FPR-03 ~0-1' 10/9/2001			FPR-04 ~0-1' 10/9/2001			FPR-05 ~0-1' 10/9/2001		
	USEPA Region IX Res. Soil PRGs	1990 NOAA ER-Ls	Threshold Effects Levels (TELs)	Probable Effects Levels (PELs)	Ontario Lowest Effect Levels (LELs)	USEPA SQBs	USEPA SQCs	MADEP TECs	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs																							
Benzene	640	NS	NS	NS	NS	**57**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Ethylbenzene	190,000	NS	NS	NS	NS	**3,600**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Styrene	440,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Toluene	66,000	NS	NS	NS	NS	**670**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Xylene (m,p-)	27,000	NS	NS	NS	NS	**25**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Xylene (o-)	27,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Xylenes (total)	27,000	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-		
Total AVOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			-		
CVOCs																							
Carbon tetrachloride	220	NS	NS	NS	NS	**1,200**	NS	NS	18	UJ	I	6.8	U		6.8	UJ	L	7.9	U		5.9	UJ	L
Chlorobenzene	15,000	NS	NS	NS	NS	**820**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Chloroethane	3,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Chloroform	220	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		1.2	J	L
Chloromethane	4,700	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloroethane (1,1-)	51,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloroethane (1,2-)	280	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloroethene (1,1-)	12,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloroethene (cis-1,2-)	4,300	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloroethene (trans-1,2-)	6,900	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloropropane (1,2-)	340	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloropropene (cis-1,3-) †	780	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Dichloropropene (trans-1,3-) †	780	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Methylene chloride	9,100	NS	NS	NS	NS	NS	NS	NS	34	UJ	I	13	UJ	I	15	UJ	I	11	UJ	I	12	UJ	I
Tetrachloroethane (1,1,2,2-)	410	NS	NS	NS	NS	**940**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Tetrachloroethene	480	NS	NS	NS	NS	**530**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Trichloroethane (1,1,1-)	200,000	NS	NS	NS	NS	**170**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Trichloroethane (1,1,2-)	730	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Trichloroethene	53	NS	NS	NS	NS	**1,600**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Vinyl chloride	79	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Total CVOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			-			-			-			1.2		
Other VOCs																							
Acetone	1,400,000	NS	NS	NS	NS	NS	NS	NS	18	UJ	I	45			6.8	UJ	L	7.9	U		5.9	UJ	L
Bromochloromethane	NS	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Bromodichloromethane	820	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Bromoform	62,000	NS	NS	NS	NS	**650**	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Bromomethane	390	NS	NS	NS	NS	NS	NS	NS	18	UJ	I	6.8	UJ	I	6.8	UJ	I	7.9	UJ	I	5.9	UJ	I
Butanone (2-)	2,200,000	NS	NS	NS	NS	NS	NS	NS	18	UJ	I	6.8	U		6.8	UJ	L	7.9	U		5.9	UJ	L
Carbon disulfide	36,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Chloroethylvinyl ether (2-)	NS	NS	NS	NS	NS	NS	NS	NS	18	UJ	I	6.8	U		6.8	UJ	L	7.9	U		5.9	UJ	L
Dibromochloromethane	1,100	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Hexanone (2-)	NS	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Methyl-2-pentanone (4-)	530,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Methyl-tert Butyl Ether	17,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Trichlorofluoromethane	39,000	NS	NS	NS	NS	NS	NS	NS	7.2	UJ	I	2.7	U		2.7	UJ	L	3.2	U		2.4	UJ	L
Vinyl acetate	43,000	NS	NS	NS	NS	NS	NS	NS	18	UJ	I	6.8	U		6.8	UJ	L	7.9	U		5.9	UJ	L
Total Other VOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			45			-			-			-		
Total VOCs	NS	NS	NS	NS	NS	NS	NS	NS	-			45			-			-			1.2		

Analyte	Flood Plain Reference Sediments: FPR-06 ~0-1' 10/9/2001			FPR-07 ~0-1' 10/9/2001			FPR-08 ~0-1' 10/9/2001			FPR-09 ~0-1' 10/9/2001			FPR-10 ~0-1' 10/9/2001		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs															
Benzene	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Ethylbenzene	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Styrene	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Toluene	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Xylene (m,p-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Xylene (o-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Xylenes (total)	-			-			-			-			-		
Total AVOCs	-			-			-			-			-		
CVOCs															
Carbon tetrachloride	11	UJ	I	6.6	U		6.2	U		7.2	U		8.7	U	
Chlorobenzene	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Chloroethane	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Chloroform	3.9	J	I	3.8			2.5	U		2.9	U		3.5	U	
Chloromethane	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloroethane (1,1-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloroethane (1,2-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloroethene (1,1-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloroethene (cis-1,2-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloroethene (trans-1,2-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloropropane (1,2-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloropropene (cis-1,3-) †	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Dichloropropene (trans-1,3-) †	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Methylene chloride	18	UJ	I	9.6	UJ	I	6.2	UJ	I	7.2	UJ	I	21	UJ	I
Tetrachloroethane (1,1,2,2-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Tetrachloroethene	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Trichloroethane (1,1,1-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Trichloroethane (1,1,2-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Trichloroethene	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Vinyl chloride	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Total CVOCs	3.9			3.8			-			-			-		
Other VOCs															
Acetone	11	UJ	I	6.6	U		6.2	UJ	I	7.2	UJ	I	8.7	UJ	I
Bromochloromethane	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Bromodichloromethane	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Bromoform	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Bromomethane	11	UJ	I	6.6	UJ	I	6.2	UJ	I	7.2	UJ	I	8.7	UJ	I
Butanone (2-)	11	UJ	I	6.6	U		6.2	U		7.2	U		8.7	U	
Carbon disulfide	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Chloroethylvinyl ether (2-)	11	UJ	I	6.6	U		6.2	U		7.2	U		8.7	U	
Dibromochloromethane	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Hexanone (2-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Methyl-2-pentanone (4-)	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Methyl-tert Butyl Ether	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Trichlorofluoromethane	4.4	UJ	I	2.7	U		2.5	U		2.9	U		3.5	U	
Vinyl acetate	11	UJ	I	6.6	U		6.2	U		7.2	U		8.7	U	
Total Other VOCs	-			-			-			-			-		
Total VOCs	3.9			3.8			-			-			-		

Analyte	Former Mill Tailrace Sediments: TR-1 ~0-0.5' 7/25/2001			TR-2 ~0-0.4' 7/25/2001			TR-3 ~0-0.4' 7/25/2001			TR-4 ~0-0.4' 7/25/2001			TR-5 ~0-0.6' 7/25/2001		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
AVOCs															
Benzene	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Ethylbenzene	3.0			3.2			5.4			5.5	UJ	I	8.7	UJ	I
Styrene	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Toluene	2.6			4.8			3.6	J		5.5	UJ	I	5.8	J	I
Xylene (m,p-)	6.3			4.8			8.6			5.5	UJ	I	8.7	UJ	I
Xylene (o-)	3.5			3.3			5.4			5.5	UJ	I	8.7	UJ	I
Xylenes (total)	9.8			8.1			14			-			-		
Total AVOCs	15.4			16.1			23			-			5.8		
CVOCs															
Carbon tetrachloride	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Chlorobenzene	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Chloroethane	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Chloroform	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Chloromethane	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloroethane (1,1-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloroethane (1,2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloroethene (1,1-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloroethene (cis-1,2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloroethene (trans-1,2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloropropane (1,2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloropropene (cis-1,3-) †	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dichloropropene (trans-1,3-) †	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Methylene chloride	6.5	UJ	I	7.4	UJ	I	17	UJ	I	14	UJ	I	22	UJ	I
Tetrachloroethane (1,1,2,2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Tetrachloroethene	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Trichloroethane (1,1,1-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Trichloroethane (1,1,2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Trichloroethene	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Vinyl chloride	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Total CVOCs	-			-			-			-			-		
Other VOCs															
Acetone	8.6	U		7.4	U		13	U		14	UJ	I	25	UJ	I
Bromochloromethane	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Bromodichloromethane	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Bromoform	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Bromomethane	1.9	UJ	I	2.9	UJ	I	5.3	UJ	I	5.5	UJ	I	8.7	UJ	I
Butanone (2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Carbon disulfide	1.9	U		2.9	U		7.4			10	J	I	15	J	I
Chloroethylvinyl ether (2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Dibromochloromethane	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Hexanone (2-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Methyl-2-pentanone (4-)	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Methyl-tert Butyl Ether	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Trichlorofluoromethane	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Vinyl acetate	1.9	U		2.9	U		5.3	U		5.5	UJ	I	8.7	UJ	I
Total Other VOCs	-			-			7.4			10			15		
Total VOCs	15.4			16.1			30.4			10			20.8		

TABLE 15D
Summary of Sediment Data - Volatile Organic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2D for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8260B.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002).

4. All concentrations are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. Analyte detections that exceed the lowest of the ecological screening levels (**bold** value) are in **bold**.

"USEPA Region IX Res. Soil PRGs" indicates the values presented are from the USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2004. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999). The soil PRGs are used as a conservative estimate of target risk levels, and some exposure pathways included in the residential soil PRG development may not be applicable for sediment exposure.

"1990 NOAA ER-Ls" indicates National Oceanic and Atmospheric Administration (NOAA) Effects Range - Low (ER-L) from "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program," from the National Ocean Service, Rockville, Maryland, March 1990, NOAA, page 138. No screening levels for VOCs are currently available from this source.

"Threshold Effects Levels (TELs)" and "Probable Effects Levels (PELs)" indicate from "A Preliminary Evaluation of Sediment Quality Assessment Values for Freshwater Ecosystems," by Smith, et al., J. Great Lakes Res., 22(3): 624-638. No screening levels for VOCs are currently available from this source.

"Ontario Lowest Effect Levels (LELs)" indicates Ministry of Environment and Energy, Ontario, Canada, 1993/1994. No screening levels for VOCs are currently available from this source.

"USEPA SQBs" indicates the values presented are Sediment Quality Benchmarks (SQBs) from USEPA Ecotox Thresholds (1996).

"USEPA SQCs" indicates Sediment Quality Criteria (SQC) from USEPA Ecotox Thresholds (1996). No screening levels for VOCs are currently available from this source.

"MADEP TECs" indicates the values presented are from the Massachusetts Department of Environmental Protection (MADEP) "Recommended Freshwater Sediment Screening Values" (May 2002), which are based on the consensus-based threshold effect concentrations (TECs) from "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems," by MacDonald, et al., Archives of Environmental Contamination and Toxicology, 36:20-31. No screening levels for VOCs are currently available from this source.

6. "†" indicates the PRG value presented is for 1,3-dichloropropene (isomer unspecified).

7. Total concentrations listed (e.g. Total AVOCs, CVOCs) are the sum of detected concentrations of the relevant suites of compounds. "AVOCs" are non-chlorinated aromatic volatile organic compounds. "CVOCs" are chlorinated volatile organic compounds. "Other VOCs" are non-AVOC and non-CVOC volatile organic compounds.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Report (included in Appendix A.2 of the Data Usability Report [SHA, 2002]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

Bias:

"L" Low

"I" Indeterminate

TABLE 15E
Summary of Sediment Data - Asbestos
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location / Date	COPC Screening Levels								% Asbestos	Validation Qualifier	Bias	Type of Asbestos	Laboratory or Data Validation Comments
	Human Health	Ecological											
	USEPA Region IX Res. Soil PRG	1990 NOAA ER-Ls	TELs	PELs	Ontario LELs	USEPA SQBs	USEPA SQCs	MADEP TECs					
Neponset River Sediments													
NR-1 / 07-26-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Actinolite	Trace asbestos detected < 1%
NR-2 / 07-26-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
NR-3 / 07-26-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Actinolite	Trace asbestos detected < 1%
NR-4 / 07-26-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
NR-5 / 07-26-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
NR-6 / 07-26-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
NR-7 / 07-25-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Actinolite	Trace asbestos detected < 1%
NR-8 / 07-25-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
Neponset River (Upstream of the Site) Reference Sediments													
SedRN-1 / 05-24-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
SedRN-2 / 05-24-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
SedRN-3 / 05-24-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
SedRN-4 / 05-24-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
SedRN-5 / 05-24-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
Lewis Pond Sediments													
LP-01 / 07-31-01	NS	NS	NS	NS	NS	NS	NS	NS	15.3			Chrysotile	
LP-02 / 07-31-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
LP-03 / 07-31-01	NS	NS	NS	NS	NS	NS	NS	NS	1.3			Chrysotile	
LP-04 / 07-31-01	NS	NS	NS	NS	NS	NS	NS	NS	3.6			Chrysotile	
LP-05 / 07-30-01	NS	NS	NS	NS	NS	NS	NS	NS	3.9			Chrysotile	
LP-06 / 07-30-01	NS	NS	NS	NS	NS	NS	NS	NS	13.5			Chrysotile	
LP-07 / 07-30-01	NS	NS	NS	NS	NS	NS	NS	NS	4.6			Chrysotile	
LP-08 / 07-30-01	NS	NS	NS	NS	NS	NS	NS	NS	4			Chrysotile	
LP-09 / 07-30-01	NS	NS	NS	NS	NS	NS	NS	NS	2.6			Chrysotile	
LP-10 / 07-30-01	NS	NS	NS	NS	NS	NS	NS	NS	2.2			Chrysotile	
Lower Pond (Norwood, Massachusetts) Reference Sediments													
SedRNwd-01 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
SedRNwd-02 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
SedRNwd-03 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
SedRNwd-04 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		none	
SedRNwd-05 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
SedRNwd-06 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
SedRNwd-07 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		none	
SedRNwd-08 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
SedRNwd-09 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
SedRNwd-10 / 12-17-02	NS	NS	NS	NS	NS	NS	NS	NS	1	U		none	

TABLE 15E
Summary of Sediment Data - Asbestos
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location / Date	COPC Screening Levels								% Asbestos	Validation Qualifier	Bias	Type of Asbestos	Laboratory or Data Validation Comments
	Human Health	Ecological											
	USEPA Region IX Res. Soil PRG	1990 NOAA ER-Ls	TELs	PELs	Ontario LELs	USEPA SQBs	USEPA SQCs	MADEP TECs					
Floodplain Sediments													
FP-01 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	0.9	J	I	Chrysotile	Uncertain < RL
FP-02 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FP-03 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FP-04 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	0.8	J	I	Chrysotile	Uncertain < RL
FP-05 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	2	J	I	Chrysotile	
FP-05 / 0-1 / 08-05-03	NS	NS	NS	NS	NS	NS	NS	NS	1.8	B	H	Chrysotile	Equip. blank action
FP-05 / 1-3 / 08-05-03	NS	NS	NS	NS	NS	NS	NS	NS	0.9	JB	I	Chrysotile	Uncertain < RL; equip. blank action
FP-06 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FP-06 / 0-1 / 08-05-03	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FP-06 / 1-3 / 08-05-03	NS	NS	NS	NS	NS	NS	NS	NS	0.8	JB	I	Chrysotile	Uncertain < RL; equip. blank action
FP-08 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FP-09 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	3.9			Chrysotile	
FP-09 / 0-1 / 08-05-03	NS	NS	NS	NS	NS	NS	NS	NS	1	UJ	I	Chrysotile	Low % solids; Trace asbestos detected < 1%
FP-09 / 1-3 / 08-05-03	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FP-10 / 10-10-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
Floodplain Reference Sediments													
FPR-01 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-02 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-03 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		None	
FPR-04 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-05 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-06 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-07 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-08 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-09 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
FPR-10 / 10-09-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
Former Mill Tailrace Sediments													
TR-1 / 07-25-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
TR-2 / 07-25-01	NS	NS	NS	NS	NS	NS	NS	NS	1	U		Chrysotile	Trace asbestos detected < 1%
TR-3 / 07-25-01	NS	NS	NS	NS	NS	NS	NS	NS	1.8			Chrysotile	
TR-3 / 0-2.5 / 08-06-03	NS	NS	NS	NS	NS	NS	NS	NS	3	J	I	Chrysotile	Reported higher of duplicate results; method uncertainty
TR-4 / 07-25-01	NS	NS	NS	NS	NS	NS	NS	NS	8.5			Chrysotile Amosite	
TR-4 / 0-3.0 / 08-07-03	NS	NS	NS	NS	NS	NS	NS	NS	5	J	I	Chrysotile	Duplicate results identical; method uncertainty
TR-5 / 07-25-01	NS	NS	NS	NS	NS	NS	NS	NS	7.5			Chrysotile	
TR-5 / 0-2.9 / 08-06-03	NS	NS	NS	NS	NS	NS	NS	NS	3.5	J	I	Chrysotile	Reported higher of duplicate results; method uncertainty

TABLE 15E
Summary of Sediment Data - Asbestos
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2D for the identity of sample delivery groups (SDGs).

2. Samples were submitted to International Asbestos Testing Laboratory (IATL) of Mt. Laurel, New Jersey for analysis of asbestos according to the USEPA, Region I "Proprietary Method of the Analysis of Asbestos in Soil, Sludge, and Sediment" Method (May 1994) and transmission electron microscopy (TEM) ELAP Method 198.4. The reporting limit (RL) for asbestos analyses is 1%.

3. Data validation and data usability assessment performed by New Environmental Horizons, Inc. (NEH). Results are presented in the Data Usability Report (SHA, 2002) and the Phase 1B RI Data Usability Report (SHA, 2004).

4. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. There were no human health or ecological COPC screening levels selected.

"USEPA Region IX Res. Soil PRGs" indicates the values presented are from the USEPA Region IX Residential Soil Preliminary Remediation Goals (PRGs), dated October 1, 2002. PRGs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999). The soil PRGs are used as a conservative estimate of target risk levels, and some exposure pathways included in the residential soil PRG development may not be applicable for sediment exposure.

"1990 NOAA ER-Ls" indicates National Oceanic and Atmospheric Administration (NOAA) Effects Range - Low (ER-L). The values presented are from "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program," from the National Ocean Service, Rockville, Maryland, March 1990, NOAA, page 138.

"Threshold Effects Levels (TELs)" and "Probable Effects Levels (PELs)" indicate the values presented are from "A Preliminary Evaluation of Sediment Quality Assessment Values for Freshwater Ecosystems," by Smith, et al., J. Great Lakes Res., 22(3): 624-638.

"Ontario Lowest Effect Levels (LELs)" are from the Ministry of Environment and Energy, Ontario, Canada, 1993/1994.

"USEPA SQBs" indicates the values presented are Sediment Quality Benchmarks (SQBs) from USEPA Ecotox Thresholds (1996).

"USEPA SQCs" indicates the values presented are Sediment Quality Criteria (SQC) from USEPA Ecotox Thresholds (1996). The values are the lower limit of the 95 percent confidence interval.

"MADEP TECs" indicates the values presented are from the Massachusetts Department of Environmental Protection (MADEP) "Recommended Freshwater Sediment Screening Values" (May 2002), which are based on the consensus-based threshold effect concentrations (TECs) from "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems," by MacDonald, et al., Archives of Environmental Contamination and Toxicology, 36:20-31.

5. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Reports (included in Appendix A.2 of the Data Usability Report [SHA, 2002] and Appendix B.7 of the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:
- "J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty bias, and/or imprecision.
- "U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
- "UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
- "B" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with sediment metals analyses). The result is usable with possible uncertainty due to the potential for contamination.
- "JB" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with sediment metals analyses). The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision, and with possible uncertainty due to the potential for contamination.

Bias:
- "I" Indeterminate
- "H" High

TABLE 16A
Summary of Fish Tissue Data - Inorganic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in mg/kg wet weight																													
	COPC Screening Levels	Neponset River Fish Fillet and Carcass Samples																		Neponset River Whole Body Fish Samples										
	USEPA Region III Fish RBCs	NRF-1 / 08-18-03			NRF-2 / 08-18-03			NRF-3 / 08-18-03			NRF-4 / 08-18-03			NRF-5 / 08-18-03			NRC-5 / 08-18-03			NRW-1 / 08-18-03			NRW-3 / 08-18-03			NRW-4 / 08-18-03			NRW-5 / 08-18-03		
		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																														
Aluminum	135	1.1	J	I	0.48	J	I	0.87	J	I	0.46	J	I	2.0	J	I	2.7	J	I	0.72	J	I	1.6	J	I	1.2	J	I	6.6	J	I
Arsenic	0.0021	0.033	J	I	0.039			0.035			0.025	J	I	0.024	J	I															
Barium	9.5	0.26	J	I	0.32	J	I	0.25	J	I	0.31	J	I	0.19	J	I	0.34	J	I	1.4	J	I	0.74	J	I	0.22	J	I	1.9	J	I
Beryllium	0.27	0.039	U		0.037	U		0.033	U		0.037	U		0.033	U		0.029	U		0.046	U		0.029	U		0.029	U		0.032	U	
Cadmium	0.14	0.0078	U		0.0074	U		0.0065	U		0.0074	U		0.0066	U		0.082			0.023			0.014			0.065			0.047		
Chromium	0.41	0.25	J	I	0.19	J	I	0.098	J	I	0.14	J	I	0.20	J	I	0.39	J	I	0.36	J	I	0.12	J	I	0.88	J	I	0.28	J	I
Cobalt	2.7	0.039	U		0.037	U		0.033	U		0.037	U		0.033	U		0.044			0.046	U		0.029	U		0.029	U		0.061		
Copper	5.4	2.4			0.41			0.63			0.37			1.7			0.83			0.63			0.55			8.9			0.84		
Iron	40.6	15			16			19			13			8.8			42			80			34			25			74		
Lead	NA	0.23	J	H	0.037	U		0.11	J	H	0.037	U		0.61	J	H	0.44	J	H	0.16	J	H	0.075	J	H	0.57	J	H	0.052	J	H
Manganese	18.9	3.4	J	I	5.1	J	I	1.3	J	I	9.1	J	I	1.6	J	I	4.9	J	I	59	J	I	8.7	J	I	7.3	J	I	60	J	I
Mercury	0.014	0.25			0.26			0.17			0.18			0.32			0.17			0.13			0.11			0.11			0.16		
Nickel	2.7	0.20	J	I	0.083	J	I	0.11	J	I	0.088	J	I	0.093	J	I	0.11	J	I	0.37	J	I	0.15	J	I	0.35	J	I	0.16	J	I
Selenium	0.68	0.35	J	H	0.32	J	H	0.25	J	H	0.41	J	H	0.30	J	H	0.44	J	H	0.46	J	H	0.34	J	H	0.43	J	H	0.37	J	H
Silver	0.68	0.039	U		0.037	U		0.033	U		0.037	U		0.033	U		0.029	U		0.046	U		0.029	U		0.029	U		0.032	U	
Thallium	0.0095	0.0017	B	H	0.00081	UJ	I	0.0054	B	H	0.0051	B	H	0.0012	B	H	0.00063	UJ	I	0.0066	B	H	0.0015	B	H	0.00092	B	H	0.00071	UJ	I
Vanadium	0.041	0.039	U		0.037	U		0.033	U		0.037	U		0.033	U		0.029	U		0.099			0.029	U		0.029	U		0.042		
Zinc	40.6	11			7.9			12			15			42			32			18			15			18			13		

Analyte	Concentrations in mg/kg wet weight																													
	COPC Screening Levels	Lewis Pond Fish Fillet Samples																		Lewis Pond Whole Body Fish Samples										
	USEPA Region III Fish RBCs	LPF-1 / 08-19-03			LPF-2 / 08-19-03			LPF-3 / 08-19-03			LPF-4 / 08-19-03			LPF-5 / 08-19-03			LPW-1 / 08-19-03			LPW-2 / 08-19-03			LPW-3 / 08-19-03			LPW-4 / 08-19-03			LPW-5 / 08-19-03		
		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																														
Aluminum	135	0.54	J	I	0.40	J	I	0.62	J	I	1.9	J	I	0.79	J	I	9.3	J	I	26	J	I	2.7	J	I	1.1	J	I	2.0	J	I
Arsenic	0.0021	0.10			0.028	J	I	0.062			0.028	J	I	0.047																	
Barium	9.5	0.94	J	I	0.079	J	I	0.21	J	I	0.43	J	I	0.047	J	I	1.3	J	I	0.64	J	I	1.6	J	I	1.3	J	I	0.73	J	I
Beryllium	0.27	0.033	U		0.031	U		0.030	U		0.032	U		0.031	U		0.032	U		0.030	U		0.032	U		0.029	U		0.026	U	
Cadmium	0.14	0.0097			0.0063	U		0.0059	U		0.0064	U		0.0062	U		0.054			0.024			0.018			0.064			0.063		
Chromium	0.41	0.27	J	I	0.21	J	I	0.23	J	I	0.32	J	I	0.31	J	I	0.98	J	I	0.96	J	I	0.31	J	I	0.46	J	I	0.34	J	I
Cobalt	2.7	0.033	U		0.031	U		0.030	U		0.032	U		0.031	U		0.047			0.043			0.043			0.053			0.035		
Copper	5.4	0.45			0.84			0.29			1.4			1.7			0.75			0.72			2.0			2.4			2.5		
Iron	40.6	30			14			20			18			7.5			85			85			130			64			80		
Lead	NA	0.48	J	H	0.11	J	H	0.063	J	H	0.22	J	H	0.24	J	H	0.58	J	H	0.43	J	H	1.1	J	H	0.45	J	H	0.59	J	H
Manganese	18.9	17	J	I	0.91	J	I	2.2	J	I	1.3	J	I	0.85	J	I	15	J	I	8.6	J	I	35	J	I	16	J	I	6.3	J	I
Mercury	0.014	0.064			0.16			0.069			0.075			0.079			0.12			0.059			0.058			0.036			0.078		
Nickel	2.7	0.15	J	I	0.10	J	I	0.11	J	I	0.41	J	I	0.076	J	I	0.29	J	I	0.26	J	I	0.62	J	I	0.32	J	I	0.31	J	I
Selenium	0.68	0.32	J	H	0.32	J	H	0.50	J	H	0.39	J	H	0.42	J	H	0.54	J	H	0.39	J	H	0.79	J	H	0.45	J	H	0.50	J	H
Silver	0.68	0.033	U		0.031	U		0.030	U		0.032	U		0.031	U		0.032	U		0.030	U		0.032	U		0.029	U		0.026	U	
Thallium	0.0095	0.0051	B	H	0.0027	B	H	0.0025	B	H	0.0014	B	H	0.0024	B	H	0.00070	UJ	I	0.00091	B	H	0.0040	B	H	0.0044	B	H	0.0034	B	H
Vanadium	0.041	0.053			0.031	U		0.036			0.032	U		0.031	U		0.055			0.10			0.14			0.084			0.064	U	
Zinc	40.6	18			20			19			17			13			18			16			33			52			23		

TABLE 16A
Summary of Fish Tissue Data - Inorganic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in mg/kg wet weight																														
	COPC Screening Levels	Lower Pond (Norwood, Massachusetts) Fish Fillet and Carcass Samples																								Lower Pond (Norwood, Massachusetts) Whole Body Fish Samples					
	USEPA Region III Fish RBCs	NWD-1-F / 10-30-03			NWD-1-C / 10-30-03			NWD-2-F / 10-30-03			NWD-2-C / 10-30-03			NWD-3-F / 10-30-03			NWD-3-C / 10-30-03			NWD-4-F / 10-30-03			NWD-5-F / 10-30-03			NWD-6-W / 10-30-03			NWD-7-W / 10-30-03		
		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																															
Aluminum	135	0.30	UJ	I	2.2			0.24	UJ	I	3.1			0.27	UJ	I	20			0.36			0.29			8.7			7.8		
Arsenic	0.0021	0.018			0.038			0.020			0.027			0.029			0.033			0.039			0.045			0.065			0.045		
Barium	9.5	0.048	U		3.0			0.075			1.8			0.20			2.1			0.16			0.23			3.5			2.7		
Beryllium	0.27	0.048	U		0.039	U		0.038	U		0.039	U		0.043	U		0.049	U		0.048	U		0.042	U		0.039	U		0.038	U	
Cadmium	0.14	0.0096	U		0.014			0.0076	U		0.0078			0.0086	U		0.0097	U		0.0095	U		0.0084	U		0.0092			0.0094		
Chromium	0.41	0.79			0.31			0.17			0.31			0.20			0.23			0.18			0.16			0.19			0.17		
Cobalt	2.7	0.048	U		0.046			0.038	U		0.039	U		0.043	U		0.049	U		0.048	U		0.042	U		0.043			0.038	U	
Copper	5.4	0.47			0.70			0.22			2.5			0.28			0.51			0.24			0.30			0.60			0.72		
Iron	40.6	7.2			130			5.7			92			8.8			120			9.2			11			160			130		
Lead	NA	0.048	U		0.19			0.038	U		0.28			0.043	U		0.36			0.048	U		0.042	U		0.34			0.14		
Manganese	18.9	0.96	U		3.8			0.76	U		17			1.4			24			0.95	U		1.9			58			29		
Mercury	0.014	0.40			0.17			0.080			0.049			0.072			0.046			0.10			0.13			0.066			0.054		
Nickel	2.7	0.36			0.46			0.038	U		0.37			0.043	U		0.22			0.048	U		0.042	U		0.20			0.25		
Selenium	0.68	0.26			0.40			0.24			0.32			0.22			0.26			0.30			0.27			0.33			0.31		
Silver	0.68	0.048	U		0.039	U		0.038	U		0.039	U		0.043	U		0.049	U		0.048	U		0.042	U		0.039	U		0.038	U	
Thallium	0.0095	0.0019	B	H	0.012	B	H	0.0021	B	H	0.0029	B	H	0.0023	B	H	0.0019	B	H	0.0010	UJ	I	0.0018	B	H	0.0020	B	H	0.0014	B	H
Vanadium	0.041	0.050			0.10			0.038	U		0.12			0.043	U		0.22			0.056			0.056			0.21			0.16		
Zinc	40.6	5.9			19			7.4			17			12			16			16			12			22			22		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2E for the identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for metals (except mercury) by United States Environmental Protection Agency (USEPA) Method 6010B and Method 6020; and mercury by USEPA Method 7471A.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1B RI Data Usability Report (SHA, 2004).

4. Metals concentrations are presented in milligrams per kilogram (mg/kg) wet weight, which are equivalent to parts per million (ppm).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. No ecological screening levels were identified.
"USEPA Region III Fish RBCs" indicates USEPA Region III Risk-Based Concentrations (RBCs) Table, October 1993. The values presented are for human consumption of fish. RBCs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999)

6. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Report (included in the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:
"J" - The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
"U" - The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
"UJ" - The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
"B" - Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with tissue metals analyses). The result is usable with possible uncertainty due to the potential for contamination.

Bias:
"L" - Low
"I" - Indeterminate
"H" - High

TABLE 16B
Summary of Fish Tissue Data - Semi-Volatile Organic Compounds and Percent Lipids
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	COPC Screening Levels	Concentrations in µg/kg wet weight (except where otherwise noted)																																				
		Neponset River Fish Fillet and Carcass Samples																Neponset River Whole Body Fish Samples												Lewis Pond Fish Fillet Samples								
		NRF-1			NRF-2			NRF-3			NRF-4			NRF-5			NRC-5			NRW-1			NRW-3			NRW-4			NRW-5			LPF-1			LPF-2			LPF-3		
	USEPA Region III Fish RBCs	8/18/2003			8/18/2003			8/18/2003			8/18/2003			8/18/2003			8/18/2003			8/18/2003			8/18/2003			8/18/2003			8/18/2003			8/19/2003			8/19/2003			8/19/2003		
		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																						
Acenaphthene	8.11	2.1	U		2.0	U		2.0	U		2.1	U		2.4			8.9			2.3			2.0			2.1	U		2.1	U		2.0	U		2.1	U		2.0	U	
Acenaphthylene	4.06	2.1	U		2.0	U		2.0	U		2.1	U		2.1	U		3.6			2.0	U		2.0	U		2.1	U		2.1	U		2.0	U		2.1	U		2.0	U	
Anthracene	40.6	2.1	U		2.0	U		2.0	U		2.3			2.1	U		2.4			2.0	U		2.0	U		2.1	U		2.1	U		2.0	U		2.1	U		2.0	U	
Benzo(a)anthracene	0.00432	2.1	U		2.0	U		2.0	U		3.0			2.1	UJ	L	7.4	J	L	2.0	U		2.9	J	L	2.4	J	L	2.1	UJ	L	4.3	J	L	3.6	J	L	4.2	J	L
Benzo(a)pyrene	0.000432	2.1	U		2.0	U		2.0	U		3.2			2.1	UJ	L	8.0	J	L	2.0	UJ	L	2.2	J	L	2.1	UJ	L	2.1	UJ	L	6.0	J	L	4.8	J	L	6.3	J	L
Benzo(b)fluoranthene	0.00432	2.1	U		2.0	U		2.0	U		3.2			2.1	UJ	L	15	J	L	2.0	UJ	L	3.5	J	L	3.8	J	L	3.9	J	L	11	J	L	9.7	J	L	10	J	L
Benzo(g,h,i)perylene	4.06	2.1	U		2.0	U		2.0	U		2.6			2.1	UJ	L	4.3	J	L	2.0	UJ	L	2.0	UJ	L	2.1	UJ	L	2.1	UJ	L	2.0	UJ	L	2.1	UJ	L	2.0	UJ	L
Benzo(k)fluoranthene	0.0432	2.1	U		2.0	U		2.0	U		3.6			2.1	UJ	L	9.0	J	L	2.0	UJ	L	3.1	J	L	2.3	J	L	2.4	J	L	7.0	J	L	6.7	J	L	6.0	J	L
Chrysene	0.432	2.1	U		2.0	U		2.0	U		4.7			2.1	UJ	L	6.2	J	L	2.0	U		2.6	J	L	2.1	J	L	2.2	J	L	3.9	J	L	3.8	J	L	4.5	J	L
Dibenz(a,h)anthracene	0.000432	2.1	U		2.0	U		2.0	U		2.9			2.1	UJ	L	2.0	UJ	L	2.0	UJ	L	2.0	UJ	L	2.1	UJ	L	2.1	UJ	L	2.0	UJ	L	2.1	UJ	L	2.0	UJ	L
Fluoranthene	5.41	2.1	U		2.0	U		2.0	U		2.4			2.1	U		2.0	U		2.0	U		2.0	U		2.1	U		2.1	U		2.0	U		2.1	U		2.0	U	
Fluorene	5.41	2.1	U		2.0	U		2.0	U		2.1	U		2.1	U		4.2			2.3			2.0	U		2.1	U		2.1	U		2.0	U		2.1	U		2.0	U	
Indeno(1,2,3-cd)pyrene	0.00432	2.1	U		2.0	U		2.0	U		2.9			2.1	UJ	L	5.3	J	L	2.0	UJ	L	2.0	UJ	L	2.1	UJ	L	2.1	UJ	L	2.0	UJ	L	2.1	UJ	L	2.0	UJ	L
Methylnaphthalene (2-)	2.70	2.1	U		2.0	U		2.0	U		2.1	U		2.1	U		3.3			2.0	U		2.0	U		2.1	U		2.1	U		2.0	U		2.1	U		2.0	U	
Naphthalene	2.70	2.1	U		2.0	U		2.0	U		2.1	U		2.6	U		5.1	U		2.2	U		2.0	U		2.1	U		2.1	U		2.0	U		2.6			3.1		
Phenanthrene	4.06	2.1	U		2.0	U		2.0	U		2.8			2.1	U		5.4			4.3			3.2			2.1	U		2.9			2.0	U		2.1	U		2.2		
Pyrene	4.06	2.1	U		2.0	U		2.0	U		2.3			2.1	UJ	L	5.6	J	L	2.0	U		2.3	J	L	2.1	UJ	L	2.1	UJ	L	2.0	UJ	L	2.1	UJ	L	2.8	J	L
Total PAHs	NS	-			-			-			35.9			2.4			88.6			8.9			21.8			10.6			11.4			32.2			31.2			39.1		
Other SVOCs																																						
Benzoic acid	540,741	10,000	UJ	I	10,000	UJ	I	10,000	UJ	I	10,000	UJ	I	11,000	UJ	I	280	J	I	2,000	J	I	920	J	I	10,000	UJ	I	10,000	UJ	I		R			R			R	
Benzyl Alcohol	40,556	520	U		510	U		510	U		520	U		530	U		510	U		500	U		490	U		520	U		520	U		510	U		520	U		510	U	
bis(2-Ethylhexyl)phthalate	225	1,800	U		3,800	J	L	480	U		3,900	J	L	51,000			12,000	J	L	4,400	J	L	7,600	J	L	930	UJ	L	1,400	UJ	L	740	UJ	L	620	UJ	L	4,500	J	L
Carbazole	158	2.1	U		2.0	U		2.0	U		2.1	U		2.1	U		2.0	U		2.0	U		2.0	U		2.1	U		2.1	U		2.0	U		2.1	U		2.0	U	
Dimethylphenol (2,4-)	2,704	520	UJ	L	510	UJ	L	510	UJ	L	520	UJ	L	530	UJ	L	510	UJ	L	500	UJ	L	490	UJ	L	520	UJ	L	520	UJ	L	4,000	UJ	L	4,200	UJ	L	4,100	UJ	L
Di-n-octylphthalate	5,407	520	U		510	U		510	U		520	U		530	U		510	UJ	L	500	U		490	U		520	U		520	U		510	UJ	L	520	UJ	L	510	UJ	L
Methylphenol (4-)	676	520	U		510	U		510	U		520	U		530	U		510	U		500	U		490	U		520	U		520	U		510	U		520	U		510	U	
Nitroaniline (4-)	158	520	U		510	UJ	I	510	U		520	U		530	U		510	U		500	U		490	U		520	U		520	U		510	U		520	U		510	U	
Total Other SVOCs	NS	-			3,800			-			3,900			51,000			12,280			6,400			8,520			-			-			-			-			4,500		
Total SVOCs	NS	-			3,800			-			3,936			51,002			12,369			6,409			8,542			10.6			11.4			32.2			31.2			4,539		
Percent Lipids (%)																																						
Percent Lipids	NS	0.82			1.2			0.43			0.91			7.0			16			4.2			2.6			1.3			2.6			0.40			0.40			0.30		

Analyte	COPC Screening Levels	Concentrations in µg/kg wet weight (except where otherwise noted)																																				
		Lewis Pond Fish Fillet Samples						Lewis Pond Whole Body Fish Samples															Lower Pond (Norwood, Massachusetts) Fish Fillet and Carcass Samples																
		LPF-4			LPF-5			LPW-1			LPW-2			LPW-3			LPW-4			LPW-5			NWD-1-F			NWD-1-C			NWD-2-F			NWD-2-C			NWD-3-F			NWD-3-C		
	USEPA Region III Fish RBCs	8/19/2003			8/19/2003			8/19/2003			8/19/2003			8/19/2003			8/19/2003			8/19/2003			10/30/2003			10/30/2003			10/30/2003			10/30/2003			10/30/2003			10/30/2003		
		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																																						
Acenaphthene	8.11	2.1	U		2.1	U		4.9			2.1	U		2.3			2.1	U		2.1	U		2.1	U		2.7			2.1	U		2.3	U		2.2	U		2.1	U	
Acenaphthylene	4.06	2.1	U		2.1	U		2.0	U		2.1	U		2.1	U		2.1	U		2.1	U		2.1	U		2.2	U		2.1	U		2.3	U		2.2	U		2.1	U	
Anthracene	40.6	2.1	U		2.1	U		2.0	U		2.1	UJ	L	2.1	U		2.1	U		2.1	U		2.1	U		2.4			2.1	U		2.3	U		2.2	U		2.1	U	
Benzo(a)anthracene	0.00432	2.9	J	L	2.1	U		6.7	J	L	6.5	J	L	2.1	U		2.1	U		2.1	U		2.1	U		4.5	U		2.1	U		2.3	U		2.2	U		3.2	U	
Benzo(a)pyrene	0.000432	6.0	J	L	2.1	U		6.2	J	L	8.4	J	L	2.1	U		2.1	U		2.1	U		2.1	U		4.5	UJ	I	2.1	UJ	L	2.3	UJ	L	2.2	UJ	L	4.5	UJ	I
Benzo(b)fluoranthene	0.00432	8.0	J	L	2.1	U		10	J	L	15	J	L	2.1	U		2.3			2.1	U		2.1	U		5.1	UJ	I	2.1	UJ	L	2.3	UJ	L	2.3	UJ	I	6.6	UJ	I
Benzo(g,h,i)perylene	4.06	2.1	UJ	L	2.1	U		2.9	J	L	2.1	UJ	L	2.1	U		2.1	U		2.1	U		2.1	U		2.5	UJ	I	2.1	UJ	L	2.3	UJ	L	2.2	UJ	L	2.4	UJ	I
Benzo(k)fluoranthene	0.0432	5.0	J	L	2.1	U		7.7	J	L	11	J	L	2.1	U		2.5			2.1	U		2.1	U		4.4	UJ	I	2.1	UJ	L	2.3	UJ	L	2.2	UJ	L	5.8	UJ	I
Chrysene	0.432	2.7	J	L	2.1	U		5.5	J	L	6.0	J	L	2.1	U		2.1	U		2.1	U		2.1	U		4.5	U		2.1	U		2.3	U		2.2	U		5.2	U	
Dibenz(a,h)anthracene	0.000432	2.1	UJ	L	2.1	U		2.0	UJ	L	2.1	UJ	L	2.1	U		2.1	U		2.1	U		2.1	U		4.2	UJ	I	2.1	UJ	L	2.3	UJ	L	2.2	UJ	L	2.1	UJ	L
Fluoranthene	5.41	2.1	U		2.1	U		4.8			3.2			2.1	U		2.2			2.1	U		2.1	U		5.8	U		2.1	U		3.0	U		2.2	U		8.7	U	
Fluorene	5.41	2.1	U		2.1	U		4.3			4.7			2.2			2.1	U		2.1	U		2.1	U		3.6			2.1	U		5.2			2.2	U		5.0		
Indeno(1,2,3-cd)pyrene	0.00432	2.1	UJ	L	2.1	U		3.2	J	L	2.1	UJ	L	2.1	U		2.5			2.1	U		2.1	U		3.4	UJ	I	2.1	UJ	L	2.3	UJ	L	2.2	UJ	L	2.2	UJ	I
Methylnaphthalene (2-)	2.70	2.1	U		2.1	U		2.0	U		2.1	U		2.1	U		2.1	U		2.1	U		2.1	U		6.4			2.7			6.3			4.0			6.4		
Naphthalene	2.70	2.4			2.1	U		2.6	U		3.3			2.9			2.1	U		2.1	U		2.1	U		4.3			2.9			2.9			3.3			4.4		
Phenanthrene	4.06	2.1	U		2.1	U		9.2			7.3			2.8			2.4			2.1	U		2.1	U		11	U		2.1	U		9.0	U		3.7	U		11	U	
Pyrene	4.06	2.1	UJ	L	2.1	U		17	J	L	12	J	I	2.1	U		2.2			2.1	U		2.1	U		5.5	U		2.1	U		2.4	U		2.2	U		8.6	U	
Total PAHs	NS	27.0			-			82.4			77.4			10.2			14.1			3.6			-			19.4			5.6			14.4			7.3			15.8		
Other SVOCs																																						
Benzoic acid	540,741		R			R		10,000	UJ	I	750	J	I	600	J	I		R			R			R			R			R		200	J	L		R		530	J	L
Benzyl Alcohol	40,556	510	U		520	U		510	U		520	U		520	U		530	U		520	U		420	U		440	U		420	U		460	U		440	U		420	U	
bis(2-Ethylhexyl)phthalate	225	16,000	J	L	4,100	J	L	4,900	J	L	12,000	J	L	230	U		4,000	J	L	1,200	U		89	U		700	U		140	U		350	U		290	U		150	U	
Carbazole	158	2.1	U		2.1	U		2.0	U		2.1	U		2.1	U		2.1	U		2.1	U		2.1	U		3.6			2.1	U		2.4			2.2	U		2.1	U	
Dimethylphenol (2,4-)	2,704	4,100	UJ	L	4,100	UJ	L	510	UJ	L	4,200	UJ	L	4,200	UJ	L	4,200	UJ	L	4,200	UJ	L		R			R			R			R			R			R	
Di-n-octylphthalate	5,407	510	UJ	L	520	UJ	L	510	UJ	L	520	UJ	L	520	UJ	L	530	UJ	L	520	UJ	L	420	U		440	UJ	L	420	UJ	L	460	UJ	L	440	UJ	L	420	UJ	L
Methylphenol (4-)	676	510	U		520	U		510	U		520	UJ	L	520	U		530	U		520	UJ	L	420	U		440	U		420	U		460	U		440	U		420	U	
Nitroaniline (4-)	158	510	U		520	U		510	U		520	U		520	U		530	U		520	U		420	U		440	U		420	U		460	U		440	U		420	U	
Total Other SVOCs	NS	16,000			4,100			4,900			12,750			600			4,000			-			-			3.6			-			202.4			-			530		
Total SVOCs	NS	16,027			4,100			4,982			12,827			610.2			4,014			3.6			-			23			5.6			216.8			7.3			545.8		
Percent Lipids (%)																																						
Percent Lipids	NS	0.63			0.58			6.0			7.5			3.5			1.6			1.6			1.2			3.3			1.5			3.4			1.4			3.0		

TABLE 16B
Summary of Fish Tissue Data - Semi-Volatile Organic Compounds and Percent Lipids
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/kg wet weight (except where otherwise noted)													
	COPC Screening Levels	Lower Pond (Norwood, Massachusetts) Fish Fillet and Carcass Samples						Lower Pond (Norwood, Massachusetts) Whole Body Fish Samples					
		NWD-4-F			NWD-5-F			NWD-6-W			NWD-7-W		
	USEPA Region III Fish RBCs	10/30/2003			10/30/2003			10/30/2003			10/30/2003		
		Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs													
Acenaphthene	8.11	2.2	U		2.3	U		2.3	U		2.3	U	
Acenaphthylene	4.06	2.2	U		2.3	U		2.3	U		2.3	U	
Anthracene	40.6	2.2	U		2.3	U		2.3	U		2.3	U	
Benzo(a)anthracene	0.00432	2.2	U		2.3	U		2.3	U		2.3	U	
Benzo(a)pyrene	0.000432	2.6	UJ	I	3.0	UJ	I	2.3	UJ	I	3.1	UJ	I
Benzo(b)fluoranthene	0.00432	3.9	UJ	I	3.8	UJ	I	3.3	UJ	I	4.4	UJ	I
Benzo(g,h,i)perylene	4.06	2.2	UJ	L	2.6	UJ	I	2.4	UJ	I	2.9	UJ	I
Benzo(k)fluoranthene	0.0432	3.7	UJ	I	3.6	UJ	I	4.2	UJ	I	4.0	UJ	I
Chrysene	0.432	2.2	U		2.3	U		2.5	U		2.3	U	
Dibenz(a,h)anthracene	0.000432	2.2	UJ	L	2.3	UJ	L	2.3	UJ	L	2.3	UJ	L
Fluoranthene	5.41	2.3	U		2.3	U		3.8	U		2.4	U	
Fluorene	5.41	2.2	U		2.3	U		3.2			2.6		
Indeno(1,2,3-cd)pyrene	0.00432	2.2	UJ	L	2.3	UJ	L	2.3	UJ	L	2.3	UJ	L
Methylnaphthalene (2-)	2.70	2.2	U		2.3	U		4.5			2.7		
Naphthalene	2.70	2.2	U		2.3			3.6			2.6		
Phenanthrene	4.06	2.2	U		2.7	U		4.6	U		4.3	U	
Pyrene	4.06	2.2	U		7.6	U		3.3	U		2.3	U	
Total PAHs	NS	-			2.3			11.3			7.9		
Other SVOCs													
Benzoic acid	540,741		R			R		1,100	J	L		R	
Benzyl Alcohol	40,556	430	U		460	U		450	U		350	J	I
bis(2-Ethylhexyl)phthalate	225	210	U		1,200	U		120	U		130	U	
Carbazole	158	2.2	U		2.3	U		2.3	U		2.3	U	
Dimethylphenol (2,4-)	2,704		R			R			R			R	
Di-n-octylphthalate	5,407	430	UJ	L	460	UJ	L	450	UJ	L	460	UJ	L
Methylphenol (4-)	676	430	U		460	U		450	U		460	U	
Nitroaniline (4-)	158	430	U		460	U		450	U		460	U	
Total Other SVOCs	NS	-			-			1,100			350		
Total SVOCs	NS	-			2.3			1,111			357.9		
Percent Lipids (%)													
Percent Lipids	NS	1.1			1.4			3.1			1.9		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2E for the identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Percent lipids analyses were performed by WHGEL using SOP# OP-015, Rev. 1, August 26, 2002.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1B RI Data Usability Report (SHA, 2004).

4. SVOC concentrations are presented in micrograms per kilogram (µg/kg) wet weight, which are equivalent to parts per billion (ppb). Lipids concentrations are presented in percent (%).

5. "COPC Screening Levels" indicates contaminants of potential concern (COPC) screening levels used to determine inclusion of an analyte in the human health or ecological risk assessments. Analyte detections that exceed the human health screening level (shaded value) are shaded. No ecological screening levels were identified.

"USEPA Region III Fish RBCs" indicates USEPA Region III Risk-Based Concentrations (RBCs) Table, October 1993. The values presented are for human consumption of fish. RBCs based on non-cancer effects are multiplied by 0.1 per USEPA Guidance (USEPA Region 1, Risk Update Number 5, September 1999)

6. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Report (included in the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:
"J" - The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.
"U" - The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.
"UJ" - The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.
"R" - Indicates data rejected during validation.

Bias:
"L" - Low
"I" - Indeterminate

TABLE 17A
Summary of Bioaccumulation Data
Inorganic Compounds
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analytes	Concentrations in mg/kg wet weight																									
	Neponset River									Neponset River Reference Area			Lewis Pond									Lower Pond (Norwood, Massachusetts) (Lewis Pond Reference Area)			Former Mill Tailrace		
	NR-5-B			NR-7-B			NR-8-B			SedRN-4-B			LP-01-B			LP-06-B			LP-09-B			SedRNwd-01-B			TR-3-B		
	1/28/2003			1/28/2003			1/28/2003			1/28/2003			1/27/2003			1/27/2003			1/27/2003			1/27/2003			1/27/2003		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																											
Aluminum	120			63			110			150			130			130			93			120			320		
Barium	55			58			62			68			65			62			57			64			25		
Beryllium	0.028	U		0.025	U		0.03	U		0.025	U		0.03	U		0.024	U		0.025	U		0.03	U		0.027	U	
Cadmium	0.21			0.57			0.61			0.49			0.099			0.099			0.095			0.094			0.033		
Chromium	0.53			0.38			0.55			0.62			8.7			7			1			0.58			0.57		
Cobalt	0.18			0.29			0.35			0.36			0.34			0.29			0.25			0.38			0.39		
Copper	4			10			8.6			3.5			6			5.4			2.6			3.3			1.5		
Iron	670			480			720			560			500			450			490			650			490		
Lead	8.9			4.1			9.6			1.2			22			34			5.9			13			7.1		
Manganese	6.8			58			75			99			9.1			4.2			17			22			8.5		
Mercury	0.0096			0.011			0.013			0.011			0.014			0.01			0.011			0.039			0.0071	U	
Nickel	0.63			0.65			0.95			0.8			2.2			3.5			0.86			0.92	J	I	0.97		
Selenium	0.63			0.58			0.64			0.72			0.44			0.59			0.52			0.48			0.46		
Silver	0.028	U		0.025	U		0.03	U		0.026	J	H	0.03	U		0.024	U		0.025	U		0.03	U		0.027	U	
Thallium	0.0042	B	H	0.0051	B	H	0.0057	B	H	0.004	B	H	0.0027	B	H	0.0044	B	H	0.0011	UJ	I	0.0017	B	H	0.0024	B	H
Vanadium	0.86			0.54			0.8			0.86			0.83			0.58			0.51			1.2	J	I	0.92		
Zinc	35			36			42			39			31			38			30			31			24		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2G for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for metals (except mercury) by United States Environmental Protection Agency (USEPA) Methods 6010B and 6020; and mercury by USEPA Method 7471A.

3. In accordance with SOP S-1669G and consistent with Section 3.6.1 of the Phase 1B-1 Work Plan, SHA and Menzie, Cura & Associates, Inc. (MCA) collected sediment samples in December 2002 to evaluate potential risk to ecological receptors. Homogenized sediment samples were submitted to Aquatec Biological Services, Inc. (Aquatec) for 28-day bioaccumulation testing using *Lumbriculus variegates* in accordance with laboratory SOP L-47 (Aquatec's SOP for bioaccumulation testing entitled "Oligochaete, *Lumbriculus variegates* , 28-day Bioaccumulation Test for Sediments"). Following the 28-day exposure test, Aquatec submitted the *Lumbriculus variegates* to WHGEL for chemical analysis.

4. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1B RI Data Usability Report (SHA, 2004).

5. Concentrations are presented in milligrams per kilogram (mg/kg) wet weight, which are equivalent to parts per million (ppm).

6. No contaminants of potential concern (COPC) screening levels were identified for the bioaccumulation data.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Report (included in the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

"B" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with bioaccumulation matrix metals analyses). The result is usable with possible uncertainty due to the potential for contamination.

Bias:

"I" Indeterminate

"H" High

TABLE 17B
Summary of Bioaccumulation Data
Semi-Volatile Organic Compounds and Percent Lipids
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/kg wet weight																										
	Neponset River									Neponset River Reference Area			Lewis Pond									Lower Pond (Norwood, Massachusetts) (Lewis Pond Reference Area)			Former Mill Tailrace		
	NR-5-B			NR-7-B			NR-8-B			SedRN-4-B			LP-01-B			LP-06-B			LP-09-B			SedRNwd-01-B			TR-3-B		
	01-28-03			01-28-03			01-28-03			01-28-03			01-27-03			01-27-03			01-27-03			01-27-03			01-27-03		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																											
Acenaphthene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Acenaphthylene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Anthracene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		150	J		270	U	
Benzo(a)anthracene	260	U		230	U		280	U		280	U		280	U		140	J		270	U		250			270	U	
Benzo(a)pyrene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		150	J		270	U	
Benzo(b)fluoranthene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		220	J		120	J	
Benzo(g,h,i)perylene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Benzo(k)fluoranthene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		170	J		270	U	
Chrysene	260	U		230	U		280	U		280	U		130	J		130	J		270	U		370			120	J	
Dibenz(a,h)anthracene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Fluoranthene	120	J		230	U		280	U		280	U		120	J		320			120	J		1100			150	J	
Fluorene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Indeno(1,2,3-cd)pyrene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Methylnaphthalene (2-)	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Naphthalene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Phenanthrene	260	U		230	U		280	U		280	U		280	U		270	U		270	U		850			270	U	
Pyrene	260	U		230	U		280	U		280	U		130	J		390			130	J		880			250	J	
Total PAHs	**120**			-			-			-			**380**			**980**			**250**			**4140**			**640**		
Other SVOCs																											
Benzoic acid	2800	J	L	910	J	L	1200	J	L	700	J	L	970	J	L	870	J	L	780	J	L	1200	J	I	360	J	L
Benzyl Alcohol	830			1900			1100			1900			1100			2400			1700			1200	J	I	5200		
bis(2-Ethylhexyl)phthalate	660	U		560	U		710	U		1000	U		450	U		440	U		370	U		420	U		550	U	
Carbazole	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Dimethylphenol (2,4-)	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Di-n-octylphthalate	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Methylphenol (4-)	180	J		210	J		170	J		250	J		280	U		200	J		160	J		220	J		270	U	
Nitroaniline (4-)	260	U		230	U		280	U		280	U		280	U		270	U		270	U		250	U		270	U	
Total Other SVOCs	**3810**			**3020**			**2470**			**2850**			**2070**			**3470**			**2640**			**2620**			**5560**		
Total SVOCs	**3930**			**3020**			**2470**			**2850**			**2450**			**4450**			**2890**			**6760**			**6200**		
Percent Lipids (%)																											
Percent Lipids	1.1			1.3			1.3			1.3			1.2			1.7			1.3			1.4			1.1		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2G for identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Percent lipids analyses were performed by WHGEL using SOP# OP-015, Rev. 1, August, 26, 2002.

3. In accordance with SOP S-1669G and consistent with Section 3.3 of the Phase 1B-1 Work Plan, SHA and Menzie, Cura & Associates, Inc. (MCA) collected sediment samples in December 2002 to evaluate potential risk to ecological receptors. Homogenized sediment samples were submitted to Aquatec Biological Services, Inc. (Aquatec) for 28-day bioaccumulation testing using *Lumbriculus variegates* in accordance with laboratory SOP L-47 (Aquatec's SOP for bioaccumulation testing entitled "Oligochaete, *Lumbriculus variegate*, 28-day Bioaccumulation Test for Sediments"). Following the 28-day exposure test, Aquatec submitted the *Lumbriculus variegates* to WHGEL for chemical analysis.

4. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1B RI Data Usability Report (SHA, 2004).

5. Concentrations are presented in micrograms per kilogram (µg/kg) wet weight, which are equivalent to parts per billion (ppb).

6. Total concentrations listed (e.g. Total PAHs) are the sum of detected concentrations of the relevant suite of compounds. "PAHs" are polycyclic aromatic hydrocarbons. "Other SVOCs" are non-PAH semi-volatile organic compounds.

7. No contaminants of potential concern (COPC) screening levels were identified for the bioaccumulation data.

8. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Report (included in the Phase 1B RI Data Usability Report [SHA, 2004]) for additional detail regarding qualifiers and bias.

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

TABLE 18A
Summary of Earthworm Tissue Data
Inorganic Parameters
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in mg/kg wet weight																											
	East Upland Area									Floodplain									Orlando Property								On-Site Area		
	EUA-1-W			EUA-2-W			EUA-3-W			FPW-1-W			FPW-2-W			FPW-3-W			OP-1-W			OP-2-W			OP-3-W			OSA-1-W		
	8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/7/2003		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals																														
Aluminum	460	J	L	250	J	L	300	J	L	600	J	L	310	J	L	130	J	L	110	J	L	190	J	L	230	J	L	310	J	L
Antimony	0.083			0.049	U		0.047	U		0.047	U		0.052			0.048	U		0.045	U		0.044	U		0.049	U		0.045	U	
Arsenic	15	J	H	6.8	J	H	1.8	J	H	1.2	J	H	0.66	J	H	0.37	J	H	0.52	J	H	0.56	J	H	0.2	J	H	0.6	J	H
Barium	14			12			17			29			21			9.3			3.6			1.9			13			17		
Cadmium	0.6			3.1			2.4			3.3			2.3			4			4.3			1.1			1.5			1.4		
Chromium	1.1			1.3			0.86			1.7			3			0.84			0.53			0.42			0.57			1.8		
Cobalt	0.56			0.41			0.43			0.7			0.35			0.55			0.37			0.45			0.52			0.51		
Copper	18			8.2			7.1			8.5			7			5.1			3.1			2			3.7			4.6		
Iron	1000	J	L	480	J	L	360	J	L	980	J	L	490	J	L	260	J	L	160	J	L	230	J	L	280	J	L	650	J	L
Lead	12			18			49			57			45			34			69			1.3			20			6.6		
Manganese	55			20			14			110			48			10			14			8.5			46			29		
Mercury	0.032			0.057			0.18			0.097			0.051			0.037			0.19			0.083			0.031			0.08		
Nickel	1.2			0.74			0.73			1.3			0.68			0.58			0.32			0.22			0.45			2.3		
Selenium	0.44			0.96			2.5			1.4			0.46			0.98			7.4			5.3			0.65			0.6		
Thallium	0.03			0.0073	B	H	0.0098	B	H	0.026			0.0085	B	H	0.0058	B	H	0.0085	B	H	0.0096	B	H	0.0065	B	H	0.0058	B	H
Vanadium	1.9			1.6			1.3			2.7			1.4			0.68			0.56			0.65			0.87			1.3		
Zinc	29			66			200			80			69			120			190			75			48			70		

Analyte	Concentrations in mg/kg wet weight														
	On-Site Area						On-Site Reference Area								
	OSA-2-W			OSA-3-W			OSR-1-W			OSR-2-W			OSR-3-W		
	8/12/2003			8/12/2003			11/21/2003			11/4/2003			10/31/2003		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
Metals															
Aluminum	850	J	L	400	J	L	130	J	H	480	J	H	360	J	H
Antimony	0.044	U		0.043	U		0.029	U		0.045			0.055		
Arsenic	0.89	J	H	0.55	J	H	0.21			3.5			5.1		
Barium	28			25			1.1			24			25		
Cadmium	1.4			1			1.1			1.1			1		
Chromium	1.4			0.76			0.29			0.67			0.58		
Cobalt	0.56			0.45			0.22			0.57			0.4		
Copper	4.6			3.5			1.2			4.5			3.7		
Iron	760	J	L	420	J	L	190			640			520		
Lead	16			14			55			22			17		
Manganese	34			21			19			31			25		
Mercury	0.088			0.073			0.13			0.089			0.087		
Nickel	0.95			0.61			0.27			0.62			0.53		
Selenium	1.7			1.4			1.6			0.55			0.62		
Thallium	0.013			0.0084	B	H	0.0051			0.013			0.015		
Vanadium	3			1.4			0.74			2			1.3		
Zinc	100			66			38			30			26		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2F for the identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for metals (except mercury) by United States Environmental Protection Agency (USEPA) Method 6010B and Method 6020; and mercury by Method 7471A.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1B RI Data Usability Report (SHA, 2004).

4. Concentrations are presented in milligrams per kilogram (mg/kg) wet weight, which are equivalent to parts per million (ppm).

5. No contaminants of potential concern (COPC) screening levels were identified for the earthworm tissue data.

6. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Report in the Phase 1B RI Data Usability Report (SHA, 2004).

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"B" Indicates the analyte was detected in a non-matrix matched, associated method blank (e.g., aqueous method blank associated with earthworm tissue metals analyses). The result is usable with possible uncertainty due to the potential for contamination.

Bias:

"L" Low

"H" High

TABLE 18B
Summary of Earthworm Tissue Data
Semi-Volatile Organic Compounds and Percent Lipids
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/kg wet weight																								
	East Upland Area									Floodplain									Orlando Property						
	EUA-1-W			EUA-2-W			EUA-3-W			FPW-1-W			FPW-2-W			FPW-3-W			OP-1-W			OP-2-W			OP-3-W		
	8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003			8/8/2003		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																									
Acenaphthene	380	U		400	U		390	U		390	U		400	U		390	U		400	U		380	U		390	U	
Acenaphthylene	380	U		400	U		390	U		390	U		400	U		390	U		400	U		380	U		390	U	
Anthracene	380	U		400	U		390	U		390	UJ	L	400	UJ	L	390	UJ	L	400	U		380	UJ	L	390	UJ	L
Benzo(a)anthracene	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Benzo(a)pyrene	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Benzo(b)fluoranthene	170	J	I	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Benzo(g,h,i)perylene	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Benzo(k)fluoranthene	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Chrysene	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Dibenz(a,h)anthracene	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Fluoranthene	380	U		400	U		390	U		390	UJ	L	330	J	I	390	UJ	L	400	U		380	UJ	L	390	UJ	L
Fluorene	380	U		400	U		390	U		390	U		400	U		390	U		400	U		380	U		390	U	
Indeno(1,2,3-cd)pyrene	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Methylnaphthalene (2-)	380	U		400	U		390	U		390	U		400	U		390	U		400	U		380	U		390	U	
Naphthalene	380	U		400	U		390	U		390	U		400	U		390	U		400	U		380	U		390	U	
Phenanthrene	380	U		400	U		390	U		390	UJ	L	400	UJ	L	390	UJ	L	400	U		380	UJ	L	390	UJ	L
Pyrene	170	J	I	400	UJ	L	390	UJ	L	390	UJ	L	240	J	I	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Total PAHs	**340**			**-**			**-**				**-**		**570**			**-**			**-**			**-**			**-**		
Other SVOCs																									
Benzoic acid	260	J	I	4,400	J	I	2,200	J	I	4,100	J	I	2500	J	I	890	J	I	2,000	J	I	600	J	I	8,200	J	I
Butylbenzylphthalate	380	UJ	L	400	UJ	L	390	UJ	L	390	UJ	L	400	UJ	L	390	UJ	L	400	UJ	L	380	UJ	L	390	UJ	L
Carbazole	380	U		400	U		390	U		390	UJ	L	400	UJ	L	390	UJ	L	400	U		380	UJ	L	390	UJ	L
Dibenzofuran	380	U		400	U		390	U		390	U		400	U		390	U		400	U		380	U		390	U	
Dichlorobenzene (1,2-)	380	U		400	U		390	U		390	U		400	U		390	U		400	U		380	U		390	U	
Methylphenol (4-)	380	UJ	L	400	U		170	J	I	390	U		400	U		160	J	I	400	U		240	J	I	610		
Total Other SVOCS	**260**			**4,400**			**2,370**			**4,100**			**2,500**			**1,050**			**2,000**			**840**			**8,810**		
Total SVOCs	**600**			**4,400**			**2,370**			**4,100**			**3,070**			**1,050**			**2,000**			**840**			**8,810**		
Percent Lipids (%)																									
Percent Lipids	0.70	J	I	1.1	J	L	1.3	J	L	1.5	J	L	1.1	J	L	0.98	J	L	1.3	J	L	1.2	J	L	1.0	J	L

TABLE 18B
Summary of Earthworm Tissue Data
Semi-Volatile Organic Compounds and Percent Lipids
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Analyte	Concentrations in µg/kg wet weight																	
	On-Site Area									On-Site Reference Area								
	OSA-1-W			OSA-2-W			OSA-3-W			OSR-1-W			OSR-2-W			OSR-3-W		
	8/7/2003			8/12/2003			8/12/2003			11/21/2003			11/4/2003			10/31/2003		
	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
PAHs																		
Acenaphthene	390	U		390	UJ	L	370	U		380	U		370	U		370	U	
Acenaphthylene	390	U		390	UJ	L	370	U		380	U		370	U		370	U	
Anthracene	390	U		390	UJ	L	370	U		380	U		370	U		370	U	
Benzo(a)anthracene	300	J	I	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Benzo(a)pyrene	390	J	L	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Benzo(b)fluoranthene	440	J	L	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Benzo(g,h,i)perylene	270	J	I	390	UJ	L	370	UJ	L	380	UJ	L	370	U		370	U	
Benzo(k)fluoranthene	160	J	I	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Chrysene	300	J	I	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Dibenz(a,h)anthracene	390	UJ	L	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Fluoranthene	520			390	UJ	L	370	U		380	U		370	U		370	U	
Fluorene	390	U		390	UJ	L	370	U		380	U		370	U		370	U	
Indeno(1,2,3-cd)pyrene	270	J	I	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Methylnaphthalene (2-)	390	U		390	U		370	U		380	U		370	U		370	U	
Naphthalene	390	U		390	U		370	U		380	U		370	U		370	U	
Phenanthrene	420			390	UJ	L	370	U		380	U		370	U		370	U	
Pyrene	1100	J	L	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Total PAHs	**5,270**			-			-			-			-			-		
Other SVOCs																		
Benzoic acid	710	J	I	2,100	J	I	2,300	J	I	3,100	J	I	5,400	J	I	5,500	J	I
Butylbenzylphthalate	390	UJ	L	390	UJ	L	370	UJ	L	380	U		370	U		370	U	
Carbazole	390	U		390	UJ	L	370	U		380	U		370	U		370	U	
Dibenzofuran	390	U		390	UJ	L	370	U		380	U		370	U		370	U	
Dichlorobenzene (1,2-)	390	U		390	U		370	U		380	U		370	U		370	U	
Methylphenol (4-)	390	U		450			150	J	I	380	UJ	L	1500			180	J	I
Total Other SVOCS	**710**			**2,550**			**2,450**			**3,100**			**6,900**			**5,680**		
Total SVOCs	**5,980**			**2,550**			**2,450**			**3,100**			**6,900**			**5,680**		
Percent Lipids (%)																		
Percent Lipids	1.1	J	L	1.8	J	L	1.3	J	L	3.0	J	I	1.1			2.8		

Notes:

1. Samples were collected by Sanborn, Head & Associates, Inc. (SHA) on the dates indicated; see Table 2F for the identity of sample delivery groups (SDGs).

2. In accordance with Section 8.1.2 of the Work Plan, Woods Hole Group Environmental Laboratories (WHGEL) of Raynham, Massachusetts, performed analyses for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C-EI; ; and polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270C using selective ion monitoring (SIM) (when required to achieve Project Action Levels). Percent lipids analyses were performed by WHGEL using SOP# OP-015, Rev. 1, August 26, 2002.

3. Data validation and data usability assessment performed by SHA and New Environmental Horizons, Inc. (NEH). Results are presented in the Phase 1B RI Data Usability Report (SHA, 2004).

4. Concentrations for SVOCs are presented in micrograms per kilogram (µg/kg) wet weight, which are equivalent to parts per billion (ppb). Concentrations for lipids are presented in percent (%).

5. Total concentrations listed (e.g. Total PAHs) are the sum of detected concentrations of the relevant suite of compounds. "PAHs" are polycyclic aromatic hydrocarbons. "Other SVOCs" are non-PAH semi-volatile organic compounds.

6. No contaminants of potential concern (COPC) screening levels were identified for the earthworm tissue data.

7. The following qualifiers and biases were assigned during data validation by NEH. Refer to NEH's Data Usability Report in the Phase 1B RI Data Usability Report (SHA, 2004).

Qualifiers:

"J" The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project objectives with the documentation of the uncertainty, bias, and/or imprecision.

"U" The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit. The value is usable for project decisions as a non-detect result at the reporting limit.

"UJ" The compound was analyzed for, but was not detected. The sample-specific quantitation (reporting) limit is estimated. The non-detect result is usable for project objectives with documentation of the bias or uncertainty in the result.

Bias:

"L" Low

"I" Indeterminate

TABLE 19
Summary of Sediment Toxicity Testing
Remedial Investigation Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sediment Collection Date	Mean Proportion Surviving	Mean Weight Growth (mg)
Neponset River Sediments			
NR-7	12/18/2002	0.84	0.466
NR-8	12/18/2002	0.94	0.401
Neponset River (Upstream of the Site) Reference Sediments			
SedRN-4	12/18/2002	0.84	0.397
Lewis Pond Sediments			
LP-01	12/18/2002	0.85	0.324
Lower Pond (Norwood, Massachusetts) Reference Sediments			
SedRNwd-01	12/17/2002	0.91	0.263
	Dup.	0.83	0.296
Former Mill Tailrace Sediments			
TR-3	12/16/2002	0.91	0.563

Notes:

1. Samples were collected by SHA on the dates indicated. Refer to the field sampling summaries in Appendix B for further information.

2. Toxicity testing was performed by Aquatec Biological Sciences, Inc. (Aquatec) of South Bennington, Vermont in accordance with their SOP entitled "Amphipod, *Hyalella azteca* , 28 day Survival and Growth Toxicity Testing for Sediments".

3. The 28-day toxicity test began on December 22, 2002, and concluded on January 19, 2003.

4. "Mean Proportion Surviving" indicates the mean proportion of Hyalella azteca surviving the 28-day test.

5. "Mean Weight Growth (mg)" indicates the mean weight growth in milligrams (mg) of Hyalella azteca at the end of the 28-day test as compared to the beginning of the test.

6. Refer to Section 2 of this Report for further explanation and discussion regarding analytical program.

7. "Dup." indicates a blind field duplicate was collected at this location and submitted for the listed analyses.